B.C.A. (COMPUTER APPLICATIONS)

(Effective for the students admitted from the Academic Year 2019-2020)

Structure of Study and Examination

Sem	Part	Code	Title of Paper	Hours/ Week	Exam Hours		Credits	Marks
					Th	Pr		
I	I	ULTAA18	Tamil Paper - I	6	3	-	3	40+60
	II	UENGA17	English Paper - I	6	3	-	3	40+60
	III	UCCAA19	Programming in C	4	3	-	3	40+60
	III	UCCAB19	Fundamentals of Information Technology	4	3	-	3	40+60
	III	UAAFA19	Allied - I: Accounting Fundamentals - I	5	3	-	5	40+60
	III	UCCAC19	Practical - I: C	2	-	3	2	40+60
	IV	-	Skill-Based Elective - I	2	-	2	2	40+60
	IV	-	Value Education	1	-	-	-	-
Total							**21**	**700**
II	I	ULTAB18	Tamil Paper - II	6	3	-	3	40+60
	II	UENGB17	English Paper - II	6	3	-	3	40+60
	III	UCCAD19	Object Oriented Programming with C++	4	3	-	3	40+60
		UCCAE19	Computer Organization and Architecture	4	3	-	3	40+60
	III	UAAFB19	Allied - II : Accounting Fundamentals - II	5	3	-	5	40+60
	III	UCCAF19	Practical - II: C++	2	-	3	2	40+60
	IV	-	Skill-Based Elective - II	2	-	2	2	40+60
	IV	-	Value Education	1	-	-	-	-
Total							**21**	**700**
III	III	UCCAG19	Data Structures	5	3	-	3	40+60
	III	UCCAH19	Java Programming	5	3	-	3	40+60
	III	UCCAI19	Design and Analysis of Algorithms	5	3	-	4	40+60
	III	UAMFA19	Allied - III : Mathematical Foundations - I	6	3	-	5	40+60
	III	UCCAJ19	Practical - III: Java	3	-	3	2	40+60
	III	UCCAK19	Practical - IV: Data Structures and Algorithms	3	-	3	2	40+60
	IV	-	Skill-Based Elective - III	2	-	2	2	40+60
	IV	-	Value Education	1	-	-	-	-
Total							**21**	**700**

Sem	Part	Code	Title of Paper	Hours/ Week	Exam Hours		Credits	Marks
					Th	Pr		
IV	III	UCCAL19	Data Communications and Networking	5	3	-	3	40+60
	III	UCCAM19	Python Programming	5	3	-	3	40+60
	III	UCCAN19	Operating Systems	5	3	-	4	40+60
	III	UAMFB19	Allied - IV: Mathematical Foundations II	6	3	-	5	40+60
	III	UCCAO19	Practical - V: Python	2	-	3	2	40+60
	III	UCCAP19	Practical - VI: Linux	2	-	3	2	40+60
	IV	-	Skill-Based Elective - IV	2	-	2	2	40+60
	IV	UNEVS17	Environment Studies	2	2	-	2	40+60
	IV	-	Value Education	1	-	-	-	-
Total							**23**	**800**
V	III	UCCAQ19	Relational Database Management Systems	5	3	-	4	40+60
	III	UCCAR19	Software Engineering	5	3	-	4	40+60
	III	UCCAS19	Mobile Application Development	4	3	-	4	40+60
	III	UECAA19	Elective - I A: Resource Management Techniques	5	3	-	5	40+60
		UECAB19	Elective - IB: Mobile Computing					
		UECAC19	Elective - IC: Computer Graphics					
	III	UCCAT19	Practical - VII: RDBMS	3	-	3	2	40+60
	III	UCCAU19	Practical - VIII: Mobile Application Development	2	-	3	2	40+60
	IV	-	Non-Major Elective - I	3	2	-	2	40+60
	IV	-	Skill-Based Elective - V	2	2	-	2	40+60
	IV	-	Value Education	1	-	-	-	-
Total							**25**	**900**
VI	III	UCCAV19	**.**NET Programming	5	3	-	4	40+60
	III	UCCAW19	Internet Programming	4	3	-	3	40+60
	III	UECAD19	Elective - II A: Cloud Computing	5	3	-	5	40+60
		UECAE19	Elective - II B: Cryptography					
	III	UECAF19	Elective - III A: Data Mining	5	3	-	5	40+60
	III	UECAG19	Elective - III B: Artificial Intelligence					
	III	UCCAX19	Practical IX: .NET	3	-	3	3	40+60
	III	UCCAY19	Practical X: Internet and Web Programming	2	-	3	2	40+60
	IV	-	Non-Major Elective - I	3	-	2	2	40+60
	IV	-	Skill-Based Elective - VI	2	-	2	2	40+60
	IV	UVEDA15	Value Education	1	2	-	2	40+60
Total							**28**	**900**
	V	Extension Activities (90 Hours)					1	
Grand Total							**140**	**4700**

Pattern of Question Paper

Practical - Total Marks 60

- **Practical:** 45 Marks
- **Record:** 10 Marks
- **Viva:** 5 Marks

Theory - Total Marks 100

- Section A (Answer ALL) - 10 x 3 = 30
- Section B (Either Or) - 5 x 5 = 25
- Section C (3 out of 5) - 3 x 15 = 45

SBE - Total Marks 60

- Section A (Any 10 out of 15) - 10 x 2 = 20
- Section B
    - **Practical:** 35 Marks
    - **Record:** 5 Marks

NME - Total Marks 60

- Section A (Answer ALL) - 5 x 2 = 10
- Section B (Answer 3 out of 5) 3 x 5 = 15
    - **Practical:** 30 Marks
    - **Record:** 5 Marks

SEMESTER I

UCCAA19 - PROGRAMMING IN C

Objective:

To introduce students to the concept of basic programming - thereby reducing the design complexity and increasing the reusability of a component.

Unit I

Algorithm and Flowchart – Basic Techniques: Sum of Two Given Numbers - Swapping Two Numbers - Simple Interest Calculation - Overview of C - Constants and Variables - Data Types.

Unit II

Operators and Expressions - Managing Input and Output Operations- Decision Making and Branching – Decision Making and Looping.

Unit III

Arrays – One Dimensional Array – Predefined Streams – Two Dimensional Array.

Unit IV

Character Arrays and Strings – Introduction-Reading and Writing String – Arithmetic Operation on Characters - Putting String Together - Comparison of Two Strings - String Handling Functions - Other Features of Strings.

Unit IV

User Defined Functions: Introduction - Defining and Accessing Functions – Function Prototypes – Categories of Function - Passing Arguments – Nesting of Functions

Unit V

Recursions - Passing Array to Functions-Passing Strings to Functions – Scope - Visibility and Lifetime of Variables - Structures and Unions.

Book for Study

1. Balagurusamy, “Programming in C”, 6th Edition, Tata McGraw Hill Publication, 2012.
2. M. G. Venkateshmurthy, “Programming Techniques through C: A Beginner's Companion”, 1st Edition, Pearson India, 2006.

Book for Reference

1. Ashok N. Kamathane - “Programming with C”, Third Edition, Pearson Publication, 2011.

SEMESTER I

UCCAB19 - FUNDAMENTALS OF INFORMATION TECHNOLOGY

Objective

The main objective is to introduce Information Technology in a Simple Language to all undergraduate students regardless of their specialization. It will help them to pursue specialized programs leading to technical and professional careers and certifications in the IT industry.

Unit I

Basics of Information Technology: Definition - Technological Trends in IT - Applications of Information Technology - Introduction to Computers: Definition - Characteristics of a Computer - Classification of Computers - Basic Anatomy of the Computer - Applications / Uses of Computers in Different Fields.

Unit II

Input and Output Devices**:** Input Devices - Output Devices - Data Representation - Programming Languages / Computer Languages - Software: System Software - Application Software - Difference between System Software and Application Software.

Unit III

Data Communication and Computer Networks**:** Data Communication - Computer Network - The Uses of a Network - Types of Networks: LAN, MAN, WAN - Intranet and Extranet - Network Topologies.

Unit IV

Internet and its Applications **:** History of Internet - Uses of Internet - Advantages of Internet - ISP - Internet Services - IP Address - Web Browser - URL - DNS - Internet Explorer - Types of Internet Connections - E-mail - Search Engine.

Unit V

Operating System**:** Evolution of Operating Systems - Function of Operating System - Classification of Operating –System - Example of Operating System – DOS –Windows – UNIX - Linux - Difference between Windows and DOS- Difference between Linux and Windows.

Books for Study

1. Pelin Aksoy, Laura DeNardis, “Introduction to Information Technology”, 1st Edition, Cengage Learning India Private Limited, 2009.
2. Alexis Leon and Mathews Leon, “Fundamentals of Information Technology”, Second Edition, Vikas Publishing House Pvt. Ltd., 2009.

Books for Reference

1. Dr. P.Rizwan Ahmed, “Introduction to Information Technology”, Second Edition, Margham Publications, Chennai, 2016.
2. Alexis Leon and Mathew Leon, “Internet for Everyone”, Second Edition, Vikas Publishing, 2012.

SEMESTER I

UCCAC19 - PRACTICAL - I: C

1. Input and Output Operations.
2. Decision Making Statements.
3. Arrays and Looping Statements.
4. Two Dimensional Arrays.
5. The Concept of Functions.
6. Recursion.
7. Character Arrays
8. Structures and Unions

SEMESTER II

UCCAD19 - OBJECT ORIENTED PROGRAMMING WITH C++

Objective

To introduce students to the concept of object oriented programming. Thereby reducing the design complexity and increasing the reusability of a component.

Unit I

Principles of OOP – Basic concepts – Benefits – Applications – Introduction to C++ – Tokens – Keywords – Identifiers – Variables – Operators – Expressions and Control structures. Functions: Function Prototyping – Parameter Passing in Function – Values Returned by Functions – Inline Functions – Function Overloading

Unit II

Classes and Objects -Constructors and Destructors: Introduction – Types of Constructors – Destructors-Operator Overloading.

Unit III

Inheritance: Types – Virtual Base Classes – Abstract Classes – Constructors in Inheritance.

Unit IV

Virtual functions and Polymorphism: Pointers to Objects – this Pointer – Pointers to Derived Classes – Virtual Functions – Pure Virtual Functions.

Unit V

Mapping Console I/O Operations - Files: File streams – File operations – File pointers – Command Line Arguments-Exception handling.

Book for Study

1. Balagurusamy E., “Object Oriented Programming with C++”, Sixth Edition, Tata McGraw Hill Publication, 2014

Books for Reference

1. Herbert Schildt, “The Complete Reference C++”, Edition IV, Tata McGraw Hill Publication, 2015.
2. Yashawant P. Kanetkar, “Let Us C++”, Edition II, BPB Publication, 2003.
3. John R. Hubbard, “Programming with C++”, Edition II, Schaum’s Outlines, Tata McGraw Hill Publication, 2009.

SEMESTER II

UCCAE19 - COMPUTER ORGANIZATION AND ARCHITECTURE

Objective

To help students to understand the basic operation of computing hardware, how it works and interfaces to software. They will also learn to apply their knowledge of computer architecture to programming and enhance programming skills.

Unit I

Digital Logic Circuits: Digital Computers Logic Gates Boolean Algebra Map Simplification Combinational Circuits FlipFlops (SR D JK T) Digital Components: Decoders Multiplexers Registers Shift Registers Data Representation: Data Types Complements Other Binary Codes.

Unit II

Basic Computer Organization and Design: Instruction Codes - Computer Registers - Computer Instructions - Timing and Control - Instruction Cycle - Memory Reference Instructions.

Unit III

Programming the Basic Computer: Introduction - Machine Language - Assembly Language - The Assembler - Central Processing Units: Introduction - General Register Organization – Instruction Formats - Addressing Modes - RISC and CISC Characteristics.

Unit IV

Input Output Organization: Peripheral Devices - Input/Output Interface - Asynchronous Data Transfer - Modes of Transfer - Priority Interrupt - Direct Memory Access.

Unit V

Memory Organization: Memory Hierarchy - Main Memory - Auxiliary Memory -Cache Memory - Virtual Memory.

Books for Study

1. M.Morris Mano, “Computer System Architecture”, Edition 3, Prentice Hall of India Pvt. Ltd., 2013.
2. Miles Murdocca and Vincent Heuring, “Computer Architecture and Organization: An Integrated Approach”, Second Edition, Wiley Publication, 2015.

Books for Reference

1. Vincent P.Heuring and Harry F. Jordan, “Computer System Design and Architecture, Edition 2, Pearson Education, 2012.
2. William Stallings, “Computer Organization and Architecture Designing for Performance”, Eighth Edition, Pearson Education, 2013.

SEMESTER II

UCCAF17 - PRACTICAL II: C ++

1. Input and Output Operations.
2. String Manipulations.
3. Inline Functions.
4. Recursion.
5. Function Overloading.
6. Constructors and Destructors
7. Operator overloading
8. Inheritance
9. Virtual Functions and Polymorphism
10. File concepts

SEMESTER III

UCCAG19 - DATA STRUCTURES

Objective

On learning this paper students will gain the knowledge on different types of data along with the structures and its algorithm.

Unit I

Introduction - Data structure operations - Complexity and Time Space of Algorithms - Mathematical Notation and Functions - Algorithmic Notation - Control Structures - Complexity of Algorithms - Sub Algorithms - Variables - Data Types - String Processing: Basic Terminology - Storing Strings - Character Data Type - String Operations

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Unit II

Linear Arrays Representation in Memory - Traversals - Inserting and Deleting - Sorting - Searching - Multidimensional Arrays - Pointer Arrays.

Unit III

Linked Lists: Representation in Memory - Traversing a Linked List - Searching - Garbage Collection - Insertion and Deletion - Headers – Two-Way Lists - Application Stacks - Array Representation - Arithmetic Expressions- Recursion - Queues - Application Circular queues - Priority Queues.

Unit IV

Trees - Binary Trees - Representation in Memory - Tree Traversals - Binary Search Trees - Searching Inserting and Deleting - Path Lengths - General Trees

Unit V

Graphs - Sequential Representation - Adjacency Matrix - Path Matrix - Heap Sort - Warshall's Algorithm for Shortest Path - Linked Representation - Graph Traversals - Hashing

Book for Study

1. Seymour Lipschutz, "Data Structures: Schaum's Outline Series", Revised Edition, McGraw Hill Publication, 2011.

Books for Reference

1. Ellis Horowitz, Sartaj Sahni, Susan Andeson Freed, "Fundamentals of Data Structures in C", 2nd Edition, Universities Press Pvt Ltd, ,2018
2. Yashavant P.Kanetkar, "Data Structures Through C", 2nd Edition, BPB Publications, 2003.
3. Alfred V.Aho, John E.Hopcroft, Jeffrey D.Ullman, "Data Structures and Algorithms", 1st Edition, Pearson Education, 2004.

SEMESTER III
UCCAH19 - JAVA PROGRAMMING

Objective

This course provides an introduction to object oriented programming (OOP) using the Java programming language. Its main objective is to teach the basic concepts and techniques which form the object oriented programming paradigm

Unit I

Introduction to Java - Features of Java -Lexical issues Data types - Variables - Operators Type conversion and casting - Control Statements

Unit II

Arrays - Strings Classes - Objects - Constructors - Overloading method - Access Control - Static and Fixed method - Inner Class - String class - Inheritance - Overriding Method - Using Super Class.

Unit III

Input/output: Exploring Java i/o: The Java I/O classes and Interfaces - File - The Stream Classes - Packages - Access Protection - Importing Packages - Interfaces

Unit IV

Exception Handling: try, catch - Throw and Throws - Finally - Thread - Multithreading: Creating a Thread - Synchronization - Deadlock.

Unit V

The Java Applet and Interface - getDocumentBase() and getCodeBase() - Event Handling - Working with Windows using AWT Classes.

Book for Study

1. Herbert Schildt - "The Complete Reference: Java 2", 10th Edition, Tata McGraw Hill Publication, 2018.

Books for Reference

1. C. Muthu, "Programming with Java", 2nd Edition, Tata McGraw Hill Publishing, 2015.
2. E.Balagurusamy, "Programming with Java: A Primer", 4th Edition, Tata McGraw Hill Publication, 2015.

SEMESTER III

UCCAI19 - DESIGN AND ANALYSIS OF ALGORITHMS

Objectives

- To demonstrate a familiarity with major algorithms and data structures.
- To apply important algorithmic design paradigms and methods.
- To synthesize efficient algorithms in problem solving situations.

Unit I

Basic Concepts: Overview - System Life Cycle - PsuedoCode for Expressing Algorithms Algorithm Specification - Performance Analysis - Performance Measurement Space Complexity, Time Complexity, Asymptotic Notation - Big Oh Notation, Omega Notation, Theta Notation and Little Oh Notation.

Unit II

Divide and Conquer: General Method - Finding the Maximum and Minimum - Merge Sort - Quick Sort – Selection - Knapsack Problem - Optimal Binary Search Trees.

Unit III

Greedy method: General method, Applications - Minimum Cost Spanning Trees, Single Source Shortest Path Problem. Dynamic Programming: General method, Applications - All Pairs Shortest Path Problem - Travelling Sales Person Problem

Unit IV

Backtracking: General Method - 8 Queens Problem - Sum of Subsets - Graph Coloring - Hamiltonian Cycles - Knapsack Problem

Unit V

Branch and Bound: General method, Applications - Least Cost Search - FIFO Branch and Bound - LC Branch and Bound Solution - NP Hard and NP Complete Problems.

Book for Study

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, 2nd Edition, Galgotia Publication Pvt.Ltd., 2009.

Books for Reference

1. Yashavant P. Kanetkar, “Data Structure through C”, 2nd Edition, BPB Publications, 2003.
2. Thomas H Corman, Charles Eleiserson, RonaldL. Rivest, Clifford Stein, “Introduction to Algorithms”, 3rd Edition, PHI Learning Pvt. Ltd, 2010.
3. Seymour Lipschutz, “Data Structures with C”, Revised Edition, Schaum’s Outline Series, 2009.

SEMESTER III

UCCAJ17 - PRACTICAL: JAVA

1. Implementing String manipulation using character Array.
2. Implementing Input and Output Stream.
3. Implementing Packages and Interface.
4. Implementing Exception handling.
5. Implementing Real time application using multithread.
6. Implementing Applet using Graphics class.
7. Implementing AWT controls.
8. Implementing Colors and fonts.
9. To create any applications using Applets and AWT.

SEMESTER III

UCCAK19 - PRACTICAL: DATA STRUCTURES AND ALGORITHMS

1. Implementing PUSH, POP operations of Stack using Arrays.
2. Implementing add, delete operations of a Queue using Arrays.
3. Implementing Infix to postfix conversion of an expression using Stack.
4. Implementing Binary tree traversals (inorder, preorder, postorder).
5. Implementing Polynomial addition using linked list.
6. Implementing the following graph traversal algorithms:
   a) Depth first traversal
   b) Breadth first traversal
7. Implementing Merge sort using Divide and Conquer Technique.
8. Implementing Travelling Salesman problem using Dynamic Programming technique.
9. Implementing Hashing - any two Collision techniques.
10. Implementing Knapsack problem.

SEMESTER IV

UCCAL19 - DATA COMMUNICATION AND NETWORKS

Objective

This subject brings the students right to the forefront of the latest advances in the networking field. It uses a bottom up approach by teaching data communications before teaching networking. Updated coverage on newer technology like Wireless Networking is included.

Unit I

Data Communications: Data Networking and the Internet - Data Communications and Networking for Today's Enterprise - Communications Model - Data Communications Networks - The Internet Protocol Architecture - TCP/IP and Internet Based Applications The Need for a Protocol Architecture - The TCP/IP Protocol Architecture - The OSI Model Standardization within a Protocol Architecture - Traditional Internet Based Applications - Multimedia Data Transmission - Concepts and Terminology - Analog and Digital Data Transmission - Transmission Impairments - Channel Capacity.

Unit II

Transmission Media - Guided Transmission Media - Wireless Transmission - Wireless Propagation – Line of Sight Transmission - Signal Encoding Techniques - Digital Data Digital Signals - Digital Data Analog Signals - Analog Data Digital Signals - Analog Data Analog Signals - Digital Data Communication Techniques - Asynchronous and Synchronous Transmission - Types of Errors - Error Detection - Error Correction - Line Configurations.

Unit III

Data Link Control Protocols - Flow Control Error Control – High Level Data Link Control (HDLC) - Multiplexing - Frequency Division Multiplexing - Synchronous Time Division Multiplexing - Statistical Time Division Multiplexing - Asymmetric Digital Subscriber Line - xDSL - Spread Spectrum - The Concept of Spread Spectrum - Frequency Hopping - Spread Spectrum - Direct Sequence Spread Spectrum – Code Division Multiple Access.

Unit IV

Circuit Switching and Packet Switching - Switched Communications Networks - Circuit Switching Networks - Circuit Switching Concepts - Softswitch Architecture - Packet Switching Principles - X.25 - Frame Relay - Asynchronous Transfer Mode - Protocol Architecture - ATM Logical Connections - ATM Cells - Transmission of ATM Cells - ATM Service Categories.

Unit V

Routing in Switched Networks - Routing in Packet Switching Networks - Examples: Routing in ARPANET – Least Cost Algorithms - Congestion Control in Data Networks - Effects of Congestion - Congestion Control - Traffic Management - Congestion Control in Packet Switching Networks - Frame Relay Congestion Control - ATM Traffic Management -ATMGFR Traffic Management.

Book for Study

1. William Stallings, "Data and Computer Communications", 8th Ed., Pearson Education, Inc., 2016.

Books for Reference

1. Andrews S. Tanenbaum, "Computer Networks", 4th Edition , Prentice Hall of India Pvt. Ltd., 2011
2. Leon Garcia and Widjaja , "Communication Networks , Fundamental Concepts and Key Architecture ", 2nd Edition, Tata McGraw Hill, 2001.
3. Behrouz A. Forouzan, "Data Communications and Networking", Fourth Edition, Tata McGraw Hill, 2017.

SEMESTER IV

UCCAM19 – PYTHON PROGRAMMING

Objective

- To learn about the fundamentals of computers
- To learn how to install Python, start the Python shell
- To learn to perform basic calculations, print text on the screen and create lists, and perform simple control flow operations using if statements and for loops
- To learn how to reuse code with functions

Unit I

Computer Systems - Python Programming Language - Computational Thinking Python Data Types - Expressions, Variables, and Assignments - Strings - Lists - Objects & Classes - Python standard library.

Unit II

Imperative Programming - Python Modules - Print() Function - Functional Eval() Execution Control Structures – User Defined Functions - Python Variables & Assignments Parameter Passing.

Unit III

Text Data, Files & Exceptions - Strings Revisited - Formatted Output - Files - Errors & Exceptions Execution Control Structures - Decision Control & The IF Statement

Unit IV

Container and Randomness - Dictionaries - Other Built-in Container Types - Character Encodings & Strings - Module Random

Unit V

FOR Loop & Iteration Patterns – Two dimensional Lists While Loop - More Loop Patterns - Additional Iteration - Control Statements Namespaces - Encapsulation in Functions - Global Vs. Local Namespaces - Exceptional Flow Control - Modules as Namespaces

Book for Study

1. Ljubomir Perkovic, "Introduction to Computing Using Python: An Application Development Focus", 2nd Edition, John Wiley & Sons, 2012

Books for Reference

1. Martin C. Brown, "Python: The Complete Reference", McGraw Hill Education; Fourth Edition, March 2018.
2. N. Ryan Marvin, Amos Omondi - "Python Fundamentals", 1st Edition, Packt Publishing, 2018.
3. Magnus Lie Hetland - "Beginning Python - From Novice to Professional", 3rd Edition A Press Publishers, 2008.

SEMESTER IV

UCCAN19 - OPERATING SYSTEMS

Objective

Operating systems are an essential part of any computer system. On learning this paper students will get a clear description of the fundamental concepts of an operating system.

Unit I

LINUX: Introduction, Brief history. UNIX Components/Architecture - Features of Unix. - Basic Commands: Directory and File Commands: pwd, ls, cd, cp, mv, rm, mkdir, rmdir, chmod. Full and Relative Pathnames, File and Directory - Naming Conventions - Wildcard Characters ? * [ ] -Ownership and Permission: chmod, chgrp, chown.

Unit II

Shell Programming Language: Naming Shell Programs .Shell Variables and Arguments. - Command Line Arguments - Looping and Conditional Execution: if..then..else..elif..fi, while .. do, for..do..done, for, while, until and case statements, break and continue, true and false commands.

Unit III

System calls - Types of System calls Process Management: Process Concepts - Inter Process Communication - Multithreaded Programming: Multithreading Models. Process Scheduling: Basic Concepts - Scheduling Criteria - Scheduling Algorithms. Deadlock: Deadlock Characterization - Deadlock Avoidance.

Unit IV

Memory Management: Background - Swapping - Contiguous Memory Allocation - Paging - Structure of the Page Table - Segmentation - Virtual Memory Management: Demand Paging - Page Replacement - Thrashing.

Unit V

File System: File Concept - Access methods - Directory Structure - Implementing File Systems: File System Structure and Implementation - Allocation Methods - Free Space Management -- Secondary Storage Structure Disk Structure - Disk Scheduling.

Case Study LINUX and WINDOWS

Books for Study

1. Behrouz A. Forouzan, Richard F. Gilberg.Thomson, "Unix and Shell Programming", 1st Edition, 2002.
2. Meeta, Tilak & Rajiv, "The 'C' Odyssey UNIX - The Open, Boundless C", First Edition, BPB Publication 1992.
3. Silberschatz Galvin Gagne, "Operating System Principles", 8th Edition, Prentice Hall, 2011.

Books for References

1. Sumitabha Das, "Your UNIX the Ultimate Guide", 2nd Edition, TMH, 2007.
2. Graham Glass, King Ables, "UNIX for Programmers and Users", 3rd edition, Pearson Education.
3. Richard Rosinski, Douglas Host, Kenneth Rosen, Rachel Klee, "UNIX: The Complete Reference", Second Edition, 2007.
4. Andrew S. Tanenbaum, "Operating Systems, Design and Implementation", 2nd Edition, Prentice Hall of India, 2012.

SEMESTER IV

UCCAO19 - PRACTICAL VI: PYTHON

1. Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.

2. Program to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria:

   (i) Grade A: Percentage >= 80

   (ii) Grade B: Percentage >= 70 and <80

   (iii) Grade C: Percentage >= 60 and <70

   (iv) Grade D: Percentage >= 40 and <60

   (v) Grade E: Percentage < 40

3. Program, using user defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.

4. Program to display the first n terms of Fibonacci series.

5. Program to find factorial of the given number.

6. Program to find sum of the following series for n terms: 1 - 2/2! + 3/3! n/n!

7. Program to calculate the sum and product of two compatible matrices.

SEMESTER IV

UCCAP19 - PRACTICAL VII: LINUX

1. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.

2. Write a shell script that displays a list of all files in the current directory to which the user has read, write and execute permissions

3. Write a shell script to find the factorial of a given number

4. Write a C program that makes a copy of a file using standard I/O and system calls.

5. Implement in C the following Linux commands using system calls:
   (a) cat (b) ls (c) mv

6. Write a C program to list every file in a directory, its inode number and file name

7. Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: ls l | sort

8. Write a C program that illustrates suspending and resuming processes using signals

9. Write a C program that implements a producer consumer system with two processes (using semaphores)

10. Write a C program that illustrates two processes communicating using shared memory

SEMESTER V

UCCAQ19 - RELATIONAL DATABASE MANAGEMENT SYSTEMS

Objective

On learning this paper students will gain the knowledge of database management with its techniques.

Unit I

File System vs. DBMS Database System Applications View of Data Database language Data Storage & Querying Data Architecture Database Users and Administrators History of Database Systems; Relational Model Structure of Relational Databases Database Schemas Relational Query Languages Relational Operations.

Unit II

Introduction to SQLSQL Data Definition Basic Structure Additional Basic Operations Set Operations Aggregate Functions Null Values Nested Sub queries Modification of the Database; Intermediate SQL Join Expressions Views Transactions Integrity Constraints SQL Data Types and Schemas Advanced SQL Triggers.

Unit III

Database Design and the E_R Model Entity Relationship Model Constraints Removing Redundant Attributes ER Diagrams Reduction to Relational Schemas ER Design Issues Extended ER Features Alternative Notations for Modeling Data; Functional Dependencies - Features of Relational designs Decomposition and Normalisation using Functional Dependencies and Multi valued Dependencies Join dependencies Domain key Normal form.

Unit IV

Storage and File Structure Overview of Physical Storage Media Magnetic disks RAID Tertiary Storage File Organization Organization of records in Files Data Dictionary Storage Ordered Indices B+ Tree Index Files.

Unit V

Distributed Databases - Homogeneous and Heterogeneous Databases Distributed Data Storage Distributed Transactions Commit Protocols Concurrency Control Object Based Databases - Complex Data types - Structured Types and Inheritance in SQL - Object identity and Reference Types in SQL XML structure of XML data XML Document Schema Querying and Transformation.

Book for Study

1. Abraham Silberschatz, Henry F.Korth and S.Sundarshan “Database System Concepts”, Sixth Edition, McGraw Hill, 2010.

Book for Reference

1. R Elmasri, S.B. Navathe - “Fundamentals of Database Systems”, Seventh Edition - Pearson Education/Addison Wesley, 2011.
2. C.J.Date, A. Kannan and S.Swamynathan - “An Introduction to Database System”, Eighth Edition - Pearson Education, 2006.

SEMESTER V

UCCAR19 - SOFTWARE ENGINEERING

Objective

On learning this paper students will gain the knowledge of developing software with its techniques.

Unit I

Introduction-Computer Based System Engineering-Emergent System Properties-System and Their Environment-System Modeling - System Engineering Process-System Procurement - Software Processes: Software Process Models-Process Iteration-Software Design and Implementation-Software Validation-Software Evolution-Automated Process Support.

Unit II

Project Management: Management Activities-Project Planning-Project Scheduling-Risk Management. Software Requirement: Functional and Non Functional Requirements - User Requirements-System Requirements Software Requirements Documents.

Unit III

Requirement Engineering Processes: Feasibility Study - Requirement Elicitation And Analysis - Requirement Validation - Requirements Management - System Model: Context Models - Behavioural Models - Data Models - Object Models.

Unit IV

Architectural Design: Architectural Design Decisions - System Organization - Modular Decomposition Styles - Control Styles - User Interface Design: Design Issues - User Interface Design Process - User Analysis - User Interface Prototyping.

Unit V

Software Testing: System Testing - Component Testing - Test Case Design - Test Automation. Software Cost Estimation: Productivity - Estimation Techniques - Algorithmic Cost Modelling - Project Duration and Staffing.

Book for Study

1. Ian Sommerville, “Software Engineering”, Edition 10, Pearson Education, 2011.

Books for Reference

1. Roger S.Pressman, “Software Engineering: A Practitioner’s Approach”, Edition 7, McGraw Hill, New York, 2016.
2. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Edition 3, Narosa Publication, 2018.

SEMESTER V

UCCAS19 - MOBILE APPLICATION DEVELOPMENT

Objective

- To study about the android architecture and the tools for developing android applications.
- To create an android application.
- To learn about the user interfaces used in android applications.
- To learn about how to handle and share android data.
- To learn about how to develop an android services and to publish android application for use.

Unit I

Introduction – Android - Android Versions - Features of Android - Architecture of Android Obtaining the Required Tools - Android SDK - Installing the Android SDK Tools Configuring the Android SDK Manager – Eclipse - Android Development Tools (ADT) - Creating Android Virtual Devices (AVDs) - Creating Your First Android Application – Types of Android Application - Anatomy of an Android Application.

Unit II

Activities, Fragments and Intents - Understanding Activities - Linking Activities Using Intents – Fragments - Adding Fragments Dynamically - Life Cycle of a Fragment - Interactions between Fragments - Calling Built - In Applications Using Intents - Understanding the Intent Object - Using Intent Filters – Adding Categories - Displaying Notifications.

Unit III

Android User Interface – Understanding the Components of a Screen - Adapting to Display Orientation Managing Changes to Screen Orientation - Utilizing the Action Bar - Creating the User Interface Programmatically - Listening for UI Notifications.

Unit IV

Databases - Content Providers and Messaging - Saving and Loading User Preferences - Persisting Data to Files - Creating and Using Databases - Content Providers - Sharing Data in Android - Using a Content Provider - Creating Your Own Content Providers - Using the Content Provider – Messaging - SMS Messaging - Sending E-mail.

Unit V

Android – lifecycle: activity - lifecycle concepts - lifecycle callbacks - onCreate() - onStart() - onResume() - onRestart() - onPause() - onStop() - onDestroy() - ios lifecycle – Deployment methodologies

Books for Study

1. Wei Meng Lee, “Beginning Android 4 Application Development”, John Wiley & Sons Inc, 1st Edition Inc, 2012.
2. Reto Meier, “Professional Android 4 Application Development”, John Wiley & Sons Inc, 1st Edition, 2012.

Books for Reference

1. Zigurd Mednieks, Laird Dornin, Blake Meike G, and Masumi Nakamura, "Programming Android", O'Reilly Inc, 2nd Edition, 2012.
2. Onur Cinar, "Android Apps with Eclipse", Apress, Springer (India) Private Limited, 2nd Edition, 2012.

Web Resources

1. http://devcloper.android.com/training/basics/firstapp/index.html
2. www.vogella.com/articles/Android/article.html
3. https://hackernoon.com/applicationlifecycleinios12b6ba6af78b
4. https://www.tutlane.com/tutorial/ios/ioslifecyclearchitecture
5. https://developer.android.com/guide/components/activities/activitylifecycle

SEMESTER V

UECAA19 - ELECTIVE I A: RESOURCE MANAGEMENT TECHNIQUES

Objective

It will enable the students to learn various research techniques and to find out the solution for the critical problems.

Unit I

Basics of Operations Research (OR): Characteristics of OR - Necessity of OR in Industry - OR and Decision making - Role of computers in OR.

Unit II

Linear programming: Formulations and Graphical Solution (of 2 Variables) Canonical & Standard terms of Linear programming Problem. Algebraic Solution: Simplex Method - Charnes Method of Penalties.

Unit III

Concept of Duality – Properties of Duality - Dual Simplex Method - Transportation Model: Definition - Formulation and Solution of Transportation Models - The Row - Minima, Column - Minima, Matrix Minima and Vogel's Approximation Methods.

Unit IV

Assignment Model: Definition of Assignment Model - Comparison with Transportation Model - Formulation and Solution of Assignment Model – Travelling Salesman Problem. Sequencing Problem: Processing n Jobs through 2 Machines – Processing n Jobs through 3 Machines - Processing 2 Jobs through m Machines - Processing n jobs through m Machines.

Unit V

PERT - CPM: Networks - Fulkerson's Rule - Measure of Activity - PERT Computation - CPM Computation.

Books for Study

1. Prem Kumar Gupta and D.S. Hira, "Operations Research", Sixth Edition, S. Chand, 2014.
2. Prof. V. Sundharesan, "Resource Management Techniques", 7th Edition, AR Publications, 2015.

Book for Reference

1. Hamdy A. Taha, "Operation Research - An Introduction", 9th Edition, Pearson, 2014.
2. Charnes A. Cooper W. and A. Henderson A., "Introduction to Linear Programming", John Wiley and Sons, 1953.

SEMESTER V
UECAB19 - ELECTIVE I B: MOBILE COMPUTING

Objective

- To understand the basic concepts of mobile computing.
- To be familiar with the network layer protocols and AdHoc networks.
- To know the basis of transport and application layer protocols.
- To gain knowledge about different mobile platforms and application development.

Unit I

Introduction to Mobile Computing – Applications of Mobile Computing - Generations of Mobile Communication Technologies - Multiplexing – Spread spectrum - MAC Protocols – SDMA-TDMA – FDMA - CDMA

Unit II

Introduction to Cellular Systems – GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS-UMTS – Architecture – Handover – Security

Unit III

Mobile IP – DHCP – Ad Hoc – Proactive protocol - DSDV, Reactive Routing Protocols – DSR, AODV, Hybrid routing – ZRP, Multicast Routing - ODMRP, Vehicular Ad Hoc networks (VANET) –MANET Vs VANET – Security.

Unit IV

Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML

Unit V

Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – M-Commerce – Structure – Pros & Cons – Mobile Payment System – Security Issues

Book for Study

1. Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, Second Edition, PHI Learning Pvt. Ltd, New Delhi, 2012.

Books for Reference

1. Jochen H. Schller, “Mobile Communications”, Second Edition, Pearson Education, New Delhi, 2007.
2. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile Systems", Fourth Edition, Thomson Asia Pvt. Ltd., 2017.
3. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Second Edition, Springer, 2007.

SEMESTER V
UECAC19 - ELECTIVE I C: COMPUTER GRAPHICS

Objective

- Understand two dimensional graphics and their transformations.
- Gain knowledge about graphics hardware devices and software used.
- Understand three dimensional graphics and their transformations and to become familiar with clipping techniques.

Unit I

Overview of graphics Systems: Video Display Device - Refresh Cathode-Ray tubes Raster - Scan Displays Random - Scan Displays - Color CRT Monitors - Direct view Storage tubes Flat - Panel Displays Three - Dimensional Viewing Devices - Stereoscopic and Virtual - Reality Systems.

Unit II

Raster - Scan Systems Video Controller - Random - Scan Systems Video Controller - Random-Scan Systems - Input device - Keyboard Mouse - Trackball and Space ball . Joysticks - Data Glove – Digitizers Image Scanners - Touch Panels - Light pens. Voice Systems – Hard - Copy Devices - Line Drawing Algorithms DDA Algorithms - Circle generating Algorithm Properties of Ellipses.

Unit III

Two Dimensional Geometric Transformation: Basic Transformations - Translation - Rotation - Scaling - Matrix Representations and Homogeneous Coordinates - Other Transformations Reflections Two Dimensional Viewing

Unit IV

Three Dimensional Concepts: Three Dimensional Display method - Parallel projection - Depth cueing visible line and surface - Three Dimensional Geometric and modeling Transformations: Translation - Rotation - Scaling - Composite Transformations. Three Dimensional Viewing: Viewing pipeline - Viewing Coordinates - Projections - Parallel Projections - Perspective Projections.

Unit V

Windows to view point coordinate Transformations - Clipping Operations - Point Clipping - Line Clipping - Curve Clipping - Text Clipping - Exterior Clipping. Visible Surface Detection

Methods: Classification Visible Surface Detection Algorithms - Back Face Detection - Depth - Buffer Method - A-Buffer Method - Scan line method

Books for Study

1. Donald Hearn, M. Pauline Baker, "Computer Graphics", 2nd Edition, Prentice Hall of India Publication, 2011.
2. Donald Hearn, M. Pauline Baker Warren Carithers, "Computer Graphics with Open GL", 4th Edition, Pearson Publication, 2014.

Books for Reference

1. Apurva A. Desai - "Computer Graphics", 1st Edition, Prentice Hall of India Publication, 2008.
2. ISRD Group - "Computer Graphics", Second Edition, McGraw Hill Book Company, 2008.

SEMESTER V

UCCAT19 - PRACTIVAL - VIII: RDBMS

1. Creating data base tables and using data types. Create table Modify table Drop table

2. Practical Based on Data Manipulation Adding data with Insert Modify data with Update Deleting records with Delete

3. Practical Based on Implementing the Constraints NULL and NOT NULL Primary Key and Foreign Key Constraint Unique, Check and Default Constraint

4. Practical for Retrieving Data Using following clauses Simple select clause Accessing specific data with Where Ordered By Distinct and Group By

5. Practical Based on Aggregate Functions AVG -COUNT - MAX -MIN -SUM -CUBE

6. Practical Based on implementing all String functions and Date and Time Functions, union, intersection, set difference.

7. Implement Nested Queries & JOIN operation.

8. Practical Based on implementing use of triggers, cursors & procedures.

9. Make Database connectivity with front end tool VB and Oracle as back end perform Insertion, Deletion and Updation for the following:

    a) Staff Information System

    b) Electricity Bill Processing System

SEMESTER V
UCCAU19 - PRACTICAL IX: MOBILE APPLICATION DEVELOPMENT

1. Creating a simple "Hello World" application
2. Adding an action bar to android app to make application interactive
3. Build user interfaces using Views, Menus and Notifications
4. Handle file operations in Android application program.
5. Build an android application with multiple screens.
6. Learning Android Emulator to emulate android apps on various devices.
7. Use of Intents to perform basic interaction with apps.
8. Using Android styles and themes to make application

SEMESTER VI
UCCAV19 - .NET PROGRAMMING

Objective

To gain knowledge about the methodologies behind ASP.Net and help the students to develop .Net based application using ADO.NET

Unit I

Introduction to ASP.NET: .NET Framework (CLR, CLI, BCL) - ASP.NET Basics - ASP.NET - Page Structure - Page Life Cycle - Controls: HTML Server Controls - Web Server Controls - Web User Controls - Validation Controls - Custom Web Controls.

Unit II

Form validation: Client side validation - Server side validation - Validation Controls: Required Field Comparison Range - Calendar Control - Ad rotator Control - Internet Explorer Control - State Management: View State - Control State - Hidden Fields - Cookies - Query Strings - Application State - Session State.

Unit III

Architecture of ADO.NET - Connected and Disconnected Database - Create Database – Create Connection using ADO.NET Object model - Connection Class - Command Class - Data Adapter Class - Dataset Class - Display data on data bound controls and Data Grid.

Unit IV

Database accessing on Web Applications: Data Binding Concept with web - Creating Data Grid - Binding standard web server controls - Display data on web form using Data Bound Controls.

Unit V

Writing Datasets to XML - Reading datasets with XML - Web Services: Remote method call using XML - SOAP - Web service description language - Building and Consuming a web service - Web Application deployment.

Books for Study

1. Bill Evjen, Devin Rader, Farhan Muhammad, Scott Hanselman Srivakumar, First Edition, "Professional ASP.NET 1.1", Wrox, 2016.
2. Matthew MacDonald TMH, "The Complete Reference ASP.NET", First Edition, Mcgraw Hill, 2002.

Books for Reference

1. Dino Esposito "Introducing Microsoft ASP .NET 2.0", First Edition, PHI Publisher.
2. Matthew MacDonald, "Pro ASP.NET 4 in C#", 4th Edition, A Press, 2010.
3. Kogent Learning Solutions Inc, "ASP.NET 2.0 Black Book", Platinum Edition, DreamTech Press, 2006.

SEMESTER VI

UCCAW19 - INTERNET PROGRAMMING

Objectives

- Enhance the programming experience with the help of tools like editors and debuggers that makes JavaScript coding easier and more interactive.
- Develop dynamic and interactive web pages using the powerful tool and server scripting language like PHP.
- Understanding File handling concepts to connect, access, and update a MySQL database.

Unit I: Javascript

Introduction - Values - Numbers - Strings - Unary Operators - Boolean Values - Empty Values - Automatic Type Conversion - Program Structure : Expressions and Statements- Bindings - Binding Names - The Environment – Functions - The Console Log Function - Return Values - Control Flow - Conditional Execution - While and Do Loops - Indenting Code - For Loops - Breaking out of a Loop - Updating Bindings Succinctly - Dispatching on a Value with Switch – Capitalization – Comments.

Unit II

Functions - Bindings and Scopes - Functions as Values - Declaration Notation - Arrow Functions - The Call Stack - Optional Arguments - Closure – Recursion - Growing Functions. Data Structures: Objects and Arrays : The Were Squirrel - Data Sets – Properties – Methods - Objects – Mutability - The Lycanthrope's Log - Computing Correlation - Array Loops - The Final Analysis - Further Arrayology - Strings and their Properties - Rest Parameters - The Math Object - Destructuring – JSON.

Unit III: PHP Programming

Web Server – Apache - PHP Introduction - PHP Install - PHP Syntax - PHP Variables- PHP Echo / Print - PHP Data Types - PHP Strings - PHP Constants - PHP Operators - Control Structures - PHP Functions - Directory Functions - File System Functions - PHP Arrays PHP Sorting Arrays PHP Super Global - String Functions - Date and Time Functions-Mathematical Functions - Miscellaneous Functions.

Unit IV

Basic Form Processing (GET & POST Method) - PHP Form Handling - PHP Form Validation - PHP Form Required – URL - E-Mail - PHP Form Complete PHP MYSQL Functions -Connect - Create DB - Create Table- Insert Data - Get Last ID - Insert Multiple - Prepared-Select Data - Delete Data - Update Data - Limit Data -Table Join - Database Driven Application.

Unit V

PHP Arrays Multi-PHP Date and Time - PHP Include-PHP File Handling- PHP File Open/Read - PHP File Create/Write - PHP File Upload-PHP Cookies - PHP Sessions-PHP Filters - PHP Filters Advanced - PHP Error Handling - PHP Exception-COM-DOM-CURL-SOAP

Books for Study

1. Mariji Haverbeke, "Eloquent Javascript, A Modern Introduction to Programming", Third Edition, Published by No Starch Press, 2018.
2. Julie C Meloni, Sams "Teach yourself PHP, MySQL and Apache", 6th Edition, Sams Publishing, 2012.

Book for Reference

1. Phil Ballard , "JavaScript in 24 Hours", 6th Edition, Sams Teach Yourself, 2015.
2. Ed LeckyThompson Steven D. Nowicki Thomas Myer, "Professional PHP6", Wrox Press, Paperback Edition, 2011.
3. VikramVaswani, "How to do Everything with PHP & MySQL, 1st Edition, McGraw Hill, 2005

SEMESTER VI

UECAD19 - ELECTIVE - II A: CLOUD COMPUTING

Objective

- To introduce the broad perceptive of cloud architecture and model
- To understand the concept of Virtualization and design of cloud Services
- To understand the concept of Cloud security

Unit I

Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models: - Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud – Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

Unit II

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.

Unit III

Cloud Computing and service models- Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Public Cloud Platforms: GAE, AWS, and Azure.

Unit IV

Parallel and Distributed Programming Paradigms – MapReduce, Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim.

Unit V

Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design –Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security

Book for Study

1. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud”, Illustrated Edition, O'Reilly, 2009.

Books for Reference

1. John W.Rittinghouse and James F.Ransome, “Cloud Computing: Implementation, Management, and Security”, 1st Edition, CRC Press, 2010
2. Gautam Shroff, “Enterprise Cloud Computing”, 1st Edition, Cambridge University Press,2011
3. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, First Edition, Morgan Kaufmann Publishers,2012

SEMESTER VI

UECAE19 - ELECTIVE - II B: CRYPTOGRAPHY

Objectives

- To understand Cryptography Theories, Algorithms and Systems.
- To understand necessary Approaches and Techniques
- To build protection mechanisms in order to secure computer networks.

Unit I

Computer Security Concepts - The OSI Security Architecture - Security Attacks - Security Services Security Mechanisms - A model for Network Security - Symmetric Cipher Model - Substitution Techniques - Transposition Techniques - Stenography.

Unit II

Block Cipher Principles - The DES - A DES example - The strength of DES - Differential and Linear Cryptanalysis - Block Cipher Design Principles - Divisibility and Division algorithms - The Euclidean Algorithm - Modular Arithmetic.

Unit III

Origin of AES - AES Structure - AES round function - AES Key Expansion - AES Implementation. Multiple Encryption and Triple DES

Unit IV

Prime Numbers - Fermat's and Euler's Theorem - Testing for Primality - The Chinese Remainder Theorem - Principles of Public Key Cryptosystems - The RSA Algorithm.

Unit V

Diffie - Helman Key Exchange - Digital Signatures - Symmetric Key Distribution Using Symmetric Encryption Symmetric Key Distribution Using Asymmetric Encryption - Distribution of Public Keys - Kerberos.

Book for Study

1. William Stallings, "Cryptography and Network Security Principles and Practices", Seventh Edition, Prentice Hall, 2017.

Books for Reference

1. C K Shyamala, N Harini and Dr. T R Padmanabhan: "Cryptography and Network Security", First Edition, Wiley India Pvt.Ltd, 2011.
2. BehrouzA.Foruzan, "Cryptography and Network Security", 2nd Edition, Tata McGraw Hill 2007.
3. Charlie Kaufman, Radia Perlman, and Mike Speciner, "Network Security: PRIVATE Communication in a PUBLIC World", Second Edition, Prentice Hall, 2002.
4. Sudha Sridhar , "Cryptography and Network Security", Charulatha Publications, 2013

SEMESTER VI

UECAF19 - ELECTIVE - III A: DATA MINING

Objective

To discover knowledge from Database and to learn techniques for implementing Data Mining.

Unit I

Basic Data Mining Tasks – Data Mining Versus Knowledge Discovery In Databases – Data Mining Issues – Data Mining Metrics – Social Implications Of Data Mining – Data Mining From A Database Perspective. Data Mining Techniques: Introduction – A Statistical Perspective on Data Mining – Similarity Measures – Decision Trees – Neural Networks – Genetic Algorithms.

Unit II

Classification: Introduction – Statistical – Based Algorithms- Distance- Based Algorithms – Decision Tree- Based Algorithms- Neural Network – Based Algorithms – Rule-Based Algorithms – Combining Techniques.

Unit III

Clustering: Introduction – Similarity and Distance Measures – Outliers – Hierarchical Algorithms – Partitional Algorithms - Association Rules: Introduction - Large Item Sets – Basic Algorithms – Parallel and Distributed Algorithms – Comparing Approaches – Incremental Rules –Advanced Association Rules Techniques – Measuring the quality of Rules

Unit IV

Web mining: Introduction – Web content Mining –Crawlers - Web Structure Mining – Web Usage Mining - Spatial Mining: Overview – Primitives – Generalization and specialization – Spatial Rules- Spatial Classification Algorithm.

Unit V

Temporal Mining: Introduction – Modeling temporal events – Time series – Pattern detection – Sequences – Temporal Associations Rules.

Books for Study

1. Margaret H.Dunham - “Data Mining: Introductory and Advanced Topics”, 1st Edition, Pearson Education 2012.
2. Jiawei Han and MichelineKamber - “Data Mining Concepts and Techniques” - Elsevier Fifth Edition, 2009.

Books for Reference

1. Soumendra Mohanty, “Data Warehousing Design Development and Best Practices”, First Edition, TataMcGraw Hill, 2005.
2. William H Inmon, “Building the Data Warehousing”, Fourth Edition, Wiley India.
3. Rajan Chattamvelli, “Data Mining Methods”, Second Edition, Narosa Publishing House Pvt. Ltd. New Delhi, 2016.

SEMESTER VI

UECAG19 - ELECTIVE - III B: ARTIFICIAL INTELLIGENCE

Objectives

To provide in depth knowledge in the following areas:

- Searching Techniques
- Knowledge Representation
- Learning

Unit I

AI Meaning History of AI Intelligent Agents - Agents and Environments - Good Behavior -- Problem Solving - Uniformed Search Strategies.

Unit II

Solving Problems By Searching Informed Search Strategies: Greedy Best First Search - A* Search - Hill Climbing Search - Genetic Algorithm - Local Search In Continuous Spaces Constraint Satisfaction Problems (CSP) - Backtracking Search and Local.

Unit III

Logical Agents: Knowledge Based Agents - Logic - Propositional Logic - Reasoning Patterns in Propositional Logic - Syntax and Semantics of First Order Logic.

Unit IV

Learning from Observations - Forms of Learning - Inductive Learning - Knowledge in Learning - Explanation Based Learning - Learning using Relevant Information - Inductive Logic Programming

Unit V

Communication - Communication as Action - Formal Grammar for a Fragment of English - Syntactic Analysis - Augmented Grammars - Semantic Interpretation - Ambiguity and Disambiguation.

Book for Study

1. Stuart Russell Peter Norvig, “Artificial Intelligence - A Modern Approach” Second Edition Pearson Education / Prentice Hall of India 2010.

Books for Reference

1. Nils J. Nilsson, “Artificial Intelligence: A New Synthesis”, First Edition, Harcourt Asia Pvt. Ltd., 1998.
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Third Edition, Tata McGraw Hill, 2017.
3. George F. Luger “Artificial Intelligence Structures and Strategies for Complex Problem Solving”, Third Edition, Pearson Education / PHI, 1997.

SEMESTER VI

UCCAX19 - PRACTICAL IX: .NET

1. Write a VB.NET program to design a Calculator.
2. Write a VB.NET program to develop a Quiz Application (Use Timer Control).
3. Write a VB.NET program to generate a bill for a Departmental Store by applying appropriate validation techniques in Email registration form using validation controls.
4. Create a Shopping Web application using image buttons.
5. Create an Employee Payroll application using Master Pages.
6. Create a Banking application with menu option using Data Source Controls to retrieve data from the table.
7. Write a Program to displaying data with the Grid View.
8. Write a Program to implement ad rotator control.
9. Write a Program to View State and Session State.
10. Write a Program to implement Validation Controls**.**
11. Write a Program to implement State Management Techniques.
12. Write a Program to access data sources through ADO.NET.

SEMESTER IV

UCCAY19 - PRACTICAL X: INTERNET PROGRAMMING

1. Implementing factorial of a number in JavaScript.
2. Animation in JavaScript.
3. Addition and Multiplication of two numbers in JavaScript.
4. Convert the first letter of each word of the sting to Uppercase in JavaScript.
5. Implementing Arrays in JavaScript.
6. Implementing Control Statements and Looping in PHP.
7. Implementing Functions in PHP.
8. Implementing Form Processing (GET & POST) in PHP.
9. Implementing Validation in PHP.
10. Implementing Cookies in PHP.

SEMESTER V / VI

USCSE519 / USCSE619 - SKILL-BASED ELECTIVE: ACCOUNTING SOFTWARE

Objective

- To seamlessly combine the activities of accounting, inventory, payroll, finance and more.
- To maintain a record of all monetary transactions.

Unit I

Company Creation and Configuration : Creation for New Company – Company Features Accounting Features – Inventory Features – Configuring Tally – Configuring Voucher Entry – Configuring Invoice/Orders Entry – Shut A Company – Alter a Company – Delete a Company

Unit II

Accounting and Inventory an Outline : Fundamentals of Accounting – Accounting Terms Definitions – Ledger and Ledger Accounts – Trial Balance – Trading and Profit and Loss Account – Profit and Loss Account – Balance Sheet – Fundamentals of Inventory - Accounts Masters Creation : Accounts Information – Group(Create, Display, Delete) – Multiple Groups – Ledgers(Create, Display, Alter) – Multiple Ledgers – Cost Categories – Cost Centres.

Unit III

Inventory Master Creation: Stock Groups – Entering Vouchers: Voucher Types –Voucher Entry - Different Types of Accounting Vouchers(Payment/Receipt, Journal, Sales, Purchase) – Reports In Tally: Display Balance Sheet – Profit And Loss Account – Display Trial Balance – Day Book – Reconciliation of Bank Accounts.

Unit IV: (Practical)

1. Trading , Profit and Loss Account of a Company
2. Balance Sheet of a Company
3. Cost Category and Cost Centre

Unit V: (Practical)

4. Bank Reconciliation Statement
5. Inventory and Stock
6. Display and Reporting

Book for Study

1. LP Computer Series, “Guide To Tally 9 - Law Point”, Kolkata, First Edition, 2007.

Book for Reference

1. “Tally for Beginners”, Tally Press.

SEMESTER V / VI

USCSF519 / USCSF619 - SKILL-BASED ELECTIVE WEB PROGRAMMING

Objectives

- To impart knowledge in designing web pages with text and images.
- To validate and perform actions on web pages through scripting languages.
- To learn and implement XML Concepts.

Unit I

Introduction to HTML: Working with Text in HTML - Working with List - Adding Graphics to HTML Documents - Creating Tables - Working with Links and URLs - Working with HTML Frames

Unit II

Dynamic HTML: Overview of CSS - Font and Text Styles - Color and Backgrounds Attributes in CSS-Border and List - Class - External Style Sheets - Working with DIV and SPAN Tag - XML Overview: Working with Basics of XML - XML Namespaces – DTD - XML Schema - Extensible Style Sheets and XSL Transformation.

Unit III

JavaScript: Introduction to Scripting-Advantages of JavaScript – Basic Programming Techniques - Operators and Expression – Conditional and Super Controlled Loops – Functions in JavaScript - User Defined Functions - Object Model.

Unit IV: (Practical)

1. Write a program to design Bio-data using Basic HTML tags.
2. Write a program in HTML to develop a College Website.
3. Write a program to create Time Table preparation using HTML tags.
4. Write a program to create Simple Calculator in Java Script.
5. Write a JavaScript program to Scroll your name in the Scroll bar.

Unit V: (Practical)

6. Write a program to create a JavaScript code block using arrays to generate the current date in words.
7. Write a program to display even and odd numbers using Javascript
8. Write a program to flip the text using XML.
9. Write a program to create our department details using CSS.
10. Write a program for food menu in hotel using CSS.

Book for Study

1. Ivan Bayross, "Web Enabled Commercial Application Development Using HTML, DHTML Java Script and PHP", BPB Publications, 4th Edition, 2010.
2. Paul J. Deitel, Harvey Deitel, Abbey Deitel, "Internet and World Wide Web How to Program", Edition 5, Pearson, 2011.

Books for Reference

1. Kogent Learning Solutions Inc,"Html5 Black Book: Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP and jQuery", Dreamtech Press, 2011.
2. Heather Williamson, "XML: The Complete Reference", Tata McGraw Hill Pub, 2001.
3. Deitel, Nieto, Lin, Sadhu, "XML HOW TO PROGRAM", 1st Edition, Pearson Education, 2002.

SEMESTER V / VI

USCSG519 / USCSG619 - SKILL-BASED ELECTIVE: R PROGRAMMING

Objective

To enrich the students in R programming language and train them in a software environment for statistical computing and graphics supported by the R Foundation for Statistical Computing.

Unit I

Introduction to R, R Studio, Basic Objects: Vector, Matrix, Array, Lists, Data Frames, Functions.

Unit II

Basic Expressions: Assignment Expressions, Conditional Expressions, Loop Expressions. Basic Objects: Object Functions, Logical Functions, Math functions, Numeric Methods Statistical function, Apply – Family Functions.

Unit III

Working with Strings, Working with Data, Meta programming, Object Oriented Programming.

Unit IV: (Practical)

1. Write a program that prints 'Hello World' to the screen.
2. Write a program that asks the user for a number n and prints the sum of the numbers 1 to n
3. Write a program that prints a multiplication table for numbers up to 12.
4. Write a function that returns the largest element in a list.

Unit V: (Practical)

5. Write a function that computes the running total of a list.
6. Write a function that tests whether a string is a palindrome.
7. Implement the following sorting algorithms: Selection sort, Insertion sort, Bubble Sort
8. Implement linear search.
9. Implement binary search.
10. Implement Matrices Addition, Subtraction and Multiplication

Books for Study

1. Kun Ren, "Learning R. Programming, Packt Publishing" - ebooks Account (October 28, 2016).
2. Dr. Mark Gardener, "Beginning R: The Statistical Programming Language", Paperback, 2013.

Books for Reference

1. Colin Gillespie, Robin Lovelace, "Efficient R Programming: A Practical Guide to Smarter Programming", O'Reilly Media, 1st Edition (October 25, 2016); eBook (2017-04-10).
2. Daniel Navarro, "Learning Statistics with R", lulu.com (2015); eBook (University of Adelaide, 2018. Updated Continuously)

SEMESTER V / VI

USCSH519/ USCSH619 - SKILL-BASED ELECTIVE:

VISUAL PROGRAMMING USING C#

Objective

- To understand the various types of applications
- To get expertise in visual programming
- To understand the functionalities of middleware platform

Unit I

Introduction - C# - Extensible Markup Language (XML) - Introduction to Microsoft .NET - The .NET Framework and the Common Language Runtime - Introduction to Object Technology.

Unit II

Introduction to C# Applications - Creating a Simple Application in Visual C# Express - Formatting Text with Console.Write and Console.WriteLine - Another C# Application: Adding Integers – Arithmetic - Decision Making: Equality and Relational Operators - Strings and Characters.

Unit III

Introduction - Classes, Objects, Methods, Properties and Instance Variables - Declaring a Class with a method and instantiating an Object of a Class - Declaring a Method with Parameters.

Unit IV: (Practical)

1. Write a C# Program to print “Hello Auxilians!” message.
2. Write a C# Program to print the numbers from 1 to 15 using while loop.
3. Write a C# program to find out the leap years from 1900 to 1950.
4. Write a C# Program to Find Greatest among 2 numbers.

Unit V: (Practical)

5. Write a C# Program to Swap 2 Numbers.
6. Write a C# Program to Compute Average for the Set of Values.
7. Write a C# program to print Fibonacci series.

Book for Study

1. Paul Deitel & Harvey Deitel, “C# 2010 for Programmers”, 4th Edition, Pearson Education, 2011.
2. Ian Griffiths, Matthew Adams- Jesse Liberty, “Programming C# 4.0”, Sixth Edition, O’Reilly, 2010.

SEMESTER I / II

USCSA119 / USCSA219- SKILL-BASED ELECTIVE: MULTIMEDIA USING FLASH

Objective

To train the students to create powerful animations using the tool Flash. They can build interactive and complex elements that can be embedded in Web pages.

Unit I

Introduction Flash – Basics – Creating Objects – Editing Objects - Colour and Text – Symbols and Instances – Library – Bitmap, Sound and Videos

Unit II

Frames and Layers - Animation Basics – Understanding - Animation – Scenes – Frame by Frame Animation - Text Animation – Motion Tweening - Shape Tweening.

Unit III

Motion Guide – Movie Clips - Making Buttons – Creating Animated Buttons – Creating Linear Videos.

Unit IV: (Practical)

1. Draw an Object using Basic Tools.
2. Draw and Import the symbol and Instances.
3. Create a background using Frame – by – Frame Animation.
4. Create an Animation using Onion skin.

Unit V: (Practical)

5. Planet Rotation using motion Tweening.
6. Text Animation using shape Tweening
7. Creating and editing Buttons with mask.
8. Create a movie using Guide Layer and Tweening.

Books for Study

1. Ellen Finkelstein and Gurdy leete, "Macromedia Flash 8 for Dummies", Wiley Publishing, Inc, 2006.
2. "Macromedia Flash Mx 2004 For Windows And Mc Intosh: Visual Quickstart Guide", Peachpit Pr, 2003

SEMESTER III / IV

USCSB319 / USCSB419 - SKILL-BASED ELECTIVE: PHOTOSHOP

Objective

To train the students in photo editing software usage. They can manipulate, crop, resize, and correct color on digital photos.

Unit I

Introduction – Bitmaps and Vectors – Pixels and Resolution – Photoshop screen Environment: Toolbox – Documents size – File Formats – Opening and saving files – File Browser.

Unit II

Toolbox: Selection Tools – Painting tools – Editing tools – Retouching tools – Color Settings.

Unit III

Layers: Working with layers – Linking Layers – Layer styles – Locking Layers – Managing Layer Components.

Unit IV

Palette: Information palette – History palette – Type palette – Brush palette – Path palette – layer palette.

Unit V

1. Convert Black and White Images into Color Images.
2. Apply Rain Effects using Filter tools for a particular image.
3. Enhancing an image using retouching tool.
4. Design a Banner.
5. Creating web page.
6. Creating and modifying text using mask effect.

Book for Study

1. "Photoshop CS6 in Simple Steps" - Dreamtech Press Publication, Edition 2012.

Books for Reference

1. Brad Dayley , DaNae Dayley , "Adobe Photoshop CS6 Bible", 1st Edition, Wiley, 2012.
2. Kate Binder, "Easy Adobe Photoshop Elements 4" (Paperback), 2005.

SEMESTER V / VI

UGCSA519 / UGCSB619 – NME: STATISTICAL PACKAGE FOR SOCIAL SICENCE

Objective

To study the SPSS the students will understand the data analysis, define variables and perform variable manipulation and transformation.

Unit I

SPSS: Introduction – Task Bar and Start Menu – Common Buttons – Commonly used Windows Creating and Editing a Data File – Select Case – Sort Case – Merging Files – Painting Results.

Unit II

Graphs and Charts: Producing Graphs and Charts – Bar Charts – Line Graphs – Pie Charts – Box Plots – Error Bar Charts – Histograms – Scatter Plots – Frequencies.

Unit III

Descriptive Statistics: Normal Distribution Mean, Median, Mode – Variance & Standard Deviation – Skewness & Kurtosis – Maximum, Minimum, Range And Sum – Standard Error.

Unit IV: (Practical)

1. Creating data file, assigning names and value to variables and saving it.
2. Creating data file and find the percentage of subjects in each group.
3. Running a simple analysis to create a frequency table.
4. Creating a new variable based on an existing variable.
5. Creating charts for different Variables.

Unit V: (Practical)

6. Statistical application to obtain central tendency or dispersion values.
7. Editing of tables & charts, fixing tables and charts in word document.
8. Running a simple analysis to create different correlation
9. Running a simple analysis to create various types of 't' tests.
10. Creating two-way tables and to obtain Chi – Square values.

Book for Study

1. Darren George & Paul Mallery, "SPSS for Windows Step by Step", Pearson Education in South Asia, Eighth edition.

Books for Reference

1. Sabine Landau & Brain S.Everitt , "A Handbook of Statistical Analyses using SPSS", A CRC Press Company, 2004
2. Jesus Salcedo, Keith McCormick, "SPSS Statistics for Data Analysis and Visualization", 2017.

SEMESTER V / VI

UGCSB519 / UGCSB619 – NON-MAJOR ELECTIVE:

WEB DESIGNING USING DREAMWEAVER

Objective

To train the students in building quality web sites. Develop skills in analyzing the usability of a web site. Learn techniques of responsive web design.

Unit I

Opening the Document Window – Locating the Little Bar – Menu Bar Components – Menu Bar – Toolbar – Status Bar – Design View – Object Panel – Launchers – Property Inspector – Creating a New Site – Local Vs. Remote Site – Designing a Local Site – Creating and Opening a Site – Setting up the Sitting Window – Accessing the Site.

Unit II

Working with HTML Tags - Code Inspector – Quick Tag Editor – Importing HTML – Creating Web Pages: Opening and Closing Pages – Copying and Pasting Test Working with Text and Property Inspector – Working with Background Colors.

Unit III

Leaving Links – Working with Anchors – Working with Image Link – Creating a Email Links.

Unit IV

Definition of a Tables – Creating Tables – Preformatted Tables - Editing a Table – Frames and Frameset: Creating and Editing Frames – Adding Multimedia to a Website.

Unit V

CSS – Applying Style Sheet to a Webpage – CGI – Form – Adding Form in the Project – Creating Layers – Customizing Dreamweaver.

Practical

1. Create and design a webpage for Clipart Gallery.
2. Design an E-Book with appropriate navigation.
3. Create a webpage for online shopping.
4. Create a webpage.
5. Create a webpage using Rollover images and CSS.

Books for Study

1. Candue Garrod, ‘Dreamweaver Rapid Web Design”, Prentice Hall of India, 2001.
2. Jim Maivald Publisher, “Adobe Dreamweaver CC Classroom in a Book”, (2019 Release), First Edition, Adobe Press, 2018.

Books for Reference

Hirdesh Bhardwaj, “Web Designing”, 1st Edition, Pothi.com, 2016.

B.Com. Degree Course

(Effective from the Academic year 2017 - 2018)

Objective of the Course:

(i) To impart sound knowledge and skills related to Business and Accounting to the students through a well designed, balanced and comprehensive syllabus structure.
(ii) To make the students acquire better skills of employability through career oriented papers.
(iii) To help students acquire various life skills through Skill based electives.
(iv) To help the students become socially aware and responsible through extension programmes.

Eligibility for Admission:

Students who have completed Higher Secondary with Commerce, Economics, Accountancy, and Mathematics / Statistics / Computer Science / History / Indian Culture are eligible to take up B.Com. Degree Course.

Course Duration-3 years

Total No. of Weeks per Semester-15

Distribution of hours/credits per week and Scheme of Examination

Sem	Part	Paper Code	Title of Paper	Hours/ week	Exam Hours		Credits	Marks
					Th	Pr		
	I	ULTAA18	Tamil paper –I	6	3	-	3	40+60
	II	UENGA17	English paper – I	6	3	-	3	40+60
	III	UCCOA19	Principles of Accounting – I	5	3	-	4	40+60
	III	UCCOB19	Business Economics – I	5	3	-	4	40+60
	III	UABMA15	Allied - I: Business Mathematics and Statistics	5	3	-	5	40+60
	IV	-	Skill-Based Elective – I	2	2	-	2	40+60
	IV	-	Value Education	1	-	-	-	-
			Total	**30**	**-**	**-**	**21**	**600**
II	I	ULTAB18	Tamil paper – II	6	3	-	3	40+60
	II	UENGB17	English paper – II	6	3	-	3	40+60
	III	UCCOC19	Principles of Accounting – II	5	3	-	4	40+60
	III	UCCOD19	Business Economics – II	5	3	-	4	40+60
	III	UASOR15	Allied-II: Statistics and Operations Research	5	3	-	5	40+60
	IV	-	Skill-Based Elective – II	2	2	-	2	40+60
	IV	-	Value Education	1	-	-	-	-
			Total	**30**	**-**	**-**	**21**	**600**

Sem	Part	Paper Code	Title of Paper	Hours/ week	Exam Hours		Credits	Marks
					Th	Pr		
III	III	UCCOE19	Financial Accounting I	6	3	-	4	40+60
	III	UCCOF19	Principles of Cost Accounting	6	3	-	4	40+60
	III	UCCOG19	Law of Contracts I	5	3	-	4	40+60
	III	UAIED19	Allied - III: Indian Economic Development Policy	5	3	-	5	40+60
	III	UECOA19	Elective - I A: Principles of Management	5	3	-	5	40+60
	III	UECOB19	Elective - I B: Essentials of Business Communication					
	IV	-	Skill-Based Elective - III	2	3	-	2	40+60
	IV	-	Value Education	1	-	-	-	-
			Total	**30**	**-**	**-**	**24**	**600**
IV	III	UCCOH19	Financial Accounting II	5	3	-	4	40+60
	III	UCCOI19	Methods of Cost Accounting	5	3	-	4	40+60
	III	UCCOJ19	Law of Contract II	5	3	-	4	40+60
	III	UCCOK19	Marketing	5	3	-	4	40+60
	III	UAITA19	Allied IV: International Trade	5	3	-	5	40+60
	IV	UNEVS17	Environmental Studies	2	2	-	2	40+60
	IV	-	Skill-Based Elective - IV	2	2	-	2	40+60
	IV	-	Value Education	1	-	-	-	-
			Total	**30**	**-**	**-**	**25**	**700**
V	III	UCCOL19	Corporate Accounting I	6	3	-	4	40+60
	III	UCCOM19	Management Accounting II	6	3	-	4	40+60
	III	UCCON19	Income Tax – Law and Practice I	6	3	-	5	40+60
	III	UECOC19	Elective – II A: Banking: Law and Practice	6	3	-	5	40+60
	IV	-	Non-Major Elective - I	3	2	-	2	40+60
	IV	-	Skill based Elective - V	2	2	-	2	40+60
			Value Education	1	-	-	-	-
			Total	**30**	**-**	**-**	**22**	**600/ 700**
VI	III	UCCOO19	Corporate Accounting II	6	3	-	5	40+60
	III	UCCOP19	Management Accounting II	6	3	-	5	40+60
	III	UCCOQ19	Income Tax – Law and Practice II	6	3	-	5	40+60
	III	UECOE19	Elective – II A: E-Commerce and Tally	4	3	-	3	40+60
	III	UECOF19	Elective Practical: Tally	2	-	3	2	40+60
	IV	-	Non Major Elective - II	3	2	-	2	40+60
	IV	-	Skill based Elective - VI	2	2	-	2	40+60
	IV	UVEDA15	Value Education	1	2	-	2	40+60
			Total	**30**	**-**	**-**	**26**	**800/ 700**
	V		Extension Activities		-	-	1	-
			Grand Total				**140**	**3900**

SEMESTER I

UCCOA19 – PRINCIPLES OF ACCOUNTING – I

Objective:

To make the students understand the basic Principles of Accounting

Unit I: Introduction

Introduction to Accounting – Principles of Double Entry System – Basic Accounting Principles – Accounting Concepts and Conventions – Accounting Equation – Journal Entries, Ledgers and Trial Balance

Unit II: Subsidiary Books

Journal Proper - Subsidiary Books – Purchase Book, Sales Book, Returns Book, Cash Book, Bills Recivable and Bills Payable Books

Unit III: Bank Reconciliation Statement and Rectification of Errors

Bank Reconciliation Statement – Rectification of Errors (with Suspense Account)

Unit IV: Final Accounts

Final Accounts – Trading, Profit and Loss Account and Balance Sheet with adjustments

Unit V: Accounts of Non-Profit Organisations

Accounts of Non-Profit Organisations

Theory: Problem – 20:80

Textbook:

Reddy T.S. and Murthy A. – Advanced Accounting – Margham Publications, Chennai, Reprint 2016

Books for Reference:

1. Shukla M.C., Gupta M.P., Agarwal B.M. and Grewal T.S. – Advanced Accounts (Volume I) – S.Chand & Company Limited, New Delhi, Reprint 2019.
2. Nagarajan K.L., Vinayagam N. and Mani P.L. – Principles of Accountancy – Eurasia Publishing House, New Delhi, Revised Edition 2017
3. Jain S.P., Narang K.L., Mukesh Kumar Sharma, Romila Jain and Satish Khasa - Financial Accounting – Kalyani Publishing House, New Delhi, Reprint 2018
4. Tulsian P.C. – Financial Accounting – Pearson Education, New Delhi, Edition 2009, Reprint 2017
5. Raman B.S. - Financial Accounting (Vol.1) – United Publishers and Distributors, Guwhati, Edition 2018

SKILL BASED ELECTIVE - SEMESTER I / II

USCOA119/nUSCOA219 – CONSUMER AWARENESS

Unit I: Consumer Awareness Movement and Consumer Protection Act - Right to Safety

Gandhiji's Quote - Brief History – I, II and III era in USA – Japan – India - Pre and Post Independence – 5 'R's of Dutiful Consumer -Consumer Protection Act,1986 -Introduction – Aim -Main features – Provisions – Rights of Consumer — Meaning of consumer- Introduction – meaning and measures for safety – United Nations Guidelines – Safety standards – Legislations for Consumer Safety (FSSAI 2006) Food safety (adulteration, Junk Food, GMA Food) – Safe Drugs (Meaning of Adulterated , Spurious or Counterfeit Drugs and Misbranded; reasons; responsibility of consumers – Product Safety – Standard Certification Marks – Bureau of Indian Standards

Unit II: Right to Information, Right to Choose, and Right to be heard

Meaning of the right to be informed – sources of information – Meaning of Brand name, label, Package & Trade Mark – Contents of Label – Advertisements, print and Electronic Media – Official records and citizen charter – Meaning of right to Choose – Restricted choice – Meaning of right to be heard – Consumer voice – Platforms for consumer representation – Need to be organized – Consumer Protection Councils (District, State and Central) –Chairman - Objectives

Unit III: Right to Redress - I

Meaning – Types if Grievances – Remedies available under the Consumer Protection Act,1986 -Restrictive Trade Practice – Meaning – Instances of Restrictive Trade Practices - Unfair Trade Practice – Meaning – Instances of Unfair Trade Practices – Pre-packed goods and unfair trade practices – Deceptive and Misleading Advertisements – Advertising Standards Council of India (ASCI)

Unit IV: Right to Redress - II

Definitions; goods, services, Consumer of Goods, consumer of Services, Complaint, complainant, consumer dispute, defect, deficiency, Appropriate laboratory, manufacturer - Filing a complaint – Limitation for filing complaint - Complaint form – Admission of complaint – Procedure on receipt of complaint – Appeals – Remedies available – District Forum, State Commission and National Commission – composition – appointments – Term of office

Unit V: Consumer Responsibilities and Case laws and other tips

Introduction – Consumer Citizen –Consumer Responsibilities – Critical Awareness – Social Responsibility – Environmental Awareness – Solidarity – Responsibilities in association with all the Rights – Leading Case laws

Activities for Internal Component: 15 marks

1. Students are trained to give a representation to the District Consumer Protection Council – 5 marks
2. Students will have to create consumer awareness in their respective classes with the permission of the class teacher – 5 marks
3. Seminars from the latest news bulletins of the Consumer Voice and the FSSAI

Marks: CA- 25, IC- 15 Total- 40 marks

Students will be motivated to subscribe to Consumer Voice, Weekly News Digest – FSSAI Updates and Industry News, a weekly Compilation of News and Articles of foodsafetyhelpline.com

References:

1. www.consumer.tn.gov.in - publications
2. www.consumeradvice.in - publications
3. E-books available in the FSSAI website like Dart, Pink, Yellow and Orange books
4. Newsletters (quarterly publications) of State Consumer Knowledge Helpline Knowledge Resource Management Portal (SCHKRMP)
5. "Nugarvor Kavasam" a publication by the Department of Civil Supplies and Consumer protection. Articles from the Dailies.

SEMESTER II

UCCOC19 – PRINCIPLES OF ACCOUNTING - II

Objective:

To teach the students some Financial Accounting concepts and procedure of Accounting for Special transactions

Unit I: Single Entry System and Self-Balancing Ledgers

Single Entry – Meaning – Definition – Statement of Affairs – Conversion Method – Difference between Single Entry and Double Entry Systems

Unit II: Average Due Date and Account Current

Average Due Date and Account Current

Unit III: Depreciation

Depreciation – Meaning – Definition – Causes – Methods of charging Depreciation Straight line Method - Written Down Value Method – Sinking Fund Method for replacement of assets – Change in methods of charging Depreciation – Annuity Method – Depletion, Revaluation and Machine Hour Rate methods.

Unit IV: Accounting for Special Transactions I

Joint Venture Accounts – Consignment Accounts

Unit V: Accounting for Special Transactions II

Bills of Exchange

Theory: Problems – 20 : 80

Textbook:

Reddy T.S. and Murthy A. – Advanced Accounting – Margham Publications, Chennai, Reprint 2016

Books for Reference:

1. Shukla M.C., Gupta M.P., Agarwal B.M. and Grewal T.S. – Advanced Accounts (Volume I) – S.Chand & Company Limited, New Delhi, Reprint 2019.
2. Nagarajan K.L., Vinayagam N. and Mani P.L. – Principles of Accountancy – Eurasia Publishing House, New Delhi, Revised Edition 2017
3. Jain S.P., Narang K.L., Mukesh Kumar Sharma, Romila Jain and Satish Khasa - Financial Accounting – Kalyani Publishing House, New Delhi, Reprint 2018
4. Tulsian P.C. – Financial Accounting – Pearson Education, New Delhi, Edition 2009, Reprint 2017
5. Raman B.S. - Financial Accounting (Vol.1) – United Publishers and Distributors, Guwhati, Edition 2018

SEMESTER III

UCCOE19 – FINANCIAL ACCOUNTING – I

Objective:

To acquaint students with the Accounting principles, concepts and their applications in different forms of business.

Unit I: Branch Accounts

Meaning – Objectives – Types of Branches – Dependent; Accounting in respect of Dependent branch - Debtor system - Stock and Debtor system - Wholesale branch system - Final account system and Independent branches (Excluding Foreign Branches).

Unit II: Departmental Accounting

Meaning – Need for Departmental Accounting – Advantages – Distinction between Department and Branch – Methods and techniques of Departmental Accounting – Allocation of expenses – Inter-departmental transfers.

Unit III: Hire purchase and Installment Purchase Systems

Hire purchase Systems – Definition – Distinction between Hire purchase and Installment purchase system – Accounting treatment for Hire purchase system - Calculation of Interest – Default and Repossession – Installment purchase system – Meaning – Accounting treatment.

Unit IV: Royalty Accounts

Meaning of Royalty – Accounting treatment – Sub-lease – Meaning – Accounting treatment

Unit V: Investment Accounts

Meaning of investments – Nature of investments, as an asset – Types of Securities – Purchase and sale of Investments – Cum-interest and ex-interest quotations – Investment in Equity shares- Accounting treatment of Investments – Columnar Investment Accounts

Theory: Problems – 20 : 80

Textbook:

Reddy T.S. and Murthy A. – Advanced Accounting – Margham Publications, Chennai, Reprint 2016

Books for Reference:

1. Shukla M.C., Gupta M.P., Agarwal B.M. and Grewal T.S. – Advanced Accounts (Volume I) – S.Chand & Company Limited, New Delhi, Reprint 2019.
2. Nagarajan K.L., Vinayagam N. and Mani P.L. – Principles of Accountancy – Eurasia Publishing House, New Delhi, Revised Edition 2017
3. Jain S.P., Narang K.L., Mukesh Kumar Sharma, Romila Jain and Satish Khasa - Financial Accounting – Kalyani Publishing House, New Delhi, Reprint 2018
4. Tulsian P.C. – Financial Accounting – Pearson Education, New Delhi, Edition 2009, Reprint 2017
5. Raman B.S. - Financial Accounting (Vol.1) – United Publishers and Distributors, Guwhati, Edition 2018

SEMESTER III

UCCOF19 – PRINCIPLES OF COST ACCOUNTING

Objective:

To introduce the students to Cost Accounting System and its application in business.

Unit I: Introduction

Definition of Cost, Costing, Cost Accountancy and Cost Accounting – Cost Accounting Vs Financial Accounting – Classification of costs – Cost Centers and Cost Units – Advantages and Limitations of Cost Accounting
Preparation of Cost Statements – Tenders and Quotations.

Unit II: Material Control

Meaning of Material Control – Purchase procedure – Stock levels – Economic Ordering Quantity – Bin card Vs. Stores ledger – Pricing of Issue of Materials – Actual price Methods (FIFO, LIFO, HIFO, Base Stock and Specific Price) – Average Price Methods (Simple Average, Weighted Average with returns and losses)

Unit III: Labour Cost

Labour Turnover – Causes – Measurement – Calculation of Labour Cost – Calculation of Normal and Overtime Wages – Taylor, Merrick, Halsey, Rowan, Barth and Emerson Schemes.

Unit IV: Overheads I

Meaning and Definition of Overheads – Functional, Behavioural and Element-Wise classification of Overheads.

Unit V: Overheads II

Allocation and Apportionment of Overheads – Primary Distribution Summary – Secondary Distribution Summary (All methods) – Absorption of Overheads (All methods) – Machine Hour Rate.

Theory : Problem – 20 : 80

Textbook:

Reddy T.S and Hari Prasad Reddy Y. – Cost Accounting – Margham Publications, Chennai, Reprint 2018

Books for Reference:

1. Jain S. P. and Narang K.L. _ Cost Accounting – Kalyani Publishers, New Delhi, Reprint 2017
2. Khanna, Ahuja and Pandey – Cost Accounting – S. Chand & Co., New Delhi, Reprint 2016
3. Lall Nigam B.M. and Bagavathi V. – Cost Accounting: An Introduction – Prentice Hall of India, New Delhi, Reprint 2018.
4. Pillai R.S.N. and Bagavathi V. – Cost Accounting – S. Chand & Co., Ltd., New Delhi, Reprint 2014
5. Arora M. N. – A Textbook of Cost and Management Accounting – Vikas Publishing House, Chennai, 10th Edition, 2012

SEMESTER III

UCCOG19 – LAW OF CONTRACTS – I

Objective:

To provide knowledge about the essential elements of a contract

Unit I: Introduction

Agreement - Contract – Definition - Essential elements of valid contract - Classification of contracts – Offer -Legal rules - types – Tenders - Quotations – Acceptance - Legal rules - Communication and Revocation of offer & Acceptance – Consideration – Definition - Legal rules – Exception - Stranger to contract.

Unit II: Capacity to Contract

Capacity to contract – Minor - legal rules - Persons of unsound mind, other persons - Free consent – meaning – Coercion - Definition- Meaning – Consequences - Undue influence – Definition - consequences - Difference between the two - Misrepresentation-Consequences – fraud - Elements of fraud - consequences - Difference between the two - Mistake – Unilateral and Bilateral and their consequences

Unit III: Legality of Contract

Legality of object- Effect of illegality- Unlawful and illegal agreements- Agreements opposed to public policy- Exceptions – Wager - Contingent Contracts - Quasi Contracts.

Unit IV: Performance of Contracts

Performance of Contracts- Tender of performance- Actual performance- Requisites of valid tender of performance - Revocation of Joint Liabilities and Rights - Time and place of performance- Reciprocal promises- Appropriations of Payments- Assessment of Contracts- Discharge of Contract- Remedies for Breach of Contract.

Unit V: Contract of Agency

Contract of Agency

Textbook:

Kapoor N. D. – Business Law – Sultan Chand & Sons, New Delhi, Revised Ed. 2015

Books for Reference:

1. Kapoor N. D. – Elements of Company Law – Sultan Chand & Sons New Delhi, Revised Ed. 2015
2. Gulshan S.S. – Mercantile Law – Excel Books, New Delhi, 2012
3. Pillai R.S.N. and Bagavathi V. – Business Law – Sultan Chand & Sons, New Delhi, Revised Ed. 2017
4. Kuchhal M.C. and Vivek Kuchhal – Business Laws – Vikas Publishing House, Chennai, 2015
5. Dr.Jain V.K. and CA Shashank S.Sharma – Business Laws, Business Correspondence and Reporting – Taxmann Publication, New Delhi, 2017

SEMESTER III

UECOA19 – ELECTIVE - I A: PRINCIPLES OF MANAGEMENT

Objective:

To impart knowledge about the Principles of Management and the aspects of Management.

Unit I: Introduction

Management – Meaning – Definition –Concepts - Nature and Characteristics –Levels - Importance and Scope - Skills of Manager– Process of Management- Functions and Principles-Contributions by F.W. Taylor, Henri Fayol & Peter F. Drucker – Conceptual idea of Corporate Social Responsibility.

Unit II: Planning and Decision Making

Planning – Meaning – Definition – Nature – Importance – Advantages and Limitations – Steps in the Process of Planning – Types of Plans - Concept of M.B.O. – Forecasting and Decision Making – Steps and Problems in Decision Making

Unit III: Organising

Organising – Meaning – Nature – Importance – Principles - Steps – Types of Organisation structure (Line, Functional, Line and Staff, Committee and their suitability (Excluding Advantages and Disadvantages) – Delegation – Meaning – Types - Process and Principles – Decentralisation of Authority – Differences between Delegation and Decentralisation.

Unit IV: Staffing and Motivation

Staffing – Meaning – Elements or Functions - Importance Recruitment and Selection Process – Meaning of Directing – Nature and Characteristics of Directing – Significance - Leadership – Meaning – Nature – Functions – Importance – Types or Styles of leadership.
Job Analysis – Job Description – Job Specification and Job Evaluation (Meaning only)
Motivation – Meaning – Monetary and Non-Monetary Incentives – Theories of Motivation – Maslow, McGregor, Herzberg.

Unit V: Control and Coordination

Control – Definition – Meaning – Nature and Purpose – Elements – Need and Significance - Control Process – Problems in the Control - Management by Exception.
Co-ordination – Meaning – Nature - Problems – Importance – Types – Co-operation - Importance – Types – Problems

Communication – Meaning – Nature – Elements of good Communication – Importance – Essentials - Barriers to Communication – measures to improve Communication Barriers – Feedback.

Textbook:

Dr. Gupta C.B. – Business Management - Sultan Chand & sons, New Delhi, Revised Edition 2018

Books for Reference:

1. Prasad L.M. – Management: principles and practices – Sultan Chand & Sons, New Delhi, Revised Edition 2012
2. Harold Koontz & Cyril O' Donnel –Principles of Management: An Analysis of Managerial Functions – McGraw Hill Publishing Co. Ltd., New Delhi, Reprint 2012
3. Sharma B.D., Bhallka N.S. and Gupta R.S. – Principles of Management – Kalyani Publishers, New Delhi, Reprint 2013
4. Kumkum Mukherjee – Principles of Management – McGraw Hill Education, New Delhi Reprint 2013
5. Bhushan Y.K. – Fundamentals of Business Organization and Management – Sultan Chand & Sons, New Delhi, Revised Edition 2013

SEMESTER III

UECOB19 – ELECTIVE – II A: ESSENTIALS OF BUSINESS COMMUNICATION

Objective:

To introduce students to the concept of Communication and application of different forms of communication used in business.

Unit I

Business Communication – Meaning – Definition – Objectives – Process of Communication – Importance of Communication - Types of Communication – Directions of Communications – Barriers to Effective Communication.

Unit II

Features of Business Communication – Guidelines (The 7*C*s) for Effective Business Communication – Model Letters – Layout of Business Letter – Features in Layout of a Business Letter – Need for Business Letter – Functions of a Business Letter – Classification of Business Letter.

Unit III

Guidelines for writing a complaint letter – Drafting Complaint Letters regarding various issues to the authorities - Essentials of Bank Correspondence – Letters from Customers to Bank – Opening of a Current Account – Requesting to Stop Payment – Extension of time for the repayment of a Loan – Transfer of SB Account to another Branch – Wrong Debit in the Account.

Unit IV

Reports - Importance – Kinds – Effective Report – Guidelines – Short Reports – Long Reports - Meetings, Agenda and Minutes.

Unit V

Job Application – Meaning – Important aspects – Advantages - Drafting Job Application - Resumes – Meaning – Types – Drafting - Model of Letters and Resumes – Interviews – Guidelines .

Textbook:

Raghunathan N. S and Santhanam B – Business Communication - Margham Publications, Chennai - Reprint 2017.

Books for Reference:

1. Sundar K and Kumara Raj A – Essentials of Business Communication – Vijay Nicole Imprints Private Limited, Chennai – Reprint 2017.
2. Krishnamacharyulu C. S. G – Business Communication – Himalaya Publishing House, Mumbai – First Edition – 2016

SEMESTER III / IV

SKILL BASED ELECTIVE:

USCOB319 / USCOB419 – PRACTICAL BANKING

Unit I: Banking system in India

Indian Banking System - Definition– Functions of Commercial Banks- Opening of an Account – KYC forms and Nominations – Online Account Opening Form - Types of Deposit

Unit II: Bank Forms and Applications

Pass Book - Pay-in Slip – Withdrawal slip – Cheque – Standing order form – Application forms for SMS alert – Ultimate beneficial owner(s) form

Unit III: Negotiable Instrument

Negotiable Instruments – Cheque, Bill of Exchange, Promissory note – Reasons for dishonour of a cheque – Endorsements

Unit IV: E-banking and Internet Banking

Recent developments in Banking: E-Banking - NEFT Application and RTGS Application forms - Personal Identification Number, ATM Cards , Debit Cards, Credit Cards – Online Enquiry and update profile - Electronic Fund Transfer- Electronic Clearing System – Mobile Banking – Utility services.

Unit V: Lending and Borrowings

Principles of Lending – Types of Borrowings – Precautions to be taken by a banker. Customer grievances and redressal – Ombudsman – CIBIL Score

Note: Study material will be provided by the department

SEMESTER IV

UCCOH19 – FINANCIAL ACCOUNTING – II

Objective:

To acquaint students with the Accounting principles, concepts and their applications in different forms of businesses

Unit I: Fire Insurance Claims

Need for Fire insurance – Types of Fire insurance policies – Claim for loss of stock – Claim for loss of profits.

Unit II: Insolvency

Meaning of Insolvency – Relevant Acts – Preparation of Statement of Affairs and Deficiency Account

Unit III: Partnership

Partnership Fundamentals – Admission of a partner – Retirement of a partner – Retirement cum Admission.

Unit IV: Death of a partner, Dissolution of firm and Insolvency of a Partnership Firm

Death of a partner – Settlement and Mode of payment – Ascertainment of deceased partner's share of Profit – Dissolution of firm – Meaning – Modes of Dissolutions – Settlements of accounts – Accounting treatment – Treatment of Goodwill on Dissolution – Treatment of unrecovered assets and liabilities – Insolvency of Partnership Firm.

Unit V: Piecemeal Distribution

Piecemeal Distribution – Proportionate capital method – Maximum loss method

Theory: Problem – 20 : 80

Textbook:

Reddy T.S. and Murthy A. – Advanced Accounting – Margham Publications, Chennai, Reprint 2016

Books for Reference:

1. Shukla M.C., Gupta M.P., Agarwal B.M. and Grewal T.S. – Advanced Accounts (Volume I) – S.Chand and Company Limited, New Delhi, Reprint 2019.
2. Nagarajan K.L., Vinayagam N. and Mani P.L. – Principles of Accountancy – Eurasia Publishing House, New Delhi, Revised Edition 2017
3. Jain S.P., Narang K.L., Mukesh Kumar Sharma, Romila Jain and Satish Khasa - Financial Accounting – Kalyani Publishing House, New Delhi, Reprint 2018
4. Tulsian P.C. – Financial Accounting – Pearson Education, New Delhi, Edition 2009, Reprint 2017
5. Raman B.S. - Financial Accounting (Vol.1) – United Publishers and Distributors, Guwhati, Edition 2018

SEMESTER IV

UCCOI19 – METHODS OF COST ACCOUNTING

Objective:

To introduce to students the various methods of Cost Accounting and their applications in different industries

Unit I: Process Costing

Process Costing – Meaning – Process Accounts – Normal Loss and Scrap – Calculation and Treatment of Abnormal Loss and Abnormal Gain.

Unit II: Costing Methods

Joint products and By-products – Methods of apportionment – Average Unit Cost Method, Physical Units Method, Survey Method, Market Value at Separation Point as basis, Market Value after Further processing as basis, Reverse Cost Method.
Job Costing – Features – Process Costing Vs. Job Costing – Batch Costing.

Unit III: Contract Costing

Contract costing Vs. Job Costing - Completed Contracts – Incomplete Contracts – Treatment of Profit – Treatment of Plant – Contracts with losses – Multiple Contracts.

Unit IV: Transport Costing

Transport Costing – Meaning – Computation of Cost unit – Calculation of Cost for running distance - Passenger transport cost (Including Fare Calculation) and Goods transport cost.

Unit V: Reconciliation Statement & system

Reconciliation of Cost and Financial Accounting Systems – Causes for differences in profits shown by both the systems – Prepration of Reconciliation Statement and Memorandum Reconciliation Account.

Theory : Problems – 20 :80

Textbook:

Reddy T.S and Hari Prasad Reddy Y. – Cost Accounting – Margham Publications, Chennai, Reprint 2018

Books for Reference:

1. Jain S. P & Narang K.L. _ Cost Accounting – Kalyani Publishers, New Delhi, Reprint 2017
2. Khanna, Ahuja and Pandey – Cost Accounting – S. Chand & Co., New Delhi, Reprint 2016
3. Lall Nigam B.M. and Bagavathi V. – Cost Accounting: An Introduction – Prentice Hall of India, New Delhi, Reprint 2018.
4. Pillai R.S.N and Bagavathi V. – Cost Accounting – S. Chand & Co., Ltd., New Delhi,2014
5. Arora M. N. – A Textbook of Cost and Management Accounting – Vikas Publishing House, Chennai, 10th Edition, 2012

SEMESTER IV

UCCOJ19 - LAW OF CONTRACTS – II

Objective:

To provide knowledge to the students about special types of Contracts and to give an introduction about Companies Act

Unit I: Sale of Goods Act - I

Sale of Goods Act - Formation of Contract - Sales Vs Agreement to sell - Delivery of goods - Document of title to goods - Nature – Types - Transfer of Property – Essential – Passing of Property – Specific Goods – Unascertained Goods – Goods sent on approval - Conditions and Warranty - Caveat Emptor – Exemptions - Consumer Protection Act 1986 – meaning of Consumer – Consumer and Customer – Defect – Deficiency – Unfair Sales Practices – Restrictive Sales Practices

Unit II: Sale of Goods Act – II

Sale of goods Act - Pricing and Types (including contracts involving sea routes) - Performance of Contract - Delivery of Goods - Rules – Acceptance of Delivery – Buyer's liability for not accepting -Rights of an Unpaid Seller – Against the Goods – Against the buyer personally – Remedies for breach of contract of sale - Auction Sales – Procedure – Rules – Damping – Implied warranties in an auction sale

Unit III: Other Special Contracts

Indemnity and Guarantee- Bailment, Pledge and Hypothecation

Unit IV: Introduction to Companies Act -I

Companies- Incorporation- Commencement of Business- Types of Companies with special reference to Public, Private and Government Companies - Memorandum of Association - Meaning - Contents - Alteration - Articles of Association – Meaning – Contents – Alteration - Legal Effects – Doctrine of Indoor Management - Constructive Notice.

Unit V: Introduction to Companies Act -II

Prospectus – Types of Prospectus - Statement in lieu of Prospectus - Deemed Prospectus - Misstatement and their Consequences - Underwriting Commission and Brokerage.

Meetings - Types – Essentials and Legal rules for a valid meeting - Voting at Meetings – modes - Proxies - Types of Resolutions – Minutes – Adjournment

Note: Study Material will be provided by the Department

SEMESTER IV

UCCOK19 – MARKETING

Objective:

To provide an introduction to marketing mix and latest trends in marketing

Unit I: Introduction

Market – Meaning – Types - Marketing – Meaning – Definition and Functions of Marketing – Role and Importance - Marketing Mix – Classification of Goods – Market Segmentation – Consumer Behaviour – Meaning and Importance – Services Marketing – Difference between Product and Service - 7 P's of Services Marketing

Unit II: Product Mix

Product – Meaning – Importance and Features – New Product Planning and Development – Types - Product Mix – Product Life Cycle – Branding, Brand Loyalty and Equity, Copyrights, Trademarks and Patents – Packing.

Unit III: Price Mix

Pricing – Meaning – Objectives – Pricing Strategies - Factors affecting Pricing – Pricing in Product Life Cycle

Unit IV: Promotion Mix

Promotion – Meaning – Need – Promotion Mix – Meaning – Promotional mixes and strategies- Forms - Advantages – Limitations – Promotion in Product Life Cycle

Unit V: Channels of Distribution and Electronic Marketing

Channels of Distribution I – Meaning – Definition – Types - Market consideration - Logistic Management - Channels of Distribution II – Middlemen in Distribution – Agent Middlemen and Merchant Middleman – Wholesalers and Retailers – Recent Trends in Marketing - Tele-Marketing, Relationship Marketing, Word of Mouth Marketing, Test Marketing, E-Marketing – Meaning – Types – Participants in E-Marketing

Textbook:

Pillai R.S.N. and Bagavathi V. – Modern Marketing – S. Chand and Co. Ltd., New Delhi, 2015

Books for Reference:

1. Philip Kotler and Gary Armstrong –Principles of Marketing – Pearson Education India, New Delhi, 2015
2. Gupta C.B. and Rajan Nair N. – Marketing Management Text and Cases – Sultan Chand and Sons, New Delhi, 2018
3. Kavitha Sharma and Dr. Swathi Agarwal, Principles of Marketing, Taxmann Publication, New Delhi, 2018
4. Govindarajan M. Marketing Management, Concepts, Cases, Challenges and Trends, Prentice Hall India Learning Private Ltd., New Delhi, Reprint 2012
5. Jayachandran S. – Marketing Management – SAI Book House, Hyderabad, Edition 2018

SEMESTER V

UCCOL19 – CORPORATE ACCOUNTING - I

Objective:

To teach the basic Accounting concepts and practices of Companies

Unit I: Shares

Joint stock companies – Issue of Shares and Redemption of Preference Shares– Forfeiture and Reissue of Shares

Unit II: Debentures

Issue of Debentures and Redemption of debentures - Underwriting of Shares and debentures.

Unit III: Final Accounts of Companies

Company Final Accounts – Profit prior to Incorporation.

Unit IV: Amalgamation, Absorption and External Reconstruction

Amalgamation, Absorption and External Reconstruction – Meaning – Calculation of Purchase Consideration – Accounting Entries

Unit V: Internal Reconstruction

Alteration of Share capital and Internal Reconstruction – Scope – Schemes of Reconstruction – Steps for Reconstruction.

Theory: Problem – 20: 80

Textbook:

Reddy T. S. & Murthy A. – Corporate Accounting – Margham Publications, Chennai, 2016

Books for Reference:

1. Jain S.P. and Narang K. L. – Advanced Accounts – Vol II – Kalyani Publishers, New Delhi, 2018
2. Gupta R.L. and Radhasamy M. – Advanced Accounts – Vol II – S. Chand & Sons., New Delhi, 2017
3. Dr. Maheswari S.N. – Corporate Accounting – Vikas Publishing House, New Delhi, 2017
4. Shukla M.C. and Grewal T. S. – Advanced Accounts – Vol II - S. Chand & Sons., New Delhi, 2019
5. Dr. Arulanandam M.A. & Raman K.S – Advanced Accountancy – Himalaya Publishing House, Revised Edition 2015

SEMESTER V

UCCOM19 – MANAGEMENT ACCOUNTING - I

Objective:

To introduce Management Accounting systems to the students and to teach the analytical tools applied in Companies

Unit I: Introduction

Management Accounting – Meaning – Definition –Nature and scope – Objectives and functions – Relationship between Financial, Cost and Management Accounting – Installation of Management Accounting System.

Unit II: Analysis of Financial Statements

Analysis of Financial Statements – Meaning – Comparative and Common Size Financial Statements – Trend percentages - Ratio Analysis – Calculation of Profitability, Solvency and Turnover ratios (Including Reconstruction of Profit and Loss Account and Balance sheet)

Unit III: Funds Flow Analysis

Funds Flow Statement – Meaning – Definition –Working Capital – Preparation of Statement showing changes in Working Capital – Funds from Operations – Fund flow Statement.

Unit IV: Cash Flow Analysis

Cash Flow Analysis

Unit V: Budgets and Budgetary Control

Budgets – Budgetary Control – Essentials of a successful Budgetary Control system – Organization for Installation of Budgetary Control System – Advantages and limitations of Budgetary control - Classification of Budgets – Functional budgets – Sales Budget, Production Budget – Material Budget - Overheads Budget – Cash Budget – Master Budget – Fixed and Flexible Budget – Performance budgeting (Theory)

Theory: Problems – 40: 60

Textbook:

Reddy T.S. and Hari Prasad Reddy Y. – Management Accounting – Margham Publications, Chennai, 2018

Books for Reference:

1. Khan M.Y. and Jain S.P. – Management Accounting – Tata McGraw Hill, New Delhi,6th Edition, 2017
2. Pillai R.S. N. and Bhagavathi V. – Management Accounting – S. Chand, New Delhi, 4th Edition, 2017
3. Dr. Murthy A. and Dr. Guruswamy S. – Management Accounting – Margham Publications, Chennai, Edition 2009
4. Manmohan S.P. and Goyal P. S. – Principles of Management Accoounting – S. Chand & Co., Delhi, Revised Edition 2019
5. Sekhar R.C. and Rajagopalan A.V. – Management Accounting – Oxford University Press, Chennai, Edition 2019

SEMESTER V

UCCON19 – INCOME TAX: LAW AND PRACTICE - I

Objective:

To provide knowledge to the students about the Income Tax Act, 1961 the provisions and calculation of income under different Heads of Income

Unit I: Introduction

Brief history of Income Tax in India – Important Definitions – Residential Status and Tax liability (only theory) - Incomes exempt from tax (for Individuals only)

Unit II: Income from Salaries

Heads of Income – Income from Salaries – Allowances, Perquisites and Deductions.

Unit III: Income from House Property
Income from House property – Deductions

Unit IV: Profits and Gains of Business or Profession

Profits and Gains of Business or Profession – Depreciation.

Unit V: Income Tax authorities and Assessment Procedure
Income Tax Authorities and their Powers – Procedure for Assessment – Types of Assessment – Permanent Account Number (PAN) – Provisions related to Quoting of Aadhar Number

Theory: Problems – 60: 40

Textbook:

Dr. Mehrotra H.C. – Income Tax Law & Practice – Sahitya Bhawan Publications, Agra, (Relevant Edition)

Books for Reference:

1. Vinod.K.Singhania – Students Guide to Income Tax – Tax man Publications Pvt. Ltd., New Delhi (Relevant Edition)
2. Gaur V.P. and Narang D.B. – Income Tax – Kalyani Publishers, New Delhi (Relevant Edition)
3. Reddy T.S. and Hari Prasad Reddy Y. – Income Tax – Margham Publications, Chennai (Relevant Edition)
4. Hariharan N. – Income Tax Law and practice – Tata McGraw Hill, New Delhi, Reprint (Relevant Edition)
5. Gaur V.P. Narang D.B. and Puja Ghai – Practical Income Tax – Kalyani Publishers, New Delhi, (Relevant Edition)

SEMESTER V

UECOC19 – ELECTIVE – II A: BANKING: LAW AND PRACTICE

Objective:

To teach the students traditional banking and the modern banking functions

Unit I: Opening and Operation of Accounts

Definitions (Banking, Business of Banking & Customer) – Other businesses permitted – Types of deposit account – Special features – Types of accounts – Special features – Joint Account – Different Operative Styles - Procedure for opening account – Proper Introduction – Risks in opening account without proper introduction - Pay in Slip – Printed Cheque Books – Advantages – Pass Book –Wrong Entries in pass book and its legal effect – Insurance of Bank Deposits – Inoperative accounts – Closing of accounts – Nomination – Legal Status of Nominee - Types of Customers – Senior Citizen Accounts – KYC – RBI Guide Lines – Unique Customer Identification Code.

Unit II: Banker and Customer Relationship

Banker Customer Relationship – Debtor and Creditor – Principal and Agent – Trustee and Beneficiary – Rights and Obligations of banker – Money Laundering – RBI Guide Lines.

Unit III: Negotiable Instruments, Paying and Collecting Banker

Negotiable Instruments – Meaning – Differences between Nogotiability and transferability – Definitions – Types – Parties – Crossing – Features – Types – Endorsement – Features – Types – Regular and Irregular form of endorsements - Paying Banker – Duties and liabilities – Payment in due course – suitable replies for dishonour - Collecting Banker – Duties and liabilities - Material and non-material Alteration – Meaning – Effects – Forgery and the consequences.

Unit IV: Loans and Advances

Loans and Advances – Significance – Principles – Sources(infra structure Bonds) – Types and style – Types of Securities – Different modes of creating charges – Factors affecting the level of advances – Customer Grievances – Redress – Ombudsman.

Unit V: Electronic Banking

Meaning – Core Banking Solutions (CBS) – Internet Banking Vs Traditional Banking – Drawbacks – Major Issues – Indian Scenario – legal Issues – Mobile Banking – Telephone Banking – ATM – Electronic Fund Transfer – NEFT – RTGS – Electronic Clearing System (Debit & Credit) Operations and benefits – Electronic Payment System (EPS) – Meaning – Features – Process – Payment methods (Digital Cheque, Electronic Cash, Electronic Cards, SWIFT, Plastic cards etc.)

Internal Mark 40 marks:

1. I CA & II CA 50 marks each: 10 marks
2. Internal Component: 30 marks

Detailed Written Assignment (legal size paper and hand written) – 10 marks

1. Banking, Business of Banking and other businesses permitted & Prohibitted and subsidiary company and its business
2. Special types of customers their special features - KYC documentation – Precautions to be taken at the time of opening, operating, borrowing etc
3. Money Laundry PMLA objectives and RBI Guidelines to prevent money laundry
4. Different types of securites, special features, advantages, disadvantages, creation of charge and the precautions to be taken by bank
5. Banking Ombudsman Scheme
6. Special facilities given to senior citizens

(1, 2 and 3 along with I CA and the remaining three along with II CA)

Seminar Topics (to be taken with hand written materials or using digital medium or by way of skit etc) – 10 marks

1. Deposit Schemes with innovative and attractive features offered by different banks
2. Special Deposit Schemes offered under the Schemes recommended by the Government of India
3. Bills Discounting Scheme in India
4. Supply Bills
5. Stock Exchange Securities

(Each student has to take seminar two times and five marks for each seminar)

Practical – 10 marks

1. Net banking: All transactions in the sub menus
2. Digital Bill Payment like Electricity, booking of tickets online

Textbook:

Sundharam and Varshney – Banking Law & practice - S. Chand & Co.Ltd., New Delhi. (Latest Edition)

Books for Reference:

1. Dr. Guruswamy S. – Banking Theory, Law and practice – Vijay Nicole Imprints Pvt. Ltd., (Latest Edition)
2. E Gordon and Natarajan S. – Banking Theory, Law and practice – Himalaya Publishing House (latest Edition)
3. Gopinath M.N. - Banking Principles & Operations – Snow White Publishers, (Latest Edition)
4. Indian Institute of Banking and Finance – Anti money Laundering & KYC – Macmillan Publishers, (Latest Edition)

SEMESTER VI

UCCOO19 – CORPORATE ACCOUNTING – II

Objective:

To provide in depth knowledge on various Accounting practices and their applications in various companies

Unit I: Valuation of Goodwill and Shares

Valuation of Goodwill – Definition – Need – Factors determining the valuation of Goodwill - Methods and Valuation of shares

Unit II: Liquidation of Companies

Liquidation of Companies – Scope – Contributory – Preferential Payments - Statement of Affairs – Deficiency Account – Liquidator's Final Statement of Accounts (till payment to Fully paid equity shareholders)

Unit III: Accounts of Holding Company

Accounts of Holding Companies - Definition – Consolidation of Balance Sheet – Minority interest – Pre-acquisition or capital profits – Cost of control or Goodwill (Simple Problems only)

Unit IV: Accounts of General Insurance Company

Accounts of General Insurance company – Introduction – Definition of General insurance Business – Commission and Reinsurance Premium – Commission on Reinsurance Accepted – Commission of Reinsurance ceded- Reserve for Unexpired Risks - Preparation of Financial Statements as per IRDA Regulations.

Unit V: Accounts of Banking Company

Accounts of Banking Companies – Regulation on Banking Companies – Management – Capital and Reserve – Final Accounts. (Simple Problems)

Theory : Problem – 20 : 80

Textbook:

Reddy T. S. & Murthy A. – Corporate Accounting – Margham Publications, Chennai, 2016

Books for Reference:

1. Jain S.P. and Narang K. L. – Advanced Accounts – Vol II – Kalyani Publishers, New Delhi, 2018
2. Gupta R.L and Radhasamy M. – Advanced Accounts – Vol II – S. Chand & Sons., New Delhi, 2017
3. Dr. Maheswari S.N. – Corporate Accounting – Vikas Publishing House, New Delhi, 2017
4. Shukla M.C. and Grewal T.S – Advanced Accounts – Vol II - S. Chand & Sons., New Delhi, 2019
5. Dr. Arulanandam M.A. and Raman K.S. – Advanced Accountancy – Himalaya Publishing House, Revised Edition 2015

SEMESTER VI

UCCOP19 – MANAGEMENT ACCOUNTING – II

Objective:

To teach decision making techniques required in business

Unit I: Marginal Costing

Marginal Costing – Features – Marginal Costing Vs Absorption costing – Concepts and terms in Cost Volume Profit Analysis – Limitations of Marginal costing – Break even analysis.

Unit II: Practical Applications of Marginal Costing

Practical Application of Marginal Costing for Managerial Decision Making – Key factor – Make or buy – Idle facilities – Plant merger – Product Mix or Sales Mix – Export decision – Product Elimination decision – Plant or Equipment purchase decision.

Unit III: Standard Costing and Variance Analysis

Standard costing and Variance Analysis – Definition – Advantages and Limitations – Standard Costing Vs Budgetary Control – Computation of variances relating to Materials, Labour, Overheads and Sales based on sales value (simple problems only)

Unit IV: Capital Budgeting

Capital Budgeting – Features – Traditional Methods – Pay Back, Accounting Rate of Return – Non-traditional Methods– Net Present Value, Profitability Index, Internal Rate of Return.

Unit V: Responsibility Accounting and Zero Base Budgeting

Responsibility Accounting – Essentials – Responsibility centers – Limitations – Cost centres and Profit centers – Zero base budgeting – Process – Advantages and Limitations.

Theory : Problems – 40 : 60

Textbook:

Reddy T.S. and Hari Prasad Reddy Y. – Management Accounting – Margham Publications, Chennai, 2018

Books for Reference:

1. Khan M.Y. and Jain S.P. – Management Accounting – Tata McGraw Hill, New Delhi,6th Edition, 2017
2. Pillai R.S. N. and Bhagavathi V. – Management Accounting – S. Chand, New Delhi, 4th Edition, 2017
3. Dr. Murthy A. and Dr. Guruswamy S. – Management Accounting – Margham Publications, Chennai, Edition 2009
4. Manmohan S.P. and Goyal P. S. – Principles of Management Accoounting – S. Chand & Co., Delhi, Revised Edition 2019
5. Sekhar R.C. and Rajagopalan A.V. – Management Accounting – Oxford University Press, Chennai, Edition 2019

SEMESTER VI

UCCOQ19 – INCOME TAX: LAW AND PRACTICE – II

Objective:

To teach the students the provision and calculation of Income under different Heads of Income, calculation of Gross Total Income, Total Income and Tax Liability of Individuals and Partnership Firms

Unit I: Income from Captial Gains

Capital gains – Short term and Long term – Exemptions.

Unit II: Income from Other Sources

Income from Other Sources

Unit III: Carry forward and set off of losses

Set-off and Carry forward of losses – Clubbing of Incomes and Deemed Incomes.

Unit IV: Assessment of Individuals

Deductions from GTI – Computation of Total Income and Tax Liability of Individuals

Unit V: Preparation and Filing of Returns and Payment of Tax

Preparation and Filing of Returns – E-Filing – Deduction and Collection of Tax at Source (TDS) - Advance payment of Tax – Recovery and Refund of Tax – Appeals and Revision

Theory: Problems – 40: 60

Textbook:

Dr. Mehrotra .H.C. – Income Tax Law & Practice – Sahitya Bhawan Publications, Agra, Revised (Relevant Edition).

Books for Reference:

1. Vinod.K.Singhania – Students Guide to Income Tax – Tax man Publications Pvt. Ltd., New Delhi (Relevant Edition)
2. Gaur V.P. and Narang D.B. – Income Tax – Kalyani Publishers, New Delhi (Relevant Edition).
3. Reddy T.S. and Hari Prasad Reddy .Y – Income Tax – Margham Publications, Chennai (Relevant Edition).
4. Hariharan N. – Income Tax Law and practice – Tata McGraw Hill, New Delhi, Reprint (RelevantEdition).
5. Gaur V.P. Narang D.B. and Puja Ghai – Practical Income Tax – Kalyani Publishers, New Delhi, (Relevant Edition)

SEMESTER VI

UECOD19 – ELECTIVE III A: ELECTRONIC COMMERCE AND TALLY

Objective:

- To introduce to the students E- Commerce and its application.
- To teach the application of Tally Practice in businesses

Unit I: Introduction to E-Commerce

E-Commerce – Concept – Nature – Scope – Impact, challenges and limitations of E-Commerce – Advantages of E-Commerce – Disadvantages – Encryption and Decryption.

Unit II: Aspects of E-Commerce

Evolution of E-Commerce – Major categories of E-Commerce – Advertising and Marketing through internet – Internet Technologies.

Unit III: Security in E-Commerce

Firewall and Securities – OSI Models – Network security and Firewalls – Firewall – Protocols – Types of Protocols – Data and Message Security – Security tools (Digital Signature and Digital Certificate)

Unit IV: E-Commerce Payment Modes

E-Payment Systems – Introduction – Online-.payment – Prepaid and Post paid payment system – Types of Electronic Payment System – Security issues on Electronic payment system – Banking – Net mobile.

Unit V: Tally

Introduction of Tally – Introduction to GST - Accounting and Inventory – an outline: Fundamentals of accounting, accounting terms, Definitions – Ledger and ledger accounts – Trial balance – Trading and profit and loss account – Balance sheet – Fundamentals of Inventory.

Account creation, Account Information – Groups (create, display, delete) Multiple groups – ledger (create, display, alter) – Multiple ledger – Inventory master creation: `stock groups and stock items – Entering Vouchers and Invoices: Different types of Accounting vouchers and Inventory Vouchers – Reports in tally – Balance sheet, Profit and Loss Account – Trial Balance – Day Book-Ratio Analysis – Reconciliation of Bank account – Interest Calculation (Simple Mode)

SEMESTER VI

UECOF19 – ELECTIVE PRACTICAL: TALLY

Practical Exercises:

1. Profit and loss account and Balance sheet.

2. Trial Balance and Balance sheet using Multiple Ledger (including ledgers for GST calculation)

3. Bank Reconciliation.

4. Stock Summary and Profit and loss account.

5. Interest Receivable and Payable.

Textbook:

Dr. P. Rizwan Ahmed – E-Business & E-Commerce – Margham Publications, Chennai, 2nd Edition 2016

Books for Reference:

1. Srinivasa Vallaban – E-Commerce – Srinivasa Vallaban S.V. – E-Commerce – Vijay Nicole Imprints Pvt. Ltd., Chennai, 2015
2. Abirami Devi K. and Alagammai M. – E-Commerce – Margham Publications, Chennai, Edition 2016
3. Bhasin T.M. – E-Commerce and E-Banking - Tarun Offset, New Delhi, Edition 2013
4. Palanivel S. – Tally Accounting Software – Margham Publications, Chennai, Reprint 2016
5. Nandhini A.K. and Nandhini K.K. – Tally ERP 9 – BPB Publications, New Delhi, Edition 2011

SEMESTER V/ VI

USCOC519/ USCOC619 – SKILL-BASED ELECTIVE:

SKILLS FOR PROFESSIONAL EXCELLENCE

Unit I:

Leadership Skills – Time Management skills – Stress Management techniques, Drafting Letter of Application – Exercises.

Unit II:

Drafting Resume – Exercises.

Unit III:

Group Discussion
Interview

Unit IV:

Written – Test – Verbal Reasoning – Analogy – completing analogous pair – simple analogy – Choosing analogous pair – Choosing similar word – Detecting analogy – Three word analogy – Classification – Choosing the odd word – Choosing the odd pair.

Unit V:

Written tests – Non verbal reasoning – series completion – choosing missing figure in series – Detecting wrong figure in series – Analogy – Choosing one element of similarly related pair – choosing similarly related sets of figure – Choosing oddly related figures – Classification – Choosing the odd figure – Choosing figured with same properties.

Note: Study Material will be provided by the Department

SEMESTER V/ VI

USCOD519 / USCOD619 – SKILL-BASED ELECTIVE:

CONSUMER GUIDE AND EMPOWERMENT

Unit I

Consumer Awareness Movement - Gandhiji's Quote - Brief History – I, II and III era in USA – Japan – India - Pre and Post Independence – 5 'R's of Dutiful Consumer (Reduce, Reuse, Recycle, Reject or Refuse and Rethink) -Consumer Protection Act,1986 - Introduction – Aim - Main features – Provisions –Consumer - Rights - Responsibilities towards each Right – Critical Awareness – Social Consern – Environmental Concern - United Nations Guidelines

Unit II

Right to Information Act – Object – Meaning of Information, Public Information Officer and Assistant Public Information Officer – Right to Information under this Act – Vis-à-vis other Acts – Supply of Information to Associations – Fee for Seeking Information – Format of Application – Information Exempted – Record Retention – Assistance to the Applicant – Time Period for Supply of Information – Appeals – Complaints – Third Party Information and Disclosure – RTI online (www.rtionline.gov.in) - Compilation of Office Memorandums and Notifications on RTI (www.persmin.nic.in)

Unit III

Consumer Protection Act 1986 – Preliminary (Introduction, commencement and application) – Consumer Protection Council – Central, State and District Councils – Objects – Constitution – Consumer Disputes Redressal Agencies – Establishment – Composition – Jurisdiction – Complaint – Manner – Procedure on receipt of complaint – Finding – Appeal – Finality of Order – Limitation Period – Administrative Control – Enforcement of orders by the Redressal Agencies – Dismissal of frivolous or vexatious complaints – The Consumer Protection Rules, 1987 – Extent and Commencement – Definitions – Appropriate Laboratory (*food.raj.nic.in/Docs/18C.P.Act.pdf)*

Unit IV

FSSAI ACT 2006 – Definitions – Food Safety and Standards Authority of India – Composition of Food Authority - Duties and Functions of Food Authority – – General Principles of Food Safety – General Provisions as to Articles of Food – Provisions relating to import – Special responsibilities as to Food Safety - Compliance steps of FBO - Commissioner of Food Safety of the State - Designated Officer , Food Safety Officers and their powers - Food Analysts and their functions - Liability of the manufacturers, packers, wholesalers, distributors and sellers Food Recall Procedures – Offences and Penalties - General Provisions relating to penalty

Unit V

Certification Agencies - Certification Marks – BIS Hall mark, Agmark, ISI Mark , FPO Mark, Non Polluting Vehicle Mark, India Organic, Eco Mark, Silk Mark, Handloom Mark, Toxicity Label, Vegetarian and Non-vegetarian Maks, Geographical Indication Marks etc – Significance of Certification Marks – Bureau of Indian Standards – Objectives and Activities

Activities for Internal Component: 30 marks

1. Preparing and sending RTI application, if no reply then I Appeal followed by II appeal and tracking – 10 marks

2. Individual and Group representation about the problems faced to the Consumer Protection Council –

3. Awareness Class to the I and II B. Com. Students after the class hours. Each student should take seminar at least twice a semester

4. Seminar during the class hours – at least twice a semester –

5. Seminars from the latest news bulletins of the Consumer Voice and the FSSAI) and dailies

6. Mass Awareness Programme

Students will be motivated to subscribe Consumer Voice, Weekly News Digest – FSSAI Updates & Industry News a weekly Compilation of News and Articles ofFoodsafetyhelpline.com

References:

1. www.persmin.nic.in
2. https://rtionline.gov.in/
3. food.raj.nic.in/Docs/18C.P.Act.pdf
4. www.consumer.tn.gov.in - publications
5. www.consumeradvice.in - publications
6. E-books available in the FSSAI website like Dart, Pink, Yellow and Orange books
7. Newsletters (quarterly publications) of State Consumer Knowledge Helpline Knowledge Resource Management Portal (SCHKRMP)
8. "Nugarvor Kavasam" a publication by the Department of Civil Supplies and Consumer protection
9. Articles from the Dailies.

SEMESTER V / VI

USCOE519 / USCOE619 - SKILL-BASED ELECTIVE: PRACTICAL AUDITING

Unit I: Nature of Auditing

Introduction – Definitions – Elements of auditing - Types of Auditing – Basic Principles Governing audit

Unit II: Audit Programme

Preparation before the commencement of Audit – Audit Programme – Audit Note book – Audit Working Papers – Audit Procedure - Auditing Standards

Unit III: Audit Evidence

Evidence for assertions – Formation of opinion – Types – Methods of collecting evidence – Tutorial Assignments.

Unit IV: Internal Control, Check, Internal Audit and Sampling in Auditing

Internal Control, Internal check and Internal audit.
Sampling in Auditing – Meaning – Test checking – Precautions requires in test checking – Statistical Sampling – Advantages and limitations – SA 530 – Methods of Sample selection.

Unit V: Vouching and Verification

Cash Transactions – Receipts – Payments – Purchases – ledgers – Asset – Liabilities – Audit Report

Note: Study material will be provided

SEMESTER V / VI

UGCOA519 / UGCOA619 - NON-MAJOR ELECTIVE:

BOOK KEEPING AND ACCOUNTING

Objective:

To provide basic knowledge about Book keeping and Accounting for the students for other discipline

Unit I: Basic concepts of Accounting

Introduction to Accounting – Definition – Steps – Book Keeping Vs. Accounting – Objectives – Advantages – Limitations – Groups interested in Accounting information – Double Entry System – Accounting equation – Types of Accounts – Accounting Rules – Accounting terminology – Accounting concepts and conventions.

Unit II: Journal & Ledger

Journal Entries – Ledger – Trial Balance.

Unit III: Subsidiary Books

Subsidiary Books – Meaning – Advantages – Types (Problems related to Bills Receivable book and Bills Payable book) – Ledger.

Unit IV: Trial Balance and Rectification of errors

Trial Balance – Closing and adjustment entries – Rectification of errors without suspense account.

Unit V: Final Accounts

Final Accounts with Simple Adjustments.

Note: Study material will be provided by the department.

References:

1. Grewal T.S, - Double Entry Book – S. Chand and Co. Ltd, New Delhi, Reprint 2010.
2. Tulsian P.C. – Financial Accounting – Tata McGraw Hill, New Delhi, Edition 2009.

B.C.A. - SEMESTER I

UAAFA19 – ALLIED-I: ACCOUNTING FUNDAMENTALS – I

Objective:

To introduce the students to various basics of Accounting.

Unit I:

Accounting – Meaning – Definition – Accounting Cycle – Concepts and Conventions – Double Entry System – Journal (Simple Problems) – Ledgers

Unit II:

Preparation of Trial Balance – Subsidiary Books – Bank Reconciliation Statement.

Unit III:

Final Accounts with Simple Adjustments.

Unit IV:

Depreciation Accounting – Meaning – Definition – Types – Problems Relating to Straight Line Method and Diminishing Method.

Unit V:

Single Entry System – Meaning – Definition – Characteristics – Limitations – Difference between Double Entry Systems – Ascertainment of Profits – Networth Method – Conversion Method (Simple problems)

Theory: Problem – 20:80

Textbook:

Reddy T.S. and Murthy A. – Advanced Accounting – Margham Publications, Chennai, Reprint 2016

Books for Reference:

1. Shukla M.C., Gupta M.P., Agarwal B.M. and Grewal T.S. – Advanced Accounts (Volume I) – S.Chand and Company Limited, New Delhi, Reprint 2019.
2. Nagarajan K.L., Vinayagam N. and Mani P.L – Principles of Accountancy – Eurasia Publishing House, New Delhi, Revised Edition 2017
3. Jain S.P., Narang K.L., Mukesh Kumar Sharma, Romila Jain and Satish Khasa - Financial Accounting – Kalyani Publishing House, New Delhi, Reprint 2018
4. Tulsian P.C. – Financial Accounting – Pearson Education, New Delhi, Edition 2009, Reprint 2017
5. Raman B.S. - Financial Accounting (Vol.1) – United Publishers and Distributors, Guwhati, Edition 2018

B.C.A. - SEMESTER II

UAAFB19 – ALLIED - II: ACCOUNTING FUNDAMENTALS – II

Objective:

To acquaint the students on various Systems of Accounting and Fundamentals.

Unit I:

Partnership Accounts – Meaning – Definition – Partnership Deeds – Fundamentals (Excluding changes in capital and capital rates) – Admission of a partner (simple problems).

Unit II:

Retirement of a partner – Death of a Partner.

Unit III:

Branch Accounts – Meaning – Need – Types of Branches – Debtors system – Final Accounts System – Stock and Debtors system (cost price method alone in included)

Unit IV:

Departmental Accounts – Need – Advantages – Techniques of Departmental Accounting – Difference between branch and department – Basis of Allocation of expenses which cannot be allocated – simple problems – Inter departmental transfers (only cost price method)

Unit V:

Hire purchase system – Definition – Features – Distinction between Hire Purchase and installment system – Default and Repression (Excluding Partial Repression)

Theory: Problem – 20:80

Textbook:

Reddy T.S. and Murthy A. – Advanced Accounting – Margham Publications, Chennai, Reprint 2016

Books for Reference:

1. Shukla M.C., Gupta M.P., Agarwal B.M. and Grewal T.S. – Advanced Accounts (Volume I) – S.Chand and Company Limited, New Delhi, Reprint 2019.
2. Nagarajan K.L., Vinayagam N. and Mani P.L – Principles of Accountancy – Eurasia Publishing House, New Delhi, Revised Edition 2017
3. Jain S.P., Narang K.L., Mukesh Kumar Sharma, Romila Jain and Satish Khasa - Financial Accounting – Kalyani Publishing House, New Delhi, Reprint 2018
4. Tulsian P.C. – Financial Accounting – Pearson Education, New Delhi, Edition 2009, Reprint 2017
5. Raman B.S. - Financial Accounting (Vol.1) – United Publishers and Distributors, Guwhati, Edition 2018

DEPARTMENT OF BIOCHEMISTRY
(Effective from the Academic year 2019-2020)

Structure of the Course and Examination:

Sem	Part	Code	Title of the paper	Hours/ Week	Exam		Credits	Marks
					Th	Pr		
I	I	ULTAA18	Tamil Paper - I	6	3	-	3	40+60
	II	UENGA17	English Paper - I	6	3	-	3	40+60
	III	UCBCA19	Bio Organic Chemistry	6	3	-	5	40+60
	III	UCBCC19	Main Practical - I	3	-	-	-	-
	III	UACHA19	Allied – I: Chemistry - I	4	3	-	4	40+60
	III	UACHC19	Allied Practical	2	-	-	-	-
	IV	-	Skill-Based Elective - I	2	2	-	2	40+60
	IV	-	Value Education	1	-	-	-	-
Total							**17**	**500**
II	I	ULTAB18	Tamil Paper - II	6	3	-	3	40+60
	II	UENGB17	English Paper - II	6	3	-	3	40+60
	III	UCBCB19	Cell Biology	6	3	-	5	40+60
	III	UCBCC19	Main Practical - I	3	-	6	5	40+60
	III	UACHB19	Allied – II: Chemistry - II	4	3	-	4	40+60
	III	UACHC19	Allied Practical	2	-	3	2	40+60
	IV	-	Skill-Based Elective - II	2	2	-	2	40+60
	IV	-	Value Education	1	-	-	-	-
Total							**24**	**700**
III	I	ULTAC18	Tamil Paper - III	6	3	-	3	40+60
	II	UENGC17	English Paper -III	5	3	-	3	40+60
	III	UCBCD19	Biochemical Techniques	7	3	-	5	40+60
	III	UCBCF19	Main Practical - II	3	-	-	-	-
	III	UAMBA18	Allied – III: Microbiology - I	4	3	-	4	40+60
	III	UAMBC18	Allied Practical	2	-	-	-	-
	IV	-	Skill- Based Elective - III	2	2	-	2	40+60
	IV	UVEDA17	Value Education	1	-	-	-	-
Total							**17**	**500**
IV	I	ULTAD18	Tamil Paper - IV	5	3	-	3	40+60
	II	UENGD17	English Paper - IV	6	3	-	3	40+60
	III	UCBCE19	Physiology	5	3	-	5	40+60
	III	UCBCF19	Main Practical - II	3	-	6	5	40+60
	III	UAMBB18	Allied –III: Microbiology - II	4	3		4	40+60
	III	UAMBC18	Allied Practical	2	-	3	2	40+60
	IV	-	Skill-Based Elective - IV	2	2	-	2	40+60
	IV	UVEDA17	Environmental Studies	2	2	-	2	40+60
	IV	-	Value Education	1	-	-	-	
Total							**26**	**800**

Sem	Part	Code	Title of the paper	Hours/ Week	Exam		Credits	Marks
					Th	Pr		
V	III	UCBCG19	Enzymes	5	3	-	5	40+60
	III	UCBCH19	Intermediary Metabolism	5	3	-	5	40+60
	III	UCBCI19	Endocrinology	5	3	-	5	40+60
	III	UEBCA19	Elective I A: Immunology	5	3	-	5	40+60
	III	UEBCB19	Elective I B: Nutritional Biochemistry					
	III	UCBCL19	Main Practical - III	5	-	-	-	40+60
	IV	USBCC519	Skill-Based Elective – V: Diseases and Diet Therapy	2	2	-	2	40+60
	IV	USBCD519	Skill-Based Elective – V: Health Care for Women					
	IV	-	Non-Major Elective - I	2	3	-	2	40+60
	IV	-	Value Education	1	-	-	-	-
Total							**24**	**600**
VI	III	UCBCJ19	Molecular Biology	5	3	-	5	40+60
	III	UCBCK19	Clinical Biochemistry	5	3	-	5	40+60
	III	UEBCC19	Elective II A: Biotechnology	5	3	-	5	40+60
	III	UEBCD19	Elective II B: Bioinformatics					
	III	UEBCE19	Elective III A: Pharmacology	5	3	-	5	40+60
	III	UEBCF19	Elective III B: Plant Biochemistry					
	IV	UCBCL19	Main Practical - III	5	-	6	5	40+60
		USBCC619	Skill-Based Elective – VI: Diseases and Diet Therapy					
	IV	USBCD619	Skill-Based Elective – VI: Health Care for Women	2	2	-	2	40+60
	IV	-	Non-Major Elective - II	2	3	-	2	40+60
	IV	UVEDA15	Value Education	1	2	-	2	40+60
			Total				**31**	**800**
	V	UXTEN15	Extension Activities (90 Hours)				1	
			Grand Total				**140**	**3900**

SEMESTER I

UCBCA19 - BIO ORGANIC CHEMISTRY

Objective: To understand the biomolecules, essential to life processes

Unit I: Carbohydrates

Classification of Carbohydrates - Occurrence, Structure, Properties: reaction with Phenyhydrazine, Acid and Alkali – Isomerism - Biological importance of Monosaccharides (Glucose and Fructose), Disaccharides (Maltose, Lactose, Sucrose), Polysaccharides (Starch, Glycogen, Cellulose) and Mucopolysaccharides.

Unit II: Amino Acids

Classification - Physical properties - Chemical properties - Structure of Peptide bond - **Proteins:** Classifications - Physical properties - Primary Structure - Secondary structure- Tertiary structure - Quaternary structure - Various forces stabilizing the structures - Biologically Important Peptides - Glutathione, Insulin, Vasopressin, Oxytocin (Structure and functions).

Unit III: Lipids

Occurrence, Structure, Classification and biological importance of Lipids and Fatty acids- Compound lipids - Derived lipids - Sterols (Cholesterol, Ergosterol - structure and functions) -Characteristics of lipids - Iodine number, acid number, Saponification number, Reichert - Meissl number.

Unit IV: Nucleic Acids

Structure of Purine and Pyrimidines - Nucleosides and Nucleotides - Structure, forms of DNA (A, B, Z) Properties - Denaturation, Tm, Hypo and Hyperchromicity, Cot value- Renaturation, Hybridization - Structure and types of RNA - rRNA, tRNA, mRNA and SnRNA- Functions of RNA.

Unit V: Vitamins

Fat and Water-soluble vitamins - Sources, RDA, Biochemical functions and Deficiency diseases (A, D, E, K, C, B_1, B_2, B_5, B_6 and B_{12}) (Structure not required) - Minerals: Iron, Calcium, Sodium, Potassium, Iodine and Zinc.

Textbooks:

1. Satyanarayana U - Textbook of Biochemistry - 2nd Ed - Books and Allied Pvt Ltd, 2005
2. Martin David W, Harper, Harold A - Harper's review of Biochemistry- 25th Ed,1996

Reference Books:

1. West, Todd, Mason, Vanbruggen - Textbook of Biochemistry - 4th Ed - Oxford Publishers, 1966
2. Chatterjea M N - Textbook of Medical Biochemistry- 7th Ed - R S Jaypee Publications, 2007
3. Lehninger D Nelson and Cox - Principles of Biochemistry - 4th Ed - WH Freeman and Company Ltd,2005
4. Gurdeep Chatwal - Organic Chemistry of Natural Products, Vol I, 2nd Ed - Himalaya Publishing House, 2003
5. Donald Voet and Judith G Voet - Biochemistry- 4th Ed - VP and Publisher Kaye Pace Associate Publisher, 2011

SEMESTER II

UCBCB19 - CELL BIOLOGY

Objective: To provide an integrated knowledge on structural organization of the cell and its components

Unit I:

An overall view of cells- origin-evolution of cells- cell Theory- Cell organization: Types of cell - Structural organization of Prokaryotic (*E.coli*) and Eukaryotic cells (Animal and plant cell) - Comparison between plant cell and animal cell structure - Virus cell Structure (T4 Bacteriophage) An overview of molecular organization of cells - Microfilaments (Actin and Intermediary filament), Microtubules, Centrioles, Basal bodies, Cilia, flagella, TMV (Tobacco Mosaic virus)

Unit II:

Components and functions of Organelles: Structure and functions of Mitochondria, Endoplasmic reticulum- Rough and Smooth endoplasmic reticulum, Ribosomes, Golgi apparatus, Lysosomes - Chloroplast, Peroxisomes and Glyoxysomes

Unit III:

Nucleus: Nuclear membrane, nucleolus, nuclear pore and annulus - Structure of Chromosomes - Cell Division - Mitosis and Meiosis I & II

Unit IV:

Cell membrane: Molecular organization of animal cell membrane - membrane lipids, proteins and carbohydrates - The Fluid Mosaic Model and artificial membranes- Mitochondrial and Red cell membrane, Cell wall: Components and role of cell wall

Unit V:

Membrane functions: Cell permeability, Ion selective channels (Uniport, Antiport, Symport with example) and carriers - Transport processes, Diffusion, Facilitated diffusion, Active transport proteins (Na+-K+ ATPase), Ionophores, and Gap junction and tight junctions- Cell-Cell communication (Belt and Spot desmosomes), Cell adhesion proteins

Textbooks:

1. Powar CB - Cell Biology - Himalaya Publishing House, 2006
2. Arumugam N - Cell Biology - Saras Publication, 1996

Reference Books:

1. Dalela A Verma - Text book of Cytology- Jai Prakash Nath and Co, 1996
2. De Robertis - Cell and Molecular Biology - 8th Ed - Lippincott Williams, 2017
3. Verma S and Agarwal V K - Cell Biology, Genetics, Molecular Biology, Evolution and Ecology - S Chand and Company Ltd, 2005
4. Becker and Hardin - The World of Cell, 5th Ed - Acaden Internet Publishers, 2006
5. Harvey Lodish - Molecular Cell Biology - 8th Ed - WH Freeman, 2016

UCBCC19 - MAIN PRACTICAL – I

Objective: To inculcate practical skill in basic Biochemistry

SAFETY MEASURES IN THE LABORATORY - I

BALANCE

Physical Balance, Electronic Balance, Analytical Balance, Weight Box, Types of error

I Volumetric Analysis

1. Estimation of Glucose by Benedicts method
2. Estimation of Glycine by Sorenson's method
3. Estimation of Ascorbic acid using 2,6 Dichlorophenol indophenol
4. Estimation of Nitrite using sodium hydroxide
5. Estimation of Iron using potassium permanganate
6. Estimation of Copper
7. Estimation of Hydrogen peroxide using potassium permanganate
8. Estimation of Calcium in milk
9. Estimation of Chloride by Mohr's method
10. Acid number of oils
11. Iodine number of edible oils
12. Saponification number of lipids

II Qualitative Analysis

1. Carbohydrates: Glucose, Fructose, Galactose, Lactose, Maltose, Sucrose, Starch
2. Amino acids: Tyrosine, Tryptophan, Arginine, Cysteine, Methionine, Proline

III Cell Biology

1. Mitosis in onion root tip
2. Identification of plant and animal cell
3. Meiosis in Flower

Reference Books:

1. Jayaraman J - Manuals in Biochemistry - New Age International Publishers, 2011
2. Varley, Alan, Gowen lock - Practical Biochemistry, 6th Ed - CBS Publishers, 2002
3. David T Plummer - Practical Biochemistry- 3rd Ed - McGraw Hill Publishers, 2005
4. Sawhney SK and Randhir Singh - Introductory Practical Biochemistry- 2nd Ed - Narosa Publishers, 2001
5. Sadhana Sharma and Reema Sharma - Practical Manual of Biochemistry, 1st Ed - Medtec, 2016

SEMESTER III

UCBCD19 - BIOCHEMICAL TECHNIQUES

Objective: To study about the principles and applications of Biochemical techniques

Unit I:

Expression of the concentration of solutes in solutions - Normality, Molarity, Molality, Mass concentration- Osmole- Acids, Bases, Buffers and pH (Definition and examples) - Henderson equation - Osmosis, Isotonic- Hypo and Hypertonic, Osmotic pressure (Vant Hoff's Law), Surface tension and Viscosity: Biological importance- Instrumentation, operation and application of Electrodes - pH Electrode (Hydrogen and Glass) and Clark Oxygen Electrode - Colloids: Definition and Types

Unit II:

Chromatography: Principle, instrumentation, operation and applications of Paper chromatography, TLC, Affinity chromatography, Ion-exchange chromatography, Molecular sieve chromatography, Gas chromatography and HPLC

Unit III:

Electrophoresis: Principle, instrumentation, operation and applications of paper, agarose, starch and SDS-PAGE - Isoelectric focusing, Capillary electrophoresis
Centrifugation: Svedberg unit- Basic principle of centrifugation - Types of Centrifuges and Rotors - cell fractionation - Instrumentations and applications of Preparative and Analytical Ultra Centrifuges

Unit IV:

Spectroscopy: Fundamental principles of spectroscopy - Basic laws of absorption - Beer-Lambert's law -Principle, Instrumentation, operation and application of UV-VIS-IR Spectrophotometry, Fluorimetry, AAS, FES

Unit V:

Radio isotopic Techniques: Radioisotopes- Stable and Unstable, Units of Radioactivity, Types of Radioactivity, Detection and measurement of radioactivity (Methods based on Gas ionization, Autoradiography and excitation) Application of radioisotopes in biological science (Isotope dilution technique, metabolic studies, radio dating) - Radiation hazards and safety aspects

Textbooks:

1. Keith Wilson and John Walker - Principles and Techniques of Practical biochemistry - 5thEd - Cambridge University, 2005
2. Upadhyay, Upadhyay and Nath - Biophysical Chemistry: Principles and Techniques - 2nd Ed - Himalaya Publishing House, 2009

Reference Books:

1. Chatwal Anand - Instrumental methods of Analysis - Himalaya Publishing House, 2011
2 Galen Wood Ewing - Instrumental methods of Chemical Analysis - 5th Ed - McGraw Hill
3 Robert D Braun - Introduction to Instrumental Analysis - Pharma Book Syndicate, 2006
4 David Frifelder - Physical Biochemistry - 2nd Ed - WH Freeman
5 Shawney SK and Randhir Singh - Practical Biochemistry - 2nd Ed - Alpha Science, 2005

SEMESTER IV

UCBCE19 – PHYSIOLOGY

Objective: To Understand the homeostatic mechanism of each organ

Unit I:

Nutrition: Nutrients - Balanced diet - Nutritional status - Food groups- Calorific value of food- RQ, SDA, BMR: Definition and Measurement, Bomb colorimeter, Adverse effects of Fast foods - Brief outline on the common adulterants in food.

Unit II:

Respiratory system: Overview of respiratory system, Exchange of Gases - Circulation**:** Blood composition and Functions - Types of Blood cells - Morphology and Function - ABO Blood Groups, Blood Coagulation - Structure of Heart and Blood vessels, Cardiac cycles - Blood pressure (Diastolic, Systolic, Normal Blood pressure) Normal ECG curve.

Unit III:

Digestive System: Structure and function of different components of digestive system, Digestion, Absorption and Nutritional significance of Carbohydrates, Lipids, Proteins - Role of Bile salts in Digestion and Absorption - Mechanism of HCl and Gastric juice formation in stomach.

Unit IV:

Excretory System: Structure of Kidney, Nephron - Composition and formation of Urine -Filtration, Active and passive transport of various substances and Secretion.
Muscle: Types of Muscle, Structure and Mechanism of Muscle Contraction.

Unit V:

Nervous System: Brief outline of Nervous system - Structure of Brain, Spinal Cord, Nerve fibres, Synapses - Nerve Impulse - Action potential, Membrane potential, Types and Mechanism - Neurotransmitters - Composition and functions of CSF and Lymph - Structure and functions of eye and ear.

Textbooks:

1. Ross, Wilson - Anatomy and Physiology in Health and illness - 13th Ed - Elsevier, 2018
2. Swaminathan MS - Principles of Nutrition - Bappco publishers,2010

Reference Books:

1. Ganong - Review of Medical Physiology- 25th Ed - McGraw - Hill Education,2016
2. Guyton and Hall - Textbook of Medical Physiology - 13th Ed - Elsevier,2016
3. Davidson and Passmore - Human Nutrition and Dietetics - 8th Ed - Churchill Livingstone
4. Skills ME and Young VR - Modern Nutrition and Health Diseases
5. Chatterjee CC - Human Physiology- 11th Ed - CBS publishers

SEMESTER IV

UCBCF19 - MAIN PRACTICAL - II

Objective: To inculcate Practical Skill in Biochemistry

SAFETY MEASURES IN THE LABORATORY - II

I COLORIMETRIC ESTIMATION:

1. Estimation of Carbohydrate by Anthrone method
2. Estimation of Fructose by Resorcinol method
3. Estimation of Protein by Biuret method
4. Estimation of Amino acids by Ninhydrin method
5. Estimation of Ascorbic acid
6. Estimation of Iron
7. Estimation of Inorganic phosphorous by Fiske & Subbarrow method
8. Estimation of Tryptophan

II PREPARATIONS:

1. Preparation of Starch from potatoes
2. Preparation of Casein from Milk
3. Preparation of Lactalbumin from Milk
4. Preparation of Lecithin from egg yolk
5. Preparation of Albumin from Egg
6. Buffers: Phosphate Buffer, Citrate Buffer, Bicarbonate buffer and Tris buffer
7. Sols and Colloids

III BIOCHEMICAL TECHNIQUES:

1. Paper Chromatography
2. Thin Layer Chromatography
3. Determination of pH of Saliva/ Urine
4. Agarose gel electrophoresis (Demonstration)
5. SDS - PAGE electrophoresis (Demonstration)

IV PHYSIOLOGY:

1 Collection of Blood

2 Determination of Bleeding time and Clotting Time

3 Grouping of Blood & Rh typing

4 Body mass index calculation

Reference Books:

1. Jayaraman J - Manuals in Biochemistry - 4th Ed - New Age International Publishers, 2011
2. Varley and Alan H Gowen lock - Practical Biochemistry -6th Ed - CBS Publishers, 2002
3. David T Plummer - Practical Biochemistry - 3rd Ed - McGraw Hill Publishers, 2005
4. Sawhney SK and Randhir Singh - Introductory Practical Biochemistry - 2nd Ed- Narosa Publishers, 2001
5. Praful B Godkar - Text book of Medical Laboratory Technology- 3rd Ed- Volume I & II, Bhalani Publishing House, 2014

SEMESTER V

UCBCG19 – ENZYMES

Objectives: To impart thorough knowledge about Enzymes and Enzyme Kinetics

Unit I:

Enzymes - Holoenzyme, Apoenzyme, Prosthetic group, Isoenzyme, Ribozyme, Abzyme - Activation energy (Definition alone) -Nomenclature and IUB classification of enzymes - Properties of enzymes - Specificity and its types- Active Site - Salient features of active site- Enzyme units (IU, katal and Turnover number) - Lock and key hypothesis and induced fit theory - Identification of binding site and catalytic site

Unit II:

Factors affecting rate of chemical reaction - Collision theory - Kinetics of single substrate enzyme catalyzed reaction - Michaelis and Menten equation, Briggs'- Haldane modification of MM equation, Transformation of MM equation-LB plots, Eadie - Hofstee plot - Kinetics of Bi-substrate enzyme catalyzed reaction - Ping pong bi- bi mechanisms, Random order and Compulsory order mechanisms (kinetics not required)

Unit III:

Catalysis-mechanism of reactions involving acid-base catalysis, electrostatic catalysis, covalent catalysis, enzyme catalysis without cofactors (Mechanism of Lysozyme, Chymotrypsin) - Co-enzymes - NAD+, NADP+, FMN, FAD, Co-ASH, TPP, Pyridoxyl phosphate, Biotin, FH_4 - Structure and functions

Unit IV:

Enzyme Inhibition - Competitive inhibition -Example: Succinate Dehydrogenase - Non-competitive inhibition-Example: α Ketoglutarate Dehydrogenase - Uncompetitive inhibition Example: Aryl Sulphatase- Irreversible inhibition- Example: Acetyl Cholinesterase (Kinetics not included)-Enzyme Regulation-Feedback Inhibition-Example: HMG CoA reductase - Allosteric inhibition- Example: Aspartate transcarbamoylase

Unit V:

Multienzyme system - Mechanism of action of pyruvate dehydrogenase complex - Immobilized enzymes - various methods of immobilization (ionic bonding, adsorption, covalent bonding, micro encapsulation and gel entrapment) - Industrial and Medical applications of Enzyme

Textbooks:

1. Trevor Palmer and Philip Bonner - Enzymes: Biochemistry, Biotechnology and Clinical Chemistry, 1st Ed - Horwood Publishing, Chichester 2008
2. Nicholas and Lewis Stevens - Fundamentals of Enzymology - 3rd Ed - Oxford University Press,1999

Reference Books:

1. Lehninger, David Nelson and M Chael M Cox - Principles of Biochemistry - 7th Ed - WH Freeman and Company Ltd, 2017
2. Christopher K Mathews, KE Van Holde and Kevin G Ahern - Biochemistry, 4th Ed - Pearson Education, 2012
3. Jeremy M Berg, John L Tymoczko and Lubert Stryer - Biochemistry- 8th Ed - WH Freeman Company, New York, 2015
4. SK Sawhney and Randhir Singh - Introductory Practical Biochemistry - 1st Ed - Narosa Publishing House, 2001

SEMESTER V

UCBCH19 - INTERMEDIARY METABOLISM

Objectives: To study about the metabolism of Biomolecules and its interrelationship

Unit I:

Carbohydrate metabolism: Glycolysis, Role of PDH complex, Citric acid cycle, Amphibolic role of TCA cycle - Glycogenesis, Glycogenolysis, Gluconeogenesis - (Pathway, Key enzymes and Regulation) Energetics of Glycolysis and TCA cycle - Metabolism of Galactose and Fructose

Unit II:

Uronic acid Pathway-Pentose phosphate pathway - Glyoxylate pathway - Electron transport chain, Oxidative Phosphorylation, Uncouplers and Inhibitors - High energy compounds

Unit III:

Detoxification - Conjugation, Hydrolysis, Reduction and oxidation - Fate of Dietary proteins - Catabolism of amino acids -Oxidative and non-oxidative deamination, decarboxylation and transamination - Urea cycle

Unit IV:

Lipid metabolism: Fate of dietary lipids - Biosynthesis and α, β, ω- Oxidation of fatty acids- Energetics of β Oxidation - Biosynthesis of Cholesterol, TG and Phospholipids

Unit V:

Nucleic acid metabolism: Fate of dietary nucleic acid - Biosynthesis and degradation of purine and pyrimidine nucleotides - Inhibitors of nucleotide biosynthesis - Interrelationship of carbohydrates, proteins and fat metabolism

Textbooks

1. Robert K Murray - Harper's Illustrated Biochemistry - 31st Ed- McGraw Hill,2018
2. Satyanarayana U - Biochemistry- 5th Ed - Elsevier,2017

Reference Books

1. David L Nelson Michael M cox - Lehninger's Principles of Biochemistry - 7th Ed - W H Freeman and Co, 2017
2. Davidson and Sittman - Biochemistry- NMS- 4th Ed - Lippincott Williams and Wilkins
3. Donald Voet and Judith G Voet - Biochemistry- 4th Ed - CBS Publishers and Distributers - 2011
4. Jeremy M Berg, John L Tymoczko, Stryer L -Biochemistry -7th Ed- W H Freeman 2011
5. Christopher K Mathews, KE Van Holde, Kevin G Ahern - Biochemistry - 3rd Ed - Pearson Education, 2000

SEMESTER V

UCBCI 19 – ENDOCRINOLOGY

Objectives: To expose the students to the world of hormones

Unit I:

Glands - types of glands-General features and functions of Endocrine system - Hormones, Effector cell, target cell - Definition, Hormone target relationship, Classification - based on Solubility, types of receptors, mechanism of action, Steroid and protein hormones - Salient features, Biosynthesis, Secretion, Storage, transport, Mechanism of action - Amino acid derived hormones- Receptors – structure and types.

Unit II:

Hypothalamus and Pituitary Hormones - Hypothalamic releasing factors - Posterior pituitary - Vasopressin, Oxytocin - Secretion, Transport and Biological actions - Anterior pituitary - tropic hormones (TSH, ACTH, LH, FSH), growth hormone, prolactin - Biological actions Hypothalamus and Pituitary Gland disorders - Gigantism, Acromegaly, Dwarfism (Etiology, Clinical features)

Unit III:

Thyroid hormones: Biosynthesis, Secretion, Storage, Transport and Biological actions of thyroid hormones - Calcium regulating hormones - PTH and Calcitonin - Secretion, action on different organs Thyroid gland disorders - Goiter, Grave's disease, Hashimoto's disease (Etiology, Clinical features)

Unit IV:

Pancreatic Hormones: Cells of Islets of Langerhans Insulin, Glucagon, Somatostatin - Biosynthesis, Secretion, Storage, Transport and Biological actions - Disorders of Pancreatic Hormone: Diabetes mellitus, Hyperglycemia and Hypoglycemia - Gastro intestinal hormones

Unit V:

Adrenal hormones: Biosynthesis, Secretion, Storage, Transport and Biological actions of Adrenal Hormones: Mineralocorticoids, Glucocorticoids, Androgens and Catecholamines - Adrenal disorder: Addison's disease, Cushing syndrome (Etiology, Clinical features) - Gonadal Hormones - Androgens, Estrogens, Progesterone

Textbooks:

1. Prakash S Lohar- Endocrinology- Hormones and Human Health- MJP Publishers,2007
2. White, Handler Smith - Mammalian Biochemistry, 7th Ed - McGraw Hill,2008

Reference Books:

1. Charles GD Brook and Nicholas J Marshall- Essential Endocrinology- 4th Ed - New Age International Publishers, 2006
2. Franklyn F B - Molecular Endocrinology - 3rd Ed - Elsevier Publication, 2006
3. Maurice GH- Basic Medical Endocrinology, 4th Ed - Elsevier Publication,2009
4. Ashok Kumar B- Mammalian Endocrinology - 3rd Ed - New Central book Agency, 2008
5. Lippincott W and Wilkins - Manual of Endocrinology and Metabolism- 5th Ed - 2018

SEMESTER V
UEBCA19 - ELECTIVE - I A: IMMUNOLOGY

Objectives: To help the students to understand the components of Immune system

Unit I:

Introduction - Primary and secondary lymphoid organs - Thymus, Bone marrow, Lymph node and spleen, Cells involved in immune system: Morphology, secretions and functions - Types of Immunity - Innate and Acquired immunity

Unit II:

Antigens: Essential features, Epitopes, Haptens, Adjuvants, MHC antigens (elementary knowledge) Antibodies: Types, structure, properties and biological functions - Clonal Selection theory, Production and applications of monoclonal antibodies

Unit III:

Antigen - antibody interactions: Precipitation, Agglutination, Complement fixation, Lysis, and Opsonization - Immuno techniques: RIA, ELISA, Fluorescent antibody technique, immunoblotting technique- Immuno electrophoresis and its types

Unit IV:

Complement - Salient features - Classical and Alternative pathway - Humoral immunity, Cell mediated immunity - Autoimmunity- Pathogenesis of Graves diseases, Myasthenia gravis, Rheumatoid arthritis, SLE and Multiple Sclerosis

Unit V:

Transplantation immunology: Types of grafts, Mechanism of allograft rejection - Hypersensitivity: Types (I, II, III and IV) - Mechanism

Textbooks:

1. KubyJ-Immunology - 9th Ed- W H Freeman Company, New York, 2017
2. Dulsy Fathima and Arumugam- Immunology- 13th Ed - Saras Publication, 2004

Reference Books:

1. Tizard L R -Immmunology,13th Ed -Saunders, 2017
2. Eli Benjamin -Immunology: A Short Course,7th Ed -Wiley Liss, 2013
3. Roitt -Essential Immunology - 11th Ed -Blackwell Science, 2006
4. Raj Khanna-Immunology- 3rd Ed Oxford University Publication, 2011
5. Ramesh - Essential Immunology - McGraw Hill India Publishers, 2017

SEMESTER V

UEBCB19 - ELECTIVE – I B: NUTRITIONAL BIOCHEMISTRY

Objectives: To study the proximate principles of nutrition with reference to RDA

Unit I:

Introduction - Definition of food and Nutrition - Basic Food groups - Energy yielding foods - Body Building, Protective Foods - Basic concepts of Energy Expenditure, Unit of Energy, Measurements of Food stuffs by Bomb Calorimeter - Calorific values of Proteins, Carbohydrates and Fats Basal metabolic rate, factors affecting BMR

Unit II:

Nutritive value of Proteins, Essential Amino Acids, Biological value of Proteins (Animal and Plant) - Evaluation of Proteins by Nitrogen Balance method - DC, BV, NPU of animal and plant proteins, Single Cell Proteins, Protein Malnutrition (Kwashiorkor) Under Nutrition (Marasmus) their preventive and curative measures - Composition of Balanced Diet, RDA for Infants, Children, Adolescent, Adult - male and female, Pregnant, Lactating women and old age

Unit III:

Physiological role and nutritional significance of Carbohydrates, Proteins, Lipids - Vitamins-Water and Fat soluble, Minerals (sources, RDA, biochemical functions, deficiency and disease states) - Iron, Calcium, Iodine, Sodium, Potassium, Magnesium, Chloride, Phosphorus

Unit IV:

Advances in food processing, Food Preservation, Food fortification and Enrichment, Novel foods - Sanitation and Hygiene in Food service - Therapeutic diets for Anemia, Malnutrition, Diabetes Mellitus, Allergy, Jaundice, Diarrhea, Fever

Unit V:

Food Toxicities -Naturally occurring Toxicants in Foods (organic toxicants, inorganic toxicants, Goitrogens, Anti-vitamins, radioactive materials), Chemical contaminants in Food (pesticides, polycyclic aromatic hydrocarbons, polyhalogenated biphenyls, contaminants from plastics, toxic metals) Fluorosis

Text books:

1. Swaminathan M - Textbook of Food and Nutrition - 2nd Ed - Bapco Publications, 1998
2. Ruth A Roth - Nutrition and Diet therapy - 8th Ed - Thomson Publishing,2003

Reference Books:

1. Shubangini Joshi - Nutrition and Dietetics - 5th Ed - Tata McGraw Hill Publication, 1998
2. Mahtab S Bamji, Prasad Rao N, Vinodhini Reddy - Textbook of Human Nutrition - 2nd Ed- Oxford Publication, 2004
3. Martin Eastwood - Principles of Human Nutrition - 2nd Ed - Blackwell Publishing, 2003
4. Eleanor, Noss, Whitney - Understanding Nutrition - 8th Ed - Thomson Publishing, 2002

SEMESTER VI

UCBCJ19 - MOLECULAR BIOLOGY

Objectives: To make a study on the blueprint of life and the information centers called genes

Unit I:

Genetics: Mendel's laws of inheritance, test cross, back cross and law of incomplete dominance - Structural and Genomic organization of prokaryotes and eukaryotic cells- Evidences for DNA as genetic material - Griffith, Avery et al and Hershey - chase experiments - Central dogma of molecular genetics - Repetitive DNA

Unit II:

Prokaryotic replication: Modes of replication - Experimental evidence for semi conservative replication - Process of Prokaryotic replication - Initiation, Elongation and Termination - Enzymes and proteins involved in replication - Inhibitors of replication- An overview of DNA repair

Unit III:

Prokaryotic transcription: Promoters - Process of Prokaryotic transcription- Initiation, Elongation and Termination- Enzymes and proteins involved in transcription - Inhibitors of transcription - Post transcriptional processing of rRNA and tRNA in prokaryotes - Reverse transcription

Unit IV:

Genetic code dictionary - General features - Wobble hypothesis - Composition of prokaryotic and eukaryotic ribosome - Process of protein synthesis in prokaryotes - Initiation, Elongation and Termination - Inhibitors of protein synthesis in prokaryotes - Post translational modification

Unit V:

Regulation of gene expression in prokaryotes: Operon concept - lac operon
Mutation: Definition, Classification with example
An overview of Genomics and Proteomics, Chromosome maps, Human Genome Project, DNA micro arrays, DNA fingerprinting and foot printing

Text books:

1. Lehninger, David Nelson and M Chael M Cox - Principles of Biochemistry - 5th Ed - WH Freeman and Company Ltd, 2009
2. David Friefelder - Molecular Biology- 2nd Ed -Narosa Publishing House, 2008

Reference Books:

1. Lodish, Darnell and Baltimore - Molecular Cell Biology - 4th Ed - WH Freeman and Company, 2000
2. Brown TA - Gene Cloning- 8th Ed - Blackwell Science, 2018
3. Benjamin Lewin - Gene VIII - 8th Ed - Pearson Education International, 2018
4. Robert F Weaver- Molecular Biology- McGraw Hill, 2015
5. Veer Bala Rastogi - Principles of Molecular Biology - 4th Ed - 2016

SEMESTER VI

UCBCK19 - CLINICAL BIOCHEMISTRY

Objectives: To understand the biochemical basis of various diseases and disorders

Unit I:

Diseases related to carbohydrate metabolism- Hypo and hyperglycemia, Renal threshold value and TMG, Diabetes mellitus - Types, Etiology, Clinical features and Complications - Diabetic ketoacidosis- Significance of fasting and post prandial blood glucose - Glucose tolerance test - Glycosylated Hb - Galactosemia, Fructosuria, Glycogen storage diseases

Unit II:

Diseases related to lipid: Lipoproteins- Types and functions, Atherosclerosis, Ischemic Heart disease (IHD), Obesity, Factors affecting Blood Cholesterol level, Hypercholesterolemia, Elementary details of Hypo and Hyper lipoproteinemia - Fatty liver, Cirrhosis - Inborn errors of Amino acid Metabolism- Phenylketonuria, Alkaptonuria, Cystinuria, hemophilia, Albinism

Unit III:

Liver function test -Metabolism of Bilirubin- Jaundice - Types - Liver function test based on abnormalities of pigment metabolism - Vandenburgh reaction and Urine bilirubin - Galactose tolerance test - BSP test- Prothrombin time

Unit IV:

Renal function test- Glomerulonephritis, Nephrotic syndrome- Clearance- Definition and types- Renal function tests based on glomerular filtration (urea and creatinine clearance), Renal plasma flow (PAH test), Tubular function- Phenol sulphathelein test
Gastric function test - Collection of gastric contents, Examination of gastric residum, FTM, Stimulation test- Alcohol, Caffeine and Histamine

Unit V:

Enzymes of Diagnostic importance: AST, ALP, CPK, LDH - Tumour Markers- Acid phosphatase, Alkaline phosphatase, Amylase, Streptokinase, γ Glutamyl transferase, Aldolase - Cancer: Etiology- Morphological changes in Tumour cells- Tumour markers- AFP, CEA and HCG

Textbooks:

1. Chatterjea MN and Rana Shinde -Text Book of Medical Biochemistry - 8th Ed - Jaypee Brothers-Medicinal Publishers Ltd, 2012
2. Kaplan L A, Perce A J, Steven C Kazmierczak - Clinical Chemistry - 5th Ed - 2009

Reference Books:

1. Carl A Burtis, Edward R Ashwood-Tietz-Fundamentals of Clinical Chemistry - 8th Ed- Harcourt Private Limited, 2017
2. Davidson and Henry-Clinical Diagnosis by Laboratory Methods - 19th Ed, 2005
3. A H Gowen lock, -Varley's Practical Clinical Biochemistry - 5th Ed - 2009
4. Philip D Mayne - Clinical Chemistry in Diagnosis and Treatment - 6th Ed - ELST Publishers
5. Thomas M Devlin- Practical Clinical Biochemistry - 6th Ed - 2006

SEMESTER VI

UEBCC19 - ELECTIVE - II A: BIOTECHNOLOGY

Objective: To explore the applications and future potentiality of Biotechnology

Unit I:

Introduction to Biotechnology and its branches- Scope and importance of biotechnology- Biotechnology in India - Introduction to Genetic Engineering - Steps and enzymes involved in Genetic Engineering: Restriction endonucleases - Nomenclature, Example: Reverse Transcriptase, Taq polymerase, DNA Ligases - Applications of genetic Engineering

Unit II:

Gene cloning vectors: Plasmids - (Classification, Characteristics, Example: pBR322, Shuttle vectors - example: pJDB219 - Cosmid (Feature, Example: Cosmid pLFR5) Gene cloning in Prokaryotes: methodology of Gene cloning with reference to Insulin gene

Unit III:

Plant tissue Culture: Basis of Plant cell and tissue culture- A tissue culture laboratory - Nutrient media composition and preparation, maintenance of Aseptic Environment - Methods of Plant cell, Tissue and Organ culture Somatic embryogenesis and Soma clonal variation Animal cell culture - Characteristics, Substrates, Culture Media Somatic cell fusion, Valuable products from cell culture- Tissue Plasminogen Activator
Gene transfer in plants and animals- Transgenic plants - Herbicide resistance, stress tolerance; Transgenic plants as bioreactors- Transgenic animals - Transgenic cattle - The first mammalian clone "Dolly - Animal Bioreactors

Unit IV:

Genetically engineered microorganisms (GEMOs) in health care products (Insulin, Cytokines, Interferons, Vaccines) - Risks of releasing Genetically Engineered Organisms - Ethics of biotechnology

Unit V:

Fermentation systems- Batch and continuous process- Fermentor design- solid substrate fermentation - Components of Medium - criteria used in media formulation - Downstream processing- introduction, separation process, example of recovery process- production of Wine and SCP

Textbooks

1. Dubey RC - A Text book of Biotechnology - 5th Ed - S Chand Publishing
2. Satyanarayana U - Biotechnology - 1st Ed- Books and Allied Private Ltd,2005

Reference Books

1. William J Thieman, Michael A Palladino - Introduction to Biotechnology: Pearson New international Edition - 2013
2. Bourgaise Jewell, Buiser - Biotechnology- 2nd Ed - Pearson Education Pvt Ltd, 2004
3. Lewin B - Genes - VIII - Pearson,2004
4. Glick and Pasternak - Molecular Biotechnology - 5th Ed -ASM Press, 2017
5. Brown TA Gene - Cloning and DNA Analysis: An Introduction - 6th Ed – Wiley - Blackwell

SEMESTER VI

UEBCD19 - ELECTIVE - II B: BIOINFORMATICS

Objective: To explore the tools of Bioinformatics

Unit I:

Internet for the molecular biologists: Internet basics- Connecting to the internet; E-mail- File transfer protocol- World Wide Web – Web browsers- HTP, HTML, URL, EMB net- NCBI Analysis packages

Unit II:

Introduction to Bioinformatics: Principles, challenges and uses of Bioinformatics Genomics and genome projects; genome sequencing approaches Structural Genomics; chromosome mapping of genomes Functional genomics; DNA chips Protein Chips

Unit III:

Biological databases: Organization and types of databases Data retrieval systems - DNA sequence databases Protein sequence databases - Databases of biological information Metabolic pathway (KEGG)

Unit IV:

Sequence comparison (DNA and Protein); dot plot; Global and Local sequence alignment Database searching- BLAST and FASTA- An outline of multiple sequence alignment and phylogenetic trees CLUSTAL W, Pattern and motif identification

Unit V:

Secondary structure prediction using protein sequences; using nucleotide sequences Protein classification; domain super families and patterns; 3-D structure data bases and their uses Molecular modeling; Structure based drug designing- An introduction to micro array; functional genomics, structural genomics, Pharmacogenomics, E-cell, HGP

Textbooks:

1. Atwood and Barry Smith - Introduction to Bioinformatics - Longman, 1999
2. David Edwards, Jason S, David H - Bioinformatics: Tools and applications - Springer

Reference Books:

1. Rui Jiang, Xuegong Zhang, Michael Q Zhang E - Basics of Biochemistry - Springer
2. Paul G H and Teresa K A - Biochemistry and Molecular Evolution - Springer
3. Griffiths - An Introduction to Genetic analysis - 7th Ed - W H Freeman, 2000
4. Trends guide to Bioinformatics- Trends supplement, 1998
5. Rajadurai M - Bio Informatics: A Practical Manual

SEMESTER VI

UEBCE19 – ELECTIVE – III A: PHARMACOLOGY

Objectives: To make detailed study of drugs, and their actions on living systems

Unit I:

Introduction: Sources, Dosage forms, Route of administration, classification - absorption of drugs, Distribution - Binding of drugs to plasma proteins Receptor- Types, Binding forces in Drug-receptor interaction and Consequences of Drug-receptor interaction

Unit II:

Xenobiotics - Phase I - mechanism of oxidation, reduction, hydrolysis and Phase II - conjugation - Structure and uses of oral hypoglycemic drugs - Classes, Parenteral

Unit III:

Antibiotics: Structure and therapeutic uses of Penicillin, Streptomycin, Tetracycline, Chloramphenicol and Erythromycin; Antiseptics and Disinfectants - Structure and uses of (i) Phenols and related compounds - (a) Alkyl substituted Phenols: Cresol, Thymol (b) Chlorinated Phenols: Chloroxylenol (ii) Halogen compounds - Chloramine (iii) Organic mercurial - Thiomersol (iv) Formaldehyde and its derivative - Formaldehyde (v) Nitro furan derivative - Nitro furazone

Unit IV:

Cardiovascular drugs - Structure and action of cardiac glycosides- Digoxin and Digitoxin; Antiarrhythmic Drugs - Structure and uses of Propanolol and Procainamide; Anti-hypertensive Agents - (i) Drugs acting centrally - Example: clonidine, alpha methyl dopa (ii) Ganglion blockers - Example: Pentolinium Tartrate (iii) Vasodilators - Example: Tolazaline (iv) β Blockers - Example: Phenoxybenzamine – Hypotensive agents

Unit V:

Analgesics -Morphine, Pethidine, Aspirin, Salicin, Paracetamol and Phenacetin, Analgin and Indomethacin; Anesthetics - Chloroform, Nitrous oxide, Trichloro ethylene, Benzocaine, Procaine, Lignocaine; Cytotoxic agents - Chlorambucil

Text books:

1. Jayashree Ghosh - A Textbook of Pharmaceutical Chemistry-5th Ed - SS Chand and Company, 2014
2. Seth SD - Textbook of Pharmacology - 3rd Ed. Reed Elsevier India Private Limited, 2008

Reference Books:

1. Satoskar RS, Bhandarkar SD and Ainapure SS - Pharmacology and Pharmaco therapeutics - 24th Ed - Popular Prakashan, 1995
2. William Foye - Principles of Medicinal Chemistry - 5th Ed - 2002
3. Patrick I Graham - An Introduction to Medicinal Chemistry - 6th Ed- Oxford University Press, 2017
4. Graham, Smith DG and Aroson JK - Textbook of Clinical Pharmacology and Drug Therapy - 3rd Ed - Oxford University Press, 2002
5. West SE, Todd RW, Mason SR and Bruggen TJ - Textbook of Biochemistry - 4thEd - Oxford University Press, 1974

SEMESTER VI

UEBCF19 - ELECTIVE - III B: PLANT BIOCHEMISTRY

Objective: To explore the applications of plant and their products

Unit I:

Architecture of plant cell and its role - Plasmodesmata, Vacuoles, Plastids, Chloroplast, Mitochondria, Peroxisomes - Cell wall - Structure of plant cell wall - Cellulose and Hemicelluloses - Plant growth regulators - structure and physiological effects of Auxins, Gibberlins, Cytokinin's, Abscisic acid and Ethylene - Phytochromes

Unit II:

Photosynthesis - photosynthetic pigments - Chlorophyll, Carotenoid and Phycobilin - Structure and their function - Light reaction - Photo system I and Photo system II - Hill's reaction - Emerson effect - Cyclic and non-cyclic photo phosphorylation - Dark reaction - Calvin' s cycle (C3 - plants) - Hatch - slack cycle (C4 - plants) - Factors affecting photosynthesis – Internal and External factors

Unit III:

Nitrogen cycle - Ammonification, Nitrification, nitrate reduction and Denitrification - Symbiotic and non-symbiotic Nitrogen fixation - Nitrogenase enzyme - Nodule development - Sulfur cycle - release of sulfur from organic compounds, oxidation of sulfur compounds, reduction of sulfate Carbon cycle

Unit IV:

Seed germination - Mobilization of storage lipids during seed germination - Glyoxylate cycle - Seed dormancy - Definition of vernalization and devernilization - Cold tolerance in metabolic compounds, enzymatic activity: (Esterase and Peroxidases)

Unit V:

Secondary metabolites in plant, -Biological role of Phenolic compounds, Terpenoids, Tannins, Lignin and Pectin - Biological role of Antioxidant compounds

Textbooks:

1. Lehninger, D Nelson and C M Cox - Principles of Biochemistry - 4th Ed - WH Freeman and Company Ltd, 2005
2. Donald Voet and Judith G Voet - Biochemistry- 4th Ed

Reference Books:

1. Hans-Walter Heldt - Plant Biochemistry - 3rd Ed - Elsevier Publishers, 2005
2. Dey PM and Horborne JB - Plant Biochemistry - 1st Ed - Harwart Academic Press, 2000
3. Dubey RC - A Textbook of Biotechnology - 4th Ed - S Chand and Co Ltd, 2006
4. Mathews C K, VanHolde K E - Biochemistry - 3rd Ed – Pearson Education, 2000
5. Jeremy M Berg, J L Tymoczko, LStryer - Biochemistry, 5th Ed - WH Freeman Company, 2002

SEMESTER VI

UCBCL19 - MAIN PRACTICAL – III

Objective: To inculcate practical skill in basic Biochemistry

SAFETY MEASURES IN THE LABORATORY-III

I Colorimetric Estimations:

1. Estimation of Creatinine by Jaffe's method
2. Estimation of Glucose by Orthotoluidine method
3. Estimation of Urea by Diacetyl Monoxime method
4. Estimation of Cholesterol by Zak's method
5. Estimation of Bilirubin by Vandenbergh method
6. Estimation of Uric acid by Caraway's method
7. Estimation of Protein by Biuret method and determination of A/G ratio
8. Estimation of DNA by Diphenyl amine method
9. Estimation of RNA by Orcinol method

II Enzyme Analysis:

1. Determination of SGOT
2. Determination of SGPT
3. Effect of pH on the activity of the enzyme -Acid phosphatase
4. Effect of Temperature on the activity of the enzyme -Acid phosphatase
5. Effect of substrate concentration on the activity of the enzyme -Acid phosphatase
6. Determination of Specific activity of the enzyme- Acid phosphatase

III Urine Analysis:

1. Methods for Preservation of Urine for analysis
2. Qualitative Analysis of Urine for Normal and Abnormal Constituents

IV Hematological Experiments: (Demonstration)

1. Methods for Preservation of blood for analysis
2. Enumeration of RBC, WBC and Platelets
3. Estimation of Erythrocyte sedimentation rate
4. Determination of Hemoglobin
5. Packed cell volume

Reference Books:

1. Jayaraman J - Manuals in Biochemistry - New Age International Publishers, 2001
2. Varley, Alan H Gowen lock - Practical Biochemistry - 6th Ed - CBS Publishers, 2002
3. David T Plummer - Practical Biochemistry- 3rd Ed - McGraw Hill Publishers, 2005
4. Sawhney SK, Randhir Singh - Introductory Practical Biochemistry - 2nd Ed - Narosa Publishers, 2001
5. Kanai L Mukherjee - Medical Laboratory Technology - Volume I - Tata Graw Hill Publication Company Limited, 2010

SEMESTER V / VI

USBCC519/ USBCC619 – SKILL-BASED ELECTIVE: DISEASES AND DIET THERAPY

Objective:

To impart knowledge regarding the fundamental importance of nutrition in health

Unit I:

Definition of food and Nutrition - Basic Food groups - Energy yielding foods - Body Building - Protective Foods - Unit of Energy - Bomb Calorimeter - Calorific values of Proteins, Carbohydrates and Fats - Basal metabolic rate - Food guide Pyramid

Unit II:

Nutritive value of Proteins - Protein Malnutrition (Kwashiorkor) Under Nutrition (Marasmus) their preventive and curative measures - Single cell Proteins - Eating disorders- Anorexia nervosa, Bulimia nervosa, Binge eating disorder - Therapeutic diets for Anemia, Malnutrition, Diabetes Mellitus, Allergy, Jaundice, Diarrhea, Fever

Unit III:

Water - sources, Functions and water balance Abnormalities associated with water - Dehydration and Overhydration- Causes, Symptoms, Preventive measures and Treatments - Dietary fibres: Sources, Types, Health Benefits - Free radicals - Antioxidants: Sources, Types, Health Benefits

Unit IV:

Food processing - Food Preservation - Food fortification and Nutrient Enrichment - Sanitation and Hygiene in Food service - Food Toxicities -Naturally occurring Toxicants in Foods (organic toxicants, inorganic toxicants, Goitrogens, Anti-vitamins, radioactive materials) - Chemical contaminants in Food (pesticides, polycyclic aromatic hydrocarbons, polyhalogenated biphenyls, contaminants from plastics, toxic metals) – Value addition of foods

Unit V:

Health - Definition, Importance of Women's Health- Health tips for Women - Anemia - Types (Iron Deficiency anemia, Megaloblastic anemia, Sickle cell anemia) - Causes, Symptoms, diagnosis and treatment - Menstrual cycle and puberty in females - Polycystic ovaries, Fibroids, Cancer- Ovarian, Cervical and Breast Cancer

Note: The study materials will be provided by the Department

Reference Books:

1. Anitha FP and Philip Abraham- Clinical Dietetics and Nutrition - 4th Ed - 2002
2. Eleaner Noss Whitney, Sharon Rady Rolfes - Understanding Nutrition, 8th Ed - 1993
3. Ruth A Roth, Carolynnn E townsend - Nutrition and Diet Therapy - 8th Ed - 2002
4. Poonam Lakra, Mansi Dass Singh - Textbook of Nutrition and Health,1st Ed - 2008
5. Srilakshmi B - Dietetics, 5th Ed - New age International Private Ltd, 2008

SEMESTER V / VI

USBCD519/ USBVD619 - SBE: MEDICAL LABORATORY TECHNOLOGY

Objective: To familiarize students with method and techniques used in clinical diagnosis

Unit I:

Introduction: Code of conduct for laboratory personnel, Medical care, organization of the clinical laboratory-Functional components, Basic needs Role of medical laboratory technician, Safety aspects and first aid in laboratories

Unit II:

Specimen collection: Blood collection by vein puncture, capillary puncture, finger stick technique Equipment and storage of blood collection, anticoagulants - Collection and preservation of urine, sputum, throat swab, stool, CSF specimens

Unit III:

Collection and processing of blood for transfusion: Preparation for blood collection, screening, Rejection, Registration of Donors, Blood Collection procedure, Transportation Clinical significance of Blood Transfusion - Coomb's test

Unit IV:

Urine - Normal and Abnormal constituents - Routine examination of urine- Physical examination -Color, Appearance, odour and specific gravity - Microscopic examination of urine sediment - organized and unorganized elements – Culture test (24 and 48 Hrs) – Crystal appearance in urine – Pregnancy test (hCG test) – Typhoid test (Widal test) – Malaria test (QBC test) – Tuberculosis test (Mantoux tuberculin skin test)

Unit V:

Histotechnology and cytotechnology: Introduction to histopathology and cytology, laboratory equipment for cytology and histology: Reagents, microscope, microtome, paraffin oven, tissue floating bath, automated tissue processor and slide warmer - Preparation of tissues for histology, collection of specimens for cytological evaluation and its clinical significance

Note: The study materials will be provided by the Department

Reference Books:

1. Kanai L Mukherjee - Medical Laboratory technology- Volume-I - 2nd Ed - Tata McGraw Hill Publishing Company Limited, 2010
2. Kanai L Mukherjee - Medical Laboratory technology- Volume-II -2nd Ed - Tata McGraw Hill Publishing Company Limited, 2010
3. Kanai L Mukherjee - Medical Laboratory technology- Volume-III - 2nd Ed- Tata McGraw Hill Publishing Company Limited, 2010
4. Talib VH - A Hand book of Medical laboratory technology - CBS Publishers, 2004
5. Shivaraja Shankara YM - Laboratory manual for Practical Biochemistry - 2nd Ed - Jaypee Publication, 2013

SEMESTER I / II

USBCA119/ USBCA219 – SKILL-BASED ELECTIVE:

NUTRITION EDUCATION

Objectives: To promote healthy lifestyle with good knowledge on Nutrition

Unit I:

Food - Basic food groups - Classification of foods based on its functions - Nutritional status - Body mass index

Unit II:

Fruits: Health benefits of Mango, Jackfruit, Banana - Vegetables: Health benefits of Carrots, Cabbage, Gourd vegetables and Green leafy vegetables - Health benefits of millets and Nuts (Almonds and Cashews)

Unit III:

Probiotics: Health benefits of Probiotic foods- Health benefits of Meat, Chicken, Beef, Lamb and Fish

Unit IV:

Balanced diet - Nutrition in infancy, childhood, Adolescence, Adulthood and elderly person. Nutrition during pregnancy and lactation

Unit V:

Cooking - Methods of cooking: Baking, Frying, Roasting, Grilling, Steaming and Microwaving – Advantages and Disadvantages - Kitchen hygiene and Tips to maximize nutrient retention during cooking

Note: The study materials will be provided by the Department

Reference Books:

1. Swaminathan M -Text Book of Food and Nutrition - 2nd Ed - Bapco Publications, 1998
2. Shubangini Joshi - Nutrition and Dietetics - 5th Ed - Tata McGraw Hill Publication, 1998
3. Mahtab S Bamji, Prasad Rao N, Vinodhini Reddy - Textbook of Human Nutrition - 2nd Ed- Oxford Publication, 2004
4. Martin Eastwood - Principles of Human Nutrition - 2nd Ed - Blackwell Publishing, 2003
5. Eleanor, Noss, Whitney - Understanding Nutrition - 8th Ed - Thomson Publishing, 2002

SEMESTER III / IV

USBCB319 / USBCB419 – SKILL-BASED ELECTIVE:

HEALTH CARE FOR WOMEN

Objectives: To promote the adoption of healthy lifestyle among women

Unit I:

Health - Definition, Importance of women's health, Healthy tips for women, Anemia: Types - Iron deficiency anemia, Megaloblastic anemia, Causes - Symptoms, Diagnosis and Treatment - Preventive care benefits for women

Unit II:

Physiological anatomy of female reproductive system - Hormones related with females- Estrogen and Progesterone - Depression- Blood pressure - Osteoporosis - Obesity

Unit III:

Ovarian cancer, Cervical cancer, Polycystic ovaries, Fibroids -Types, Causes, Symptoms, Diagnosis & Treatment – HIV, HSV – Prevention and treatment

Unit IV:

Female Infertility, Amenorrhea - Causes, Symptoms, Signs and test, Treatment - Puberty - Menopause - Endometriosis - Vaginal discharge

Unit V:

Urinary Infection, Role of thyroid hormone in women, Blood group system, Rh factor, Erythroblastosis foetalis

Note: The study materials will be provided by the Department

Reference Books:

1. Murugesh N - Health Education and Community Pharmacy - 4th Ed - Sathya Publishing Company
2. Ross and Wilson - Anatomy and Physiology in Health and illness -13th Ed - Churchill Living Stone Publishers
3. Murali Manothar - Ayurveda for all-1st Ed - Pustak Mahal Publication
4. Springer, Thomas D' Hooghe - Biomarkers for endometriosis - 4th Ed - 2017
5. William Brumfitt - Manual on UTI- 3rd Ed - 2016

SEMESTER V / VI

UGBCA519/ UGBCA619 - NON-MAJOR ELECTIVE:

DISEASES AND TREATMENT

Objective: To impart knowledge on the significant role in treating diseases

Unit I:

Diseases and its types - Immune system - Types - Innate and Acquired – Phagocytosis - Blood: Composition, Sickle Cell Anemia, Iron deficiency Anemia, Leucopenia, Hemolysis, Bleeding disorder - Bone disorder: Osteomalacia, Rickets, Joint Pain

Unit II:

Asthma, Tuberculosis, Liver diseases (Jaundice and Hepatitis): Causes, Clinical features, Prevention and Treatment

Unit III:

Diabetes Mellitus, Cancer and AIDS: Causes, Clinical features, Diagnosis, Prevention and Treatment

Unit IV:

Cardiovascular Diseases (Hypertension and Heart attack), Neurological Diseases (Dementia, Seizures, Coma and Autism) - Causes, Clinical features and Treatment

Unit V:

Skin Diseases: Alopecia Areata, Hirsutism, Psoriasis, Acne Vulgaris, Dandruff - Causes, Clinical features and Treatment

Note: The study materials will be provided by the Department

Reference Books:

1. Davidson- Principles and practice of Medicine-9th Ed - Elsevier Publication, 2002
2. Richard A Goldsby, Thomas J Kindt, Barabra A Osborne, Janis Kubey- Immunology - 6th Ed - W H Freeman and Company, 2003
3. Ada P Khan - Diabetes- Causes, Prevention and Treatment- Orient paperbacks, 2004
4. Virender N Sehgal -Diagnosis and treatment of common skin diseases - 5th Ed - Jaypee Brothers Medical Pub, 2016

SEMESTER V / VI

UGBCB519 / UGBCB619 - NON-MAJOR ELECTIVE: THERAPEUTIC AGENTS

Objective: To impart knowledge on action of drugs in treating diseases

Unit I:

Drug - Definition - Nature - Dosage forms of Drugs - Routes of administration - Drug Absorption - Drug Distribution - Termination of Drugs - Elimination of Drugs - Biotransformation

Unit II:

Vaccines - Definition - Attenuated live Vaccine - Killed Viral Vaccine - Immunization - Immunization Schedule for Children

Unit III:

Antibiotics: Definition, Therapeutic Applications of Penicillin, Erythromycin, Tetracycline, Streptomycin and Chloramphenicol - Uses of Antiseptics and Disinfectant - Analgesics: Morphine, Aspirin, Paracetamol- Anesthetics: Chloroform, Procaine

Unit IV:

Medical Therapies for Mouth Ulcer, Gallstones, Urinary Stones and Intestinal Worms
Medicinal plants: Tulsi, Mint, Neem, Turmeric

Unit V:

First Aid: Important Rules of First Aid - First Aid Box - Cuts and Abrasions - Bleeding - Fractures - Burns - Fainting -Poisonous Bites - Some Common Poisons and their antidotes - Acid Poisoning - Alkali Poisoning - Poisoning by Disinfectant

Note: The study materials will be provided by the Department

Reference Books:

1. Jayashree Ghosh - A Textbook of Pharmaceutical Chemistry - 5th Ed - SS Chand and Company, 2014
2. Kanai L Mukherjee - Medical Laboratory Technology - Volume I - Tata Graw Hill Publication Company Limited, 2010
3. Davidson and Henry - Clinical diagnosis by Laboratory Methods - 22nd Ed -Saunder Publisher, 2011
4. Antia FP and Philip Abraham - Clinical Dietetics and Nutrition - 4th Ed - OUP India, 2002
5. Jose L Martinez- Ethnobotany application of medicinal plants - CRC Press, 2018

SEMESTER I

UABCA19 - ALLIED - I: BIOCHEMISTRY – I

Objective: To understand the basics of Biochemistry

Unit I:

Carbohydrates: Occurrence, biological importance of carbohydrates, Structure, Classification and Physical properties of Carbohydrate - Mutarotation Chemical Properties: Reactions of Glucose -Oxidation, Reduction and Osazone formation Reactions of Fructose: Oxidation with Concentrated Nitric acid, Reduction with sodium amalgam and Osazone formation Occurrence, Structure and Properties of Disaccharides (Maltose, Lactose, Sucrose) and Polysaccharides (Starch)

Unit II:

Amino Acids: Occurrence, biological importance of amino acids, Structure of Peptide bond, Classification of amino acids based on the Structure, Polarity of side chain and Nutritional factor Physical properties - Amphoteric nature and Isoelectric pH Chemical properties-Reactions involving Carboxyl, Amino and both the groups - Color reactions of amino acids

Proteins: Occurrence, biological importance of proteins, Functions, Classifications based on shape, solubility and composition, Classification based on biological function Physical properties: Denaturation, salting in and salting out Structural Organization of Proteins - Primary, Secondary (alpha helix and beta pleated sheet), Tertiary and Quaternary structure

Unit III:

Nucleic acids: Structural Components and Biological Importance of DNA and RNA Double helical structure of DNA proposed by Watson and Crick, Denaturation and Annealing of DNA Structure and role of ribosomal, messenger and transfer RNA - Difference between DNA and RNA

Unit IV:

Lipids: Occurrence, Biological importance of Lipids Types of Fatty acid - Saturated and Unsaturated Physical Properties of Fats and oils, Chemical Properties - Reactions involving Double bond, Carboxyl and Hydroxyl groups Classification of Lipids - Simple Lipids (Fats, Oils and Waxes), Compound lipids - Phospholipids: Phosphoglycerides (Lecithin, Cephalin and Plasmalogen), Phosphoinositides (Phosphotidyl inositol) and phosphosphingosides (Sphingomyelin), Glycolipids: Cerebrosides, Gangliosides Derived lipids - Sterols (cholesterol - structure and functions) Iodine number, Acid number, Saponification number, Reichert -meissl number of oils

Unit V:

Vitamins: Fat and Water soluble vitamins- Sources, RDA, Biochemical functions and Deficiency diseases (A, D, E, K, C, B_1, B_2, B_5, B_6 and B_{12})

Text books:

1. Jain J L, Sanjay Jain, Nithin Jain - Fundamentals of Biochemistry, 8th Ed - S Chand and Company Ltd, 2008
2. Satyanarayana U- Textbook of Biochemistry- 4th Ed - Books and Allied Private Ltd, 2013

Reference Books:

1. Deb AC - Fundamentals of Biochemistry - 9th Ed - New Central Book Agency Ltd, 2008
2. Ambika Shanmugam - Medical Biochemistry- 8th Ed - Wolters Kluwer India Private Ltd, 2016
3. Arun Bahl and Bahl B S - Advanced Organic Chemistry - 22nd Ed - S Chand and Company Ltd, 2003
4. Varley, Alan H Gowen lock - Practical Biochemistry - 6th Ed - CBS Publishers, 2002

SEMESTER II

UABCB19 - ALLIED - II: BIOCHEMISTRY – II

Objective: To understand the basics of Biochemistry

Unit I:

Enzymes: General characteristics and IUB classification of enzymes, Enzyme units (IU and Katal), Active site, Lock and key and induced fit hypothesis, Effect of temperature, pH and Substrate concentration on enzyme activity (Michaelis - Menten equation), Enzyme Inhibition - Competitive, non competitive and uncompetitive inhibition (kinetics not required) - Industrial and Medical applications of enzymes

Unit II:

Clinical biochemistry: Diabetes mellitus: Types, Causes and Symptoms - Atherosclerosis: Stages, Risks and Consequences Obesity -Gout - Protein Calorie Malnutrition - Marasmus and Kwashiorkor

Unit III:

Intermediary metabolism: Pathway and energetics (Regulation not required) - Glycolysis, TCA cycle, β- oxidation of fatty acids, Urea cycle

Unit IV:

Hormonal Biochemistry: Hormones -Definition, Classification based on nature: Protein and steroid hormone- Biological function and Disorders of Insulin, Thyroid hormones, Growth hormone, Oxytocin and Vasopressin

Unit V:

Minerals - Source, RDA, Role and Deficiency diseases of Calcium, Iron, Potassium, Iodine, Sodium and Copper

Textbooks:

1. Satyanarayana U- Textbook of Biochemistry - 3rd Ed - Books and Allied Private Ltd, 2008
2. Chatterjea M N, Rana Shinde - Textbook of Medical Biochemistry - 7th Ed - Jaypee Publishers, 2007

Reference Books:

1. Lehninger, David Nelson and M Chael M Cox - Principles of Biochemistry - 6th Ed - WH Freeman and Company Ltd, 2012
2. Jain J L, Sanjay Jain, Nithin Jain - Fundamentals of Biochemistry, 8th Ed - S Chand and Company Ltd, 2008
3. Trevor Palmer - Enzymes - 2nd Ed - Harwood Publishing Chichester, 2007
4. Deb AC - Fundamentals of Biochemistry - 9th Ed - New Central Book Agency Ltd, 2008
5. Ambika Shanmugam - Medical Biochemistry- 8th Ed - Wolters Kluwer India Private Ltd, 2016

SEMESTER II

UABCC19 - ALLIED BIOCHEMISTRY PRACTICAL

Objective: To inculcate practical skill in basic Biochemistry

I Volumetric Analysis:

1. Estimation of Glucose by Benedicts method
2. Estimation of Glycine by Sorenson's method
3. Estimation of Ascorbic acid using 2,6 Dichlorophenol indophenol
4. Estimation of Iron using potassium permanganate
5. Estimation of Nitrite using sodium hydroxide
6. Estimation of Calcium in Milk

II Qualitative Analysis:

Carbohydrates: Glucose, Fructose, Galactose, Lactose, Maltose, Sucrose, Starch
Amino acids: Tyrosine, Tryptophan, Arginine, Cysteine

III Instrumentation: (Demonstration)

1. Chromatography: Column, Paper, Thin layer
2. Electrophoresis: Vertical and Horizontal
3. Colorimeter
4. UV Spectrophotometer
5. Centrifuge

Reference Books:

1. Jayaraman J - Manuals in Biochemistry - New Age International Publishers, 2001
2. Varley, Alan H Gowen lock - Practical Biochemistry - 6th Ed - CBS Publishers, 2002
3. David T Plummer - Practical Biochemistry - 3rd Ed - McGraw Hill Publishers, 2005
4. Sawhney SK and Randhir Singh - Introductory Practical Biochemistry- 2nd Ed - Narosa Publishers, 2001

B.Sc. CHEMISTRY

(Effective from the Academic Year 2019 - 2020)

Vision of the Department:

To inculcate a keen interest for learning Chemistry, acquiring skills in carrying out tasks systematically with perseverance and precision, motivating towards research, inspiring to lead a life with scientific approach and promote the standard of personal and societal living.

Objectives:

- To instill a keen interest in learning Chemistry.
- To acquire skill and competency in practical.
- To expose the students to the recent trends in Chemistry and related sciences.
- To motivate and train students towards research.
- To develop writing, learning and communication skills.
- To train economically backward students and make them eligible for higher education and job opportunities.
- To tap out the talents through extracurricular and co curricular activities.
- To inculcate a sense of responsibility towards self, others and the society.

Eligibility for admission to B.Sc. Chemistry:

- A pass in higher secondary with Mathematics, Physics, Chemistry and Biology
- A pass in higher secondary with Mathematics, Physics, Chemistry and Computer Science
- A pass in higher secondary with Physics, Chemistry, Zoology and Botany.

Allied Subjects:

1. Mathematics/ Botany
2. Physics

Eligibility to take Allied Subjects:

Students who belong to category I and II are eligible to take Mathematics as one of the Allied papers. Students who belong to category III are eligible to take Botany as one of the Allied papers.

Structure of the Course and Scheme of Examination:

Sem	Part	Code	Title	Hours/ Week	Exam		Credits	Marks
					Th	Pr		
I	I	ULTAA18	Tamil Paper – I	6	3	-	3	40 + 60
	II	UENGA17	English Paper – I	6	3	-	3	40 + 60
	III	UCCHA19	General Chemistry – I	6	3	-	5	40 + 60
	III	UCCHC19	Practical - I: Inorganic Qualitative Analysis	3	-	-	-	-
	III	UBMAA15	Optional Allied - I: Mathematics – I	6	3	-	5	40 + 60
	III	UBBTA17	Optional Allied - I: Botany – I	4	3	-	4	40 + 60
	III	UBBTC17	Optional Allied Practical: Botany	2	-	-	-	-
	IV	UVEDA15	Value Education	1	-	-	-	-
	IV	**-**	Skill-Based Elective – I	2	2	-	2	40 + 60
Total							**18/17**	**500**
II	I	ULTAB18	Tamil Paper – II	6	3	-	3	40 + 60
	II	UENGB17	English Paper – II	6	3	-	3	40 + 60
	III	UCCHB19	General Chemistry – II	6	3	-	5	40 + 60
	III	UCCHC19	Practical - I: Inorganic Qualitative Analysis	3	-	3	4	40 + 60
	III	UBMAB15	Optional Allied - II: Mathematics – II	6	3	-	5	40 + 60
	III	UBBTB17	Optional Allied - II: Plant Biology – II	4	3	-	4	40 + 60
	III	UBBTC17	Optional Allied Practical: Plant Biology	2	-	3	2	40 + 60
	IV	UVEDA15	Value Education	1	-	-	-	-
	IV	-	Skill-Based Elective – II	2	2	-	2	40 + 60
Total							**22/23**	**600/700**
III	I	ULTAC18	Tamil Paper – III	5	3	-	3	40+60
	II	UENGC17	English Paper – III	6	3	-	3	40+60
	III	UCCHD19	General Chemistry – III	7	3	-	5	40+60
	III	UCCHF19	Practical – II: Volumetric Estimation	3	-	-	-	-
	III	UAPHA317	Allied - III: Physics – I	4	3	-	4	40+60
	III	UAPHC417	Allied Practical: Physics	2	-	-	-	-
	IV	-	Skill-Based Elective – III	2	3	-	2	40+60
	IV	UVEDA15	Value Education	1	-	-	-	-
Total							**17**	**500**

Sem	Part	Code	Title	Hours/ Week	Exam		Credits	Marks
					Th	Pr		
IV	I	ULTAD18	Tamil Paper – IV	6	3	-	3	40+60
	II	UENGD17	English Paper – IV	5	3	-	3	40+60
	III	UCCHE19	General Chemistry – IV	5	3	-	5	40+60
	III	UCCHF19	Practical – II: Volumetric Estimation	3	-	3	4	40+60
	III	UAPHB417	Allied - IV: Physics – II	4	3	-	4	40+60
	III	UAPHC417	Allied Practical: Physics	2	-	3	2	40+60
	IV	-	Skill-based Elective – IV	2	3	-	2	40+60
	IV	UNEVS17	Environmental Studies	2	3	-	2	40+60
	IV	UVEDA15	Value Education	1	-	-	-	-
Total							**25**	**800**
V	III	UCCHG19	Inorganic Chemistry	4	3	-	4	40+60
	III	UCCHH19	Organic Chemistry	4	3	-	4	40+60
	III	UCCHI19	Physical Chemistry	5	3	-	4	40+60
	III	UECHA19	Elective - I A: Analytical Chemistry	5	3	-	5	40+60
	III	UECHB19	Elective - I B: Basics of Computer Programming in C and its Applications in Chemistry					
	III	UCCHL19	Practical - III: Physical Chemistry	2	-	-	-	-
	III	UCCHM19	Practical - IV: Gravimetric Estimation	2	-	-	-	-
	III	UCCHN19	Practical - V: Organic Analysis and Preparation	2	-	-	-	-
	IV	-	Skill-Based Elective – V	2	3	-	2	40+60
	IV	-	Non Major Elective – I	3	3	-	2	40+60
	IV	UVEDA15	Value Education	1	-	-	-	-
Total							**21**	**600**
VI	III	UCCHJ19	Coordination Chemistry	4	3	-	4	40+60
	III	UCCHK19	Electro Chemistry	4	3	-	4	40+60
	III	UECHC19	Elective II A: Chemistry of Natural Products	5	-	-	5	40+60
	III	UECHD19	Elective - II B: Polymer Chemistry					
	III	UECHE19	Elective - III A: Pharmaceutical Chemistry	5	-	-	5	40+60
	III	UECHF19	Elective - III B: Applied Chemistry					
	III	UCCHL19	Practical - III: Physical Chemistry	2	-	3	4	40+60
	III	UCCHM19	Practical - IV: Gravimetric Estimation	2	-	3	4	40+60
	III	UCCHN19	Practical - V: Micro Scale Organic Analysis and Preparation	2	-	3	4	40+60
	IV	-	Skill-Based Elective – VI	2	2	-	2	40+60
	IV	-	Non-Major Elective – II	3	2	-	2	40+60
	IV	UVEDA15	Value Education	1	2	-	2	40+60
Total							**36**	**1000**
	V	-	Extension Activities (90 Hours)				**1**	
Total							**140**	**4000/ 4100**

SEMESTER I – PAPER I

UCCHA19 - GENERAL CHEMISTRY – I

Objectives:

- To impart knowledge on periodicity of properties and to learn the theory behind inorganic qualitative analysis.
- To learn the IUPAC system of nomenclature of organic compounds and shapes of molecules based on hybridization.
- To help the students to recapitulate the fundamentals in gaseous state, liquid state and quantum chemistry.

Unit I (18 hours)

1.1 Valency, oxidation number, oxidation and reduction in terms of oxidation number, calculation of oxidation state - acids, bases, salts, oxidizing and reducing agents. Oxidation, reduction and redox reactions (definition and examples). Oxidising and reducing agents
(definition and examples). Balancing chemical equations - oxidation number and ion electron methods.

1.2 Modern periodic law, general classification of elements in periodic table, general characteristics of s, p, d, and f block elements.

1.3 Periodicity of properties – definition, factors affecting and periodicity of the following properties - atomic radii, ionic radii, ionization potential and electron affinity.

1.4 Factors affecting and periodicity of electronegativity. Determination of electronegativity – Pauling's scale and Mulliken's scale.

Unit II (18 hours)

2.1 Acids and Bases-concepts- Arrhenius, Lowry-Bronsted and Lewis acid – base theory, acid- base equilibria, definition of pH of strong and weak acid solutions, calculation. Hard and soft acids and bases – definition.

2.2 Buffer solutions, relative strength of acids and bases from Ka and K_b values, Henderson-Hasselbalch equations.

2.3 Common ion effect, concept of sparingly soluble salts, solubility product principle, relation between solubility and solubility product.

2.4 Application of common ion effect and solubility product principle in inorganic qualitative analysis, eliminating the interfering radicals, significance of sodium carbonate extract, spot test reagents – Magneson, Aluminon, Nesslers, Thiourea, Cupfferon and DMG.

Unit III (18 hours)

3.1 IUPAC system of nomenclature of organic compounds- introduction, rules of IUPAC System of nomenclature of organic compounds, IUPAC system of nomenclature for complex organic compounds, alkanes, substituted alkanes, alkyl halides, alkenes, alkynes, and alkyl substituents, cycloalkanes.

3.2 Compounds having functional groups - alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, nitro compounds, aromatic compounds and substituted

aromatic compounds, poly functional (carbonyl, carboxylic, hydroxy)and heterocyclic compounds, bicyclic and spiro compounds.

3.3 Concept of Hybridization – definition, characteristics of hybrid orbitals, modes of hybridization.

3.4 Hybridization – tetravalency of carbon, geometry of molecules - methane, ethane, ethylene, acetylene and benzene.

Unit IV (18 hours)

4.1 Gaseous state - kinetic gas equation, derivation, gas laws from the kinetic gas equation, types of velocities - mean, Root Mean Square Velocity (RMS), most probable velocities (MPV), calculation of molecular velocities, deviation from ideal behavior – Vanderwaal's equation.

4.2 Maxwell's distribution of molecular velocities (derivation), equipartition of energy, collision number, Collision diameter, mean free path, definition. (No derivation)

4.3 Liquid State - qualitative treatment of the structure of liquids, surface tension – Definition, effects of surface tension, experimental determination – capillary rise method – drop weight method, applications.

4.4 Viscosity – definition, effects of viscosity on temperature and pressure, experimental determination - Ostwald's Viscometer method and Saybolt Viscometer (Including problems), Real gases – Virial equation of state, Boyle's temperature (No derivation). Joule's law, Joule Thomson effect, Joule Thomson Coefficient and its derivation, inversion temperature and its significance. (No derivation)

Unit V (18 hours)

5.1 Classical Mechanics –e/m of an electron, Rutherford's scattering experiments, Rutherford atomic model, Bohr theory of hydrogen atom, Sommerfeld extension of the Bohr theory, photoelectric effect, Compton effect.

5.2 Wave mechanical concept of the atom, de Broglie's relationship, Davisson and Germer experiment, wave nature of electron, Heisenberg's uncertainty principle.

5.3 Quantum mechanics- postulates of quantum mechanics, concept of operators, angular wave function, Eigen values, Schrodinger wave equation (no derivation), significance of wave functions.

5.4 Radial and angular wave functions, probability distribution of electrons, radial probability distribution curves.

*Related problems to be worked out

Books for Study:

1. R.D.Madan, Modern Inorganic Chemistry, 2nd Edition, S. Chand & Co, Reprint 2004.
2. B.S Bahl and Arun Bahl, Advanced Organic Chemistry, Sultan Chand and Co., Ltd, Reprint 2008.
3. B. R. Puri, L. R Sharma and M.S Pathania, Principles of Physical Chemistry, 43rd Edition, Vishal Publishing Co., 2008.

Books for Reference:

1. P.L Soni and Mohan Katyal, Textbook of Inorganic Chemistry, 20th Edition, Sultan Chand & Sons, Reprint 2001.

2. P.L Soni and H.M Chawla, Textbook of Organic Chemistry, 25th Revised Edition, Sultan Chand & Sons, 1992.
3. Arun Bahl and B.S.Bahl, Advanced Organic Chemistry, 1st Revised Multicolour Edition 2012.
4. M.K. Jain and S.C. Sharma, Modern Organic Chemistry, Vishal Publishing Co, New Delhi, Golden Jubilee Year Edition, 2017.
5. M.K. Jain and S.C. Sharma, Modern Organic Chemistry, Vishal Publishing Co, New Delhi, Golden Jubilee Year Edition, 2017.
6. K.S Tewari and M.K Vishnoi, A Textbook of Organic Chemistry, 3rd Edition, Vikas Publishing House Pvt. Ltd, 2006.
7. M.K Jain and S.C Sharma, Modern Organic Chemistry, Vishal Publishing Co, 2004.
8. P.L Soni, O.P Dharmarha and U.N Dash, Textbook of Physical Chemistry, 21st Revised Edition, S. Chand & Co, Reprint 2000.
9. P.K Mani and A.O Thomas, A Textbook of Practical Chemistry, Scientific Publication, 1973.
10. O.P. Pandey, D. N. Bajpai and S.Giri, Practical Chemistry, 8th Edition, S. Chand & Co, 2001.
11. R.K.Prasad, Quantum Chemistry through problems and solutions, New Age International Publishers, New Delhi,1997.

SEMESTER II – PAPER II

UCCHB19 - GENERAL CHEMISTRY – II

Objectives:

- To throw light on alkali metals and their compounds, different types of bonding, its importance in inorganic compounds.
- To understand the importance of VSEPR and MO theories.
- To give a detailed knowledge on electron displacement effects and reaction intermediates, the mechanistic aspects of free radical substitution reactions in alkanes and addition reactions in alkenes and dienes.
- To understand the properties of liquid crystals and solutions and basics in Thermodynamics.

Unit I (18 hours)

1.1 Chemical bonding –introduction, types of bonds - Ionic, Covalent, and Coordinate bonds- characteristics and examples.

1.2 Ionic bond - conditions for the formation of ionic bond, characteristics and general properties, radius ratio rule and its limitation, comparison of ionic and covalent bonds.

1.3 Hydration energy, lattice energy and their applications, Born-Haber cycle , Fajan's rule, hydrogen bond.

1.4 VSEPR theory- geometry of NH_3, H_2O, XeF_2, XeF_4, XeF_6, XeF_5^-, $XeOF_5^-$, XeF_8^{2-}, IF_7 and NH_4^+.

Unit II (18 hours)

2.1 Molecular orbital theory - postulates of MOT, formation of bonding and antibonding molecular orbitals. Bond order – stability and magnetic property of the molecules.

2.2 MO diagrams of homo nuclear diatomic molecules H_2, O_2, O_2^+, N_2 and hetero nuclear diatomic molecules- CO, NO.

2.3 Chemical and physical properties of alkali metals, comparative study of the elements and the compounds of alkali metals- carbonates, oxides, hydroxides and halides.

2.4 Exceptional properties of lithium, diagonal relationship of lithium and magnesium. Lithium- occurrence, ores, extraction from phosphate and silicate ores and uses. Preparation, properties and uses of lithium carbonate.

Unit III (18 hours)

3.1 Electron displacement effects- inductive effect- effect on bond length, dipole moment, reactivity of alkyl halides, strength of carboxylic acids and basic character of amines.

3.2 Electromeric effect, comparison with inductive effect, mesomeric effect, comparison with inductive effect, hyperconjugative effect and steric effect.

3.3 Bond fission- homolytic fission, heterolytic fission. Reaction intermediates- Carbocations – generation, structure, stability and reactions.

3.4 Generation, structure, stability and reactions of carbanions and free radicals. Generation of benzyne, nitrenes and carbenes.

Unit IV (18 hours)

4.1 Alkanes - chemical properties, mechanism of halogenation of alkanes.

4.2 Alkenes - addition reactions of alkenes with hydrogen, halogens, hydrogen halides - Markownikoff's rule and anti Markownikoff's rule (peroxide effect), sulphuric acid, water, hydroboration, ozonolysis, hydroxylation with $KMnO_4$, allylic substitution by NBS.

4.3 Dienes - types, stability and 1,2 and 1,4 addition reactions - Diels –Alder reaction.

4.4 Alkynes- acidity of alkynes, formation of acetylides, addition reactions with water, hydrogen halides, halogens, oxidation, ozonolysis and hydroxylation with $KMnO_4$.

Unit V (18 hours)

5.1 Mesomorphic state - Liquid crystals – classification, thermotropic and lyotropic, Smectic, Nematic and Cholestric liquid crystals and the molecular arrangements. Applications.

5.2 Solutions - solutions of gases in liquids, Henry's law-, solutions of liquids in liquids- Raoult's law, binary liquid mixtures- ideal solutions, deviations from ideal behavior, vapour pressure-composition and boiling point- composition curves.

5.3 Distillation - fractional distillation, steam distillation, vacuum distillation, azeotropic distillation.

5.4 Colloidal State - colloidal systems- classification of colloids, preparation of colloidal solutions, dispersion methods, condensation methods, properties of colloidal systems, importance and applications of colloids.

*Related problems to be worked out

Books for Study:

1. R.D.Madan, Modern Inorganic Chemistry, 2nd Edition, S. Chand & Co, Reprint 2004.
2. B.S Bahl and Arun Bahl, Advanced Organic Chemistry, Sultan Chand and Co.Ltd, Reprint 2008.
3. B. R. Puri, L. R Sharma and M.S Pathania, Principles of Physical Chemistry, 43rd Edition, Vishal Publishing Co., 2008.

Books for Reference:

1. P.L Soni and Mohan Katyal, Text book of Inorganic Chemistry, 20th Edition, Sultan Chand & Sons, Reprint 2001.
2. P.L Soni and H.M Chawla, Textbook of Organic Chemistry, 25th Revised Edition, Sultan Chand & Sons, 1992.
3. Arun Bahl and B.S.Bahl, Advanced Organic Chemistry, 1st Revised Multicolour Edition 2012. M.K. Jain and S.C. Sharma, Modern Organic Chemistry, Vishal Publishing Co, New Delhi, Golden Jubilee Year Edition, 2017.
4. M.K. Jain and S.C. Sharma, Modern Organic Chemistry, Vishal Publishing Co, New Delhi, Golden Jubilee Year Edition, 2017.
5. K.S Tewari and M.K Vishnoi, A Text book of Organic Chemistry, 3rd Edition, Vikas Publishing House Pvt. Ltd, 2006.
6. M.K Jain and S.C Sharma, Modern Organic Chemistry, Vishal Publishing Co, 2004.
7. P.L Soni, O.P Dharmarha and U.N Dash, Textbook of Physical Chemistry, 21st Revised Edition, S. Chand & Co, Reprint 2000.
8. P.K Mani and A.O Thomas, A Textbook of Practical Chemistry, Scientific Publication, 1973.
9. O.P. Pandey, D. N. Bajpai and S.Giri, Practical Chemistry, 8th Edition, S. Chand & Co, 2001.

SEMESTER II - PRACTICAL I

UCCHC19 - INORGANIC QUALITATIVE ANALYSIS

Continuous Assessment - 40 marks

I CA	- 50
II CA	- 50
Average	- 25
Performance during regular practicals	-10

Regularity in submission of observation note-book and record – 5

CA Practical examination -50

Viva-Voce	- 5
Record	- 5
Qualitative Analysis	- 40
Simple Acid Radical	- 8
Eliminating Radical	- 9
Each Basic Radical	- 8 (8 x 2 = 16)
Other tests	- 7
Total	**- 50**

Semester Practical examination - 60 marks

Viva-Voce	- 5
Record	- 10
Qualitative Analysis	- 45
Simple Acid Radical	- 8
Eliminating Radical	- 10
Each Basic Radical	- 9 (9 x 2 = 18)
Other tests	- 9
Total	**- 100**

(Note: For each radical spotting - 2 marks)

1. Analysis of a mixture containing two cations and two anions, one of which will be an interfering ion. Semi micro methods using the conventional scheme may be adopted.

   Reactions of the following anions to be analysed:

   carbonate, sulphide, sulphate, fluoride, chromate, bromide, chloride, nitrate, oxalate, phosphate and borate.

   Reactions of the following cations to be analysed:

   Lead, copper, cadmium, bismuth, aluminium, iron, manganese, zinc, cobalt, nickel, calcium, strontium, barium, magnesium and ammonium.

SEMESTER III – PAPER III

UCCHD19 - GENERAL CHEMISTRY – III

Objectives:

- To understand the principles of volumetric analysis.
- To gain knowledge on alkaline earth metals and their compounds.
- To learn the reactivities of cycloalkanes, carbonyl compounds, carboxylic acids, alcohols, ethers and epoxides.
- To provide knowledge on solid-state chemistry.
- To learn the laws of thermodynamics

Unit I (21 hours)

1.1 Definition of Mole, Molarity, Molality, Normality, Mole fraction, Equivalent weights of acid, base, oxidizing agent, reducing agent and salt.

1.2 Volumetric analysis - principle, titrand, titrant, indicator, preparation of solutions and standardization of commercial acids. Primary and secondary standards – characteristics and examples. Standardisation of solutions.

1.3 Theories of acid-base titrations, redox, precipitation, complexometric, iodometric, iodimetric titrations. Theories of acid-base, redox, metal ion and adsorption indicators, choice of indicators

1.4 Types of errors, minimizing the errors, accuracy and precision, significant figures

Unit II (21 hours)

2.1 Alkaline earth metals - Be, Mg, Ca, Sr, Ba - occurrence, comparative study of elements and compounds- oxides, halides, hydroxides, sulphates and carbonates.

2.2 Exceptional properties of Beryllium –Diagonal relationship between Be and Al, extraction of magnesium.

2.3 p block elements -Boron family-comparative study of elements and compounds- oxides, hydroxides, halides and hydrides - preparation, properties, uses and structures of $LiAlH_4$,$NaBH_4$, diborane and Borozole.

2.4 Carbon family - comparative study of elements and compounds- hydrides, oxides and halides, classification of silicates, chemistry of silicones and their applications.

Unit III (21 hours)

3.1 Cycloalkanes – preparation using Wurtz's reaction , Dieckmann's ring closure and reduction of aromatic hydrocarbons, Substitution and ring opening reactions, Baeyer's strain theory, theory of strainless rings.

3.2 Carboxylic acid- ionization of carboxylic acids, acidity constants, comparison of acid strengths of substituted haloacids, acid strengths of substituted benzoic acids, conversion of acids to their derivatives.

3.3 Dicarboxylic acids- preparation and properties of oxalic, malonic, succinic, glutaric, adipic acids and phthalic acid.

3.4 Carbonyl compounds- preparation from alcohols, alkene, alkyne, acid chloride, Grignard reagent, chemical reactions, relative reactivities of aldehydes and ketones, acidity of α hydrogen, nucleophilic addition reactions (bisulphate, HCN, Grignard and alcohol).

Unit IV (21 hours)

4.1 Thermodynamics - types of systems – isolated, closed, open, homogeneous and heterogeneous systems, phase, state of a system, state variables. Thermodynamic equilibrium - thermal, mechanical and chemical equilibria, extensive and intensive properties, processes and their types – isothermal, adiabatic and isobaric processes, reversible and irreversible processes, nature of work and heat.

4.2 The first law of thermodynamics - concept of internal energy, statements of I law, state functions, exact and inexact differentials, the Euler reciprocal relation, enthalpy of a system, enthalpies of vaporization and fusion, heat capacity of a system - relationship between C_p and C_v in gaseous systems - calculation of w, ΔU, q and ΔH for expansion and compression of ideal gases under reversible and irreversible isothermal conditions. Adiabatic expansion – calculation of w, ΔU and ΔH, final temperatures in reversible and irreversible adiabatic expansions, Comparison of isothermal and adiabatic expansions, zeroth law of thermodynamics.

4.3 Thermochemistry - heat of reaction, exothermic and endothermic reactions, relationship between q_p and q_v, standard enthalpy changes of reactions, standard enthalpies of combustion, neutralization and formation, determination of enthalpies of reactions, variation of enthalpy of reaction with temperature -Kirchhoff's equations. Bond energies-definition, calculation and applications of bond energies.

4.4 The Second law of thermodynamics - need for the second law, statements of II law, spontaneous processes, Carnot's cycle - efficiency of a heat engine-Carnot's theorem (statement only).

Unit V (21 hours)

5.1 The Solid State - differences between crystalline and amorphous solids, elements of symmetry, unit cell, space lattice, Bravais lattices, law of rational indices and Miller indices.

5.2 X - ray diffraction – derivation of the Bragg's equation – experimental methods – Laue's method and powder method.

5.3 Types of crystals – molecular, covalent, metallic and ionic crystals, three-dimensional close packing of spheres – ccp and hcp – characteristics of hcp, ccp and bcc structures, interstitial sites in closely packed arrangement of atoms – triangular, tetrahedral and octahedral sites, radius ratio rule and its effect on the shapes of ionic crystals, structures of ionic crystals-NaCl, CsCl, ZnS, Wurtzite, Fluorite and Rutile.

5.4 Imperfections in crystal systems – Schottky and Frenkel defects, metal excess and metal deficiency defects; semi conductors – band theory of solids, intrinsic semiconductors, extrinsic semiconductors – n-type and p-type semiconductors.

*Related problems to be worked out

Books for Study:

1. R.D.Madan, Modern Inorganic Chemistry, S. Chand & Co., 2nd Edition, Reprint 2004.
2. B.S Bahl and Arun Bahl, Advanced Organic Chemistry, Sultan Chand and Co. Ltd., Reprint 2008.
3. B. R. Puri, L. R Sharma and M.S Pathania, Principles of Physical Chemistry, 43rd Edition, Vishal Publishing Co., 2008.

Books for Reference:

1. P.L Soni and Mohan Katyal, Textbook of Inorganic Chemistry, Sultan Chand & Sons, 20th Edition, Reprint 2001.
2. P.L Soni and H.M Chawla, Textbook of Organic Chemistry, Sultan Chand & Sons, 25th Revised Edition, 1992.
3. K.S. Tewari and M.K. Vishnoi, A Textbook of Organic Chemistry, Vikas Publishing House Pvt. Ltd., 3rd Edition, 2006.
4. M.K. Jain and S.C. Sharma, Modern Organic Chemistry, Vishal Publishing Co., 2004.
5. P.L. Soni, O.P. Dharmarha and U.N Dash, Textbook of Physical Chemistry, S. Chand & Co., 21st Revised Edition, Reprint 2000.
6. P.K. Mani and A.O. Thomas, A Textbook of Practical Chemistry, Scientific Publication, 1973.
7. O.P. Pandey, D. N. Bajpai and S. Giri, Practical Chemistry, 8th Edition, S. Chand & Co., 2001.
8. J. Bassett, R.C. Denney, G.H. Jeffery and J. Mendham, Vogel's Textbook of Quantitative Inorganic Analysis, ELBS.

SEMESTER IV– PAPER IV

UCCHE19 - GENERAL CHEMISTRY – IV

Objectives:

- To give in depth knowledge about nitrogen family, oxygen family, halogen family and zero group elements.
- To learn the mechanistic details of electrophilic and nucleophilic substitution in aromatic compounds.
- To gain knowledge on heterocyclic compounds and phenols
- To learn the laws of thermodynamics and their applications.

Unit I (15 hours)

1.1 Nitrogen family - preparations, properties and uses of hydrazine – Structure and properties of oxides, oxoacids of N (N_2O, NO, N_2O_5,) and phosphorous (H_3PO_4, H_3PO_3, PCl_3, PCl_5)

1.2 Oxygen Family - comparative study of compounds- hydrides, halides, oxides and oxyacids.

1.3 Halogens - comparative study of elements and compounds of halogens- hydroacids, oxyacids and inter halogen compounds. Pseudohalogens- comparison of halogens and pseudo halogens.

1.4 Noble gases - position in the periodic table, clathrates and its applications, hybridization and geometry of XeF_2, XeF_4, XeF_6 and $XeOF_4$.

Unit II (15 hours)

2.1 Aliphatic Nucleophilic Substitution - mechanism of S_N1 ,S_N2, and S_Ni reactions, effect of structure of substrate, solvent, nucleophile and the leaving group.

2.2 Aromatic nucleophilic substitution - benzyne and intermediate complex mechanism, effect of substituents on reactivity.

2.3 Orientation and reactivity in substituted benzenes. Aromatic electrophilic substitution reaction in benzene and substituted benzenes-nitration, halogenation, sulphonation, Friedel-Craft's acylation and alkylation reactions.

2.4 Elimination reaction- Hoffmann and Saytzeff's rules. Cis and trans eliminations-mechanisms of E_1 and E_2 reactions, elimination vs substitution.

Unit III (15 hours)

3.1 Aromaticity – Huckel's rule and its applications.

3.2 Heterocyclic compounds - preparation, properties and uses of furan, thiophene, pyrrole, pyridine, quinoline and isoquinoline.

3.3 Phenols- preparation, properties and uses of dihydric and trihydric phenols, acidic character of phenols.

3.4 Mechanism of Kolbe's reaction, Riemer-Teimann reaction, Gattermann reaction, Mannich and Houben –Hoesch reactions.

Unit IV (15 hours)

4.1 Alcohols - reactions of alcohols with Na, HX, esterification, oxidation with alk. $KMnO_4$, acidic dichromate, con HNO_3, catalytic dehydrogenation.

4.2 Dihydric alcohol-glycol- preparation, properties and uses, trihydric alcohol – Glycerol- preparation, properties and uses.
4.3 Ethers- isomerism, preparation by Williamson synthesis, reactions of ethers.
4.4 Epoxides- preparation from alkene, ring opening reactions, reaction with alcohol, ammonia derivative and $LiAlH_4$.

Unit V (15 hours)

5.1 Entropy – the concept of entropy, entropy changes in isothermal expansion of an ideal gas, in reversible and irreversible processes, entropy change accompanying change of phase, calculation of entropy changes with changes in T, V, and P, entropy changes in different processes, entropy of a mixture of ideal gases, entropy of mixing, physical significance of entropy.
5.2 Helmholtz and Gibbs free energy functions, variation of free energy change with T and P. Maxwell's relations, criteria for reversible and irreversible processes, Gibbs-Helmholtz equation.
5.3 Partial molar properties – concept of chemical potential, the Gibbs-Duhem equation, variation of chemical potential with temperature and pressure, chemical potential in a system of ideal gases, Clausius- Clapeyron equation – applications.
5.4 Third law of thermodynamics - Nernst heat theorem, statement of third law, determination of absolute entropies of solids, liquids and gases, residual entropy.

*Related problems to be worked out

Books for Study:

1. R.D. Madan, Modern Inorganic Chemistry, S. Chand & Co., 2nd Edition, Reprint 2004.
2. B.S. Bahl, and Arun Bahl, Advanced Organic Chemistry, Sultan Chand and Co., Ltd., Reprint 2008.
3. B. R. Puri, L. R Sharma and M.S Pathania, Principles of Physical Chemistry, Shoban Lal, Nagin Chand & Co., 43rd Edition, 2008.

Books for Reference:

1. P.L. Soni and Mohan Katyal, Textbook of Inorganic Chemistry, Sultan Chand & Sons, 20th Edition, Reprint 2001.
2. B.R. Puri, L. R. Sharma and Kalia, K. C., Principles of Inorganic Chemistry, Shoban Lal, Nagin Chand &Co., 29th Edition, 2004.
3. P.L. Soni and H.M. Chawla, Textbook of Organic Chemistry, Sultan Chand & Sons, 25th Revised Edition, 1992.
4. K.S. Tewari and M.K. Vishnoi, A Textbook of Organic Chemistry Vikas Publishing House Pvt. Ltd., 3rd Edition, 2006.
5. M.K. Jain and S.C. Sharma, Modern Organic Chemistry, Vishal Publishing Co., 2004.
6. P.L. Soni. O.P. Dharmarha, and U.N. Dash, Textbook of Physical Chemistry, S. Chand & Co., 21st Revised Edition, Reprint 2000.
7. J. Rajaram and J. C. Kuriakose, Thermodynamics, Vishal Publications, 3rd Edition, 1999.
8. J. N. Gurtu, Thermodynamics, Pragati Prakashan, 4th Edition, 1973.

PRACTICAL II

UCCHF19 – VOLUMETRIC ESTIMATION

Acidimetry

1. Estimation of sodium hydroxide- standard sodium carbonate.
2. Estimation of borax-standard sodium carbonate

Permanganometry

3. Estimation of oxalic acid- standard Mohr's salt or ferrous sulphate
4. Estimation of sodium nitrite- standard oxalic acid.
5. **Estimation of Calcium
6. **Determination of percentage of Manganese dioxide in Pyrolusite

Iodometry

7. Estimation of copper-standard copper sulphate
8. Estimation of potassium dichromate- standard potassium dichromate

Complexometry

9. Estimation of magnesium using EDTA
10. *Estimation of alkalinity of a water sample
11. *Estimation of temporary and permanent hardness of water.

Dichrometry

9. Estimation of ferrous ion using diphenylamine/ N-phenyl anthranilic acid as indicator

Precipitation Titration

10. **Estimation of chloride in neutral medium

* Not to be given for examination.
** To be given as a group experiment.

Continuous Assessment - 40 marks

I CA - 50
II CA - 50
Average - 25
Performance during regular practicals-10
Regularity in submission of observation note-book and Record –5

CA Practical Examination - 50 marks

Volumetric Analysis - 35 marks

≤ 1% - 35 marks

> 1 upto 2% - 30 marks
>2 upto 3% - 25 marks
>3 upto 4% - 20 marks
> 4% - 10 marks
Short Procedure Writing - 5 marks
Viva - 5 marks
Record - 5 marks

Semester Practical examination – 60 marks

Short Procedure writing - 5
Viva-voce -5
Record -10

Volumetric Analysis:
≤ 1% - 40 marks
> 1 upto 2% - 35 marks
>2 upto 3% - 30 marks
>3 upto 4% - 25 marks
> 4% - 15 marks

SEMESTER V

UCCHG19 - INORGANIC CHEMISTRY

Objectives:

- To discuss in detail the general characteristics of d block and f block elements, make a comparative study of a few group elements and the metallurgy of certain elements and compounds.
- To make an in depth study on nuclear chemistry.
- To introduce the field of bioinorganic chemistry.

Unit I (12 Hours)

1.1 d-block elements - general characteristics of d block elements. Group discussion of d-block elements - titanium, vanadium, chromium, manganese and iron groups - electronic configuration, occurrence, oxidation states, reactivity, magnetic properties, catalytic properties, colour and comparative study of their compounds.

1.2 f-block elements – position in the periodic table, general characteristics of lanthanides and actinides - occurrence, electronic configuration, oxidation states, ionic radii – lanthanide and actinide contractions, colour, spectra, magnetic properties, formation of complexes, comparative account of lanthanides and actinides.

Unit II (12 Hours)

2.1 Principle and processes of metallurgy – minerals and ores, occurrences of metals in nature, definition, various steps of metallurgy – various ore-dressing methods, calcination, roasting, various reduction and refining methods.

2.2 Titanium, Zirconium and Platinum – occurrence, extraction, properties and uses.

2.3 Uranium – occurrence, extraction from pitchblende - acid and alkali digestion processes, extraction from carnotite, properties and uses, Chemistry of Thorium – occurrence, extraction from monazite sand, properties and uses.

2.4 Preparation and uses of ammonium molybdate, vanadium pentoxide, uranium hexa fluoride. Heat treatment of steel, uses of steel alloys.

Unit III (12 Hours)

3.1 Nuclear chemistry - fundamental and sub atomic particles of the nucleus, nucleon terminology, classification of nuclides – based on Z and N values - isotopes, isobars, isotones, mirror nuclei and isomers – based on stability, theories of nuclear forces operating between the nucleons inside the nucleus – meson theory and nuclear fluid theory.

3.2 Stability of nuclides - odd-even nature of Z and N values, N/P ratio - stability belt, packing fraction, mass defect and nuclear binding energy - calculations involving mass defect and B.E per nucleon, liquid drop model, shell model- magic numbers.

3.3 Natural radioactivity - general properties of radioactive radiations, properties of alpha, beta and gamma rays, modes of radioactive decay, rate of disintegration and half-life period, group displacement law, radioactive series including neptunium series – similarities between radioactive series.

Unit IV (12 Hours)

4.1 Nuclear transmutation – introduction, Bohr's theory of nuclear reactions, classification of nuclear reactions – based on overall energy transformation and the nature of the bombarding particles, nuclear reactions versus chemical reactions.
4.2 Artificial radioactivity - discovery, reactions emitting electrons and positrons, preparation of trans-uranium elements.
4.3 Nuclear fission – definition, reaction, Q-value, mechanism, uses – atomic bomb, nuclear reactor and its components, breeder reactor.
4.4 Nuclear fusion – definition - thermonuclear reactions, uses – stellar energy, hydrogen bomb, comparison of fission and fusion.

Unit V (12 Hours)

5.1 Bioinorganic Chemistry – micro and macro nutrients, biological aspects of Fe, Zn, Mg, Co and Mo.
5.2 Biological importance of Na, K, Ca and P.
5.3 Inorganic medicinal chemistry - radio pharmaceuticals, chelate therapy, and contrast agents in MRI.
5.4 Toxicity of metals – As, Hg, Cd, Pb and Cr toxic effects.

Books for Reference:

1. J.D. Lee, Concise Inorganic Chemistry, Von Nostrand, 3rd Edition, 1997.
2. P.L. Soni, Inorganic Chemistry, Sultan Chand & Co., 4th Edition, 1991.
3. Puri and Sharma Nagin, Inorganic Chemistry, Sultan Chand & Co., 9th Edtion, 1979.
4. R. D. Madan, Inorganic Chemistry, S. Chand & Co., 2nd Edition, Reprint 2004.
5. Cotton and Wilkinson, Advanced Inorganic Chemistry, Wiley Eastern Ltd., 5th Edition, 1988.
6. A. K. De, A Textbook of Inorganic Chemistry, Wiley Eastern Ltd., 8th Edition, 2001.
7. Shriver and Atkins, Inorganic Chemistry, Wiley Eastern Ltd., 5th Edition, 2005.
8. A. K. Srivastava & P. C. Jain, Elements of Nuclear Chemistry, S. Chand & Co., 2nd Edition, 1989.
9. S. Glasstone, Sourcebook on Atomic Energy, East-West Press Pvt. Ltd., 3rd Edition, 1967.
10. H J Arnikar, Essentials of Nuclear Chemistry, Wiley Eastern Limited, 3rd Edition, 1990.

SEMESTER V

UCCHH19 - ORGANIC CHEMISTRY

Objectives:

- To acquire knowledge on active methylene compounds, organic photochemistry and mechanisms of certain named reactions.
- To give a broad outline of stereochemistry and conformational analysis.
- To learn the mechanisms of molecular rearrangements.

Unit I: **(12 Hours)**

1.1 Stereoisomerism: Optical isomerism – conditions for optical activity. Projection formulae: Fischer, Flying wedge, Sawhorse and Newmann projection formulae- Cahn –Ingold – Prelog rules, R-S notations for optical isomers with one and two asymmetric carbon atoms.

1.2 Optical activity in compounds not containing asymmetric carbon atoms – biphenyls (atropisomerism), allenes and spiranes

1.3 Geometrical isomerism - cis - trans, syn – anti and E-Z notations , geometrical isomerism in maleic and fumaric acids and unsymmetrical ketoximes

1.4 Methods of distinguishing geometrical isomers using physical and chemical methods – cyclisation, by converting into compounds of known configuration, method of optical activity, acid strengths, dipole moment, melting point, boiling point, solubility, density, refractive index.

Unit II: (12 Hours)

2.1 Tautomerism – definition, cause of tautomerism, acidity of alpha hydrogen, reasons for acidity.

2.2 Keto - enol tautomerism - evidences in favour of the keto and enol form, enolisation - acid – base catalysed mechanisms - Nitro-acinitro tautomerism and amido-imidol tautomerism – evidences.

2.3 Conformational analysis- conformational analysis of ethane and n- butane including energy diagrams

2.4 Conformers of cyclohexane – axial and equatorial bonds, ring flipping showing axial equatorial inter conversions, conformers of mono and di substituted cyclohexanes – 1,2 and 1,3 interactions.

Unit III: (12 Hours)

3.1 Active methylene group - characteristic reactions of active methylene groups in malonic, acetoacetic and cyano acetic esters and their synthetic uses.

3.2 Basic concepts of organic photochemistry.

3.3 Photochemistry of carbonyl compounds –Norrish type I and II reactions. Photo reduction, photo addition

3.4 Photochemical rearrangement (di-pi methane rearrangement), Paterno- Buchi reaction, Barton reaction and Photo Fries reaction.

Unit IV: (12 Hours)

4.1 Reaction Mechanisms - mechanism and applications of Aldol, Benzoin, Claisen and Darzen condensations.

4.2 Cannizaro, Reformatsky, Perkin, Knoevenagal and haloform reactions– mechanism and applications
4.3 Michael addition, Dakin, Wittig and Dieckmann reactions – mechanism and applications.
4.4 Mechanism of reduction with $NaBH_4$, LiAlH4, Wolf Kishner and MPV reduction.

Unit V: (12 Hours)

5.1 Molecular rearrangements - classification as anionotropic , cationotropic and inter molecular, intra molecular. Mechanism, evidence for carbonium ion intermediate formation, migratory aptitude, inter / intra molecular rearrangement. Migration to electron deficient carbon atom - Pinacol-Pinacolone rearrangement
5.2 Rearrangement involving electron deficient nitrogen atom- Beckmann rearrangement, migration to electron deficient oxygen – Baeyer Villiger oxidation
5.3 Rearrangement of aromatic compounds- benzidine rearrangement
5.4 Rearrangements involving sigmatropic shifts – Claisen and Paraclaisen rearrangement, rearrangements to electron rich carbon atom - Favorskii rearrangements

Books for Reference:

1. B.S. Bahl and Arun Bahl, Advanced Organic Chemistry, Sultan Chand &Co., 5th Edition, 2014.
2. K.S.Tewari, S.N.Mehrotra,N.K.Vishnoi, A Text book of Organic Chemistry, 2nd Edition, Vikas Publishing House, 2001.
3. R.T.Morrison and Boyd, Organic Chemistry, 6th edition, Prentice Hall India Pvt. Ltd., 2001.
4. I.L. Finar, Organic Chemistry, Vol II, 5th Edition, Addison Wesley, 2000.
5. Jerry March, Reaction, Mechanism and Structure, 4th Edition, John Wiley and Sons, 1992.
6. A.K.Bansal, A Textbook of Organic Chemistry, New Age International Pvt. Ltd., 1990.
7. P.L.Soni, Text book of Organic Chemistry, 25th Edition, Sultan and Chand, 1992.
8. P.S Kalsi, Stereo Chemistry, Conformations and Mechanisms, New Age International Pvt. Ltd, 10th Edition, 2019.
9. Peter Sykes, A Guidebook to Mechanism in Organic Chemistry, 6th Edition, 1988.
10. M.K. Jain and S.C.Sharma, Modern Organic Chemistry, 1st Edition, S. Chand & Co 2004.
11. Gurdeep R. Chatwaal, Reaction Mechanism and Reagents in Organic Chemistry, 4th Edition, Himalaya Publishing House, 2005.
12. O.P Agarwal, Organic Chemistry-Reactions and Reagents, 24th Edition, GOEL Publishing House, 1996.
13. D. Nasipuri, Stereochemistry of Organic Compounds – Principles and Applications, New Age International, 3rd Edition, 2011.

SEMESTER V

UCCHI19 - PHYSICAL CHEMISTRY

Objectives:

- To understand the importance of chemical kinetics and the theories on reaction rates, catalysis and adsorption.
- To gain knowledge about photophysical and photochemical processes.
- To understand the applications of phase rule through the study of one component and two component systems.

Unit I: (15 Hours)

1.1 Chemical Kinetics - scope of chemical kinetics, rate, rate constant and rate law. Factors that affect the rate of the reaction. Measurements of reaction rates. Order and molecularity of chemical reactions- Differences between order and molecularity. Methods to determine the rate of the reactions.

1.2 Derivation of rate constants of first, second, third and zero order reactions and derivation for time for half change. Examples of first, pseudo-first, second, third and zero order reactions and study of kinetics of hydrolysis of ester, inversion of cane sugar, decomposition of H_2O_2, thermal decomposition of acetaldehyde and gaseous reactions involving NO. Methods to determine the order of reactions – Integration method, Graphical method, Vant Hoff differential method, Method using half life period and Ostwald's dilution method.

1.3 Experimental methods in the study of kinetics of reactions- Volumetry, Manometry, Polarimetry, Dilatometry and Colorimetry.

1.4 Effect of temperature on the rate of reactions –Arrhenius equation and concept of energy of activation.

Unit II: (15 Hours)

2.1 The Collision theory of bimolecular reactions and derivation of rate constant. Theory of unimolecular reactions- Lindemann's theory, draw backs of collision theory.

2.2 Theory of Absolute Reaction Rates based on thermodynamics. Derivation for the rate constant of a bimolecular reaction based on ARRT.

2.3 Comparison of Collision theory and ARRT-significance of entropy, enthalpy and free energy of activation and determination of ΔG, ΔH and ΔS.

2.4 Complex reactions: types - consecutive, parallel, reversible and chain reactions (no derivation, only examples)

Unit III: (15 Hours)

3.1 Photochemistry- differences between thermal and photochemical reactions. Laws of light absorption - Beer's law and Beer Lambert's law. Laws of photochemistry – Grothus Draper's law and Stark Einstein's law.

3.2 Jablonski diagram - singlet and triplet states, qualitative description of fluorescence and phosphorescence. Primary and secondary reactions – quantum yield - experimental determination by using Eder's and Uranyl oxalate actinometers.

3.3 Kinetics of hydrogen – bromine reaction, photolysis of aldehyde- Rice Herzfeld mechanism.

3.4 Photosensitization, chemiluminescence and biochemiluminescence.

Unit IV: **(15 Hours)**

4.1 Phase equilibria – Gibbs phase rule –statement, definition of terms and derivation of phase rule.
4.2 One component systems – water system and sulphur system.
4.3 Reduced phase rule - two component systems: Pb – Ag system, desilverization of Pb-Pattinson's process. Thermal analysis and cooling curves. Compound formation with congruent melting point: Zn-Mg system and $FeCl_3$-H_2O system, Freezing mixtures.
4.4 Incongruent melting point: Na-K system. CST and effect of impurity on Phenol – Water system.

Unit V: **(15 Hours)**

5.1 Catalysis-definition and characteristics of a catalyst -homogeneous catalysis-function of a catalyst in terms of Gibbs free energy of activation.
5.2 Heterogeneous catalysis- Mechanisms of surface reactions –Simple decompositions on surfaces -Kinetics of unimolecular surface reactions-Langmuir Hinshelwood mechanism.
5.3 Enzyme catalysis- characteristics of enzymes. Derivation of Michaelis Menton equation.
5.4 Adsorption - physisorption and chemisorption – differences. Freundlich adsorption isotherm -Langmuir adsorption isotherm - BET equation (no derivation) - applications of adsorption.

Books for Reference:

1. B. R. Puri, L. R Sharma and M.S Pathania, Principles of Physical Chemistry, 43rd Edition, Vishal Publishing Co., 2008.
2. P.L.Soni, Textbook of Physical Chemistry, Sultan Chand & Co, Reprint 2000.
3. Negi and Anand, Physical Chemistry, 2nd Edition, New Age copy right, Eastern Wiley Pvt. Ltd.,1985.
4. Kundu and Jain, Physical Chemistry, 2nd Edition, S.Chand &Co., 1987.
5. S.Glasstone, A Textbook of Physical Chemistry, 5th Edition, MacMillan (India) Ltd, New Delhi, Reprint1978.
6. G.W.Castellan, Physical Chemistry, 3rd Edition., Addison-Wesley, 1983.
7. Walter J.Moore, Physical Chemistry,-5th Edition Prentice Hall, 1972.
8. Jainudeen, Chemical Kinetics and Photochemistry, 1st Edition, Jazeeme Publication, 1982.
9. Gurtu, Phase Rule, 2nd Edition, Pragathi Prakash Publications, 1972.
10. Laidler, K.J, Chemical Kinetics, 3rd Edition, Harper and Row, 1987.
11. Dogra, S. K., and Dogra S, Physical Chemistry through Problems, Wiley Eastern Ltd., 1984.

SEMESTER V

MAJOR ELECTIVE 1 A

UECHA19- ANALYTICAL CHEMISTRY

Objectives:

- To learn the principles behind gravimetric analysis.
- To know in depth the principle, instrumentation, working and applications of NMR, IR, UV-Visible and Mass Spectroscopy.

Unit I: (15 Hours)

1.1 Principles of gravimetric analysis - characteristics of precipitating agents, choice of precipitants and conditions of precipitation, organic precipitants, specific and selective precipitants.
1.2 Steps in gravimetric analysis- sequestering agents, co-precipitation-mechanism of co-precipitation, post precipitation, differences.
1.3 Solubility product and precipitation- reduction of error-precipitation from homogeneous solutions.
1.4 Types, care and use of crucibles.

Unit II: (15 Hours)

2.1 Chromatography – principle, classifications, column chromatography - principle, adsorbents, solvents, apparatus, experimental procedure, applications.
2.2 Paper chromatography – principle, experimental procedure, R_f value- factors affecting R_f value, technique, precautions taken and applications, two dimensional-radial paper chromatography
2.3 Thin layer chromatography- principle, experimental method, superiority of TLC, R_f value, factors affecting R_f value.
2.4 Ion exchange chromatography- principle-types and properties of ion exchangers, applications. Specific examples- separation of chloride and bromide, cadmium and zinc

Unit III: (15 Hours)

3.1 Concepts in spectroscopy - introduction, types of spectra-radiant energy, wave and particle properties of electromagnetic radiation.
3.2 UV - Visible spectroscopy - absorption laws, deviation from Beer- Lambert's law.
3.3 Instrumentation - photocolorimeter and spectrophotometer, block diagrams with description of components, working and applications.
3.4 Electronic transitions –types- chromophore and auxochromes, factors influencing λmax and Σmax. Sensors – Introduction, optical sensors.

Unit IV: **(15 Hours)**

4.1 Infrared Spectroscopy – principle, molecular vibration, types with reference to linear and non linear molecules, vibrational frequencies, factors influencing vibrational frequencies.
4.2 Instrumentation - block diagram, source, monochromator, cell - sampling techniques - detectors and recorder, working of IR
4.3 Identification of simple organic molecules from characteristic absorption bands.

Unit V: (15 Hours)

5.1 Nuclear magnetic resonance spectroscopy – principle, instrumentation, block diagram with different components, chemical shift, factors influencing chemical shift, number of signals.
5.2 Shielding mechanism - spin-spin splitting or coupling, coupling constants.
5.3 NMR spectra of simple organic compounds- alcohols, aldehydes and ketones.
5.4 Mass Spectroscopy - basic principle, instrumentation with block diagram.
5.5 Molecular peak - base peak, isotopic peak, metastable peak, their uses, fragmentation of alcohols, aldehydes and aromatic hydrocarbons, Mc Lafferty rearrangement, nitrogen rule.
5.6 Determination of molecular formulae with examples.

Books for Reference:

1. R. Gopalan , Elements of Analytical Chemistry, 2nd Edition, Sultan Chand & Sons, New Delhi, 1993.
2. S. Usha Rani , Analytical Chemistry , Macmillan India Ltd., New Delhi, 2000.
3. B.K. Sharma , Instrumental Methods of Chemical Analysis, 24th Edition, Goel Publications, 2004.
4. A.K Srivastava and P.C Jain, Chemical Analysis: An Instrumental Approach, 3rd Edition, Sultan Chand and Sons, New Delhi, 1997.
5. Jag Mohan, Organic Analytical Chemistry Theory and Practice, 1st Edition, Narosa Publishing House, New Delhi, 2003.
6. C.R Chatwal, Analytical Spectroscopy, 1st Edition, Himalaya Publishing House, New Delhi, 1996.
7. H. Kaur, Spectroscopy, 1st Edition, Pragati Prakashan Publication, Meerut, 2001.
8. P.S Kalsi, Spectroscopy of Organic Compounds, 2nd Edition , New Age International, New Delhi
9. H. Kaur , An Introduction to Chromatography, 1st Edition, Pragati Prakashan Publication, 2001.

SEMESTER V – MAJOR ELECTIVE I B

UECHB19 - BASICS OF COMPUTER PROGRAMMING IN C AND ITS APPLICATIONS IN CHEMISTRY

Objectives:

- To introduce the basics of computers.
- To learn C language and its applications and solving problems in chemistry.

Unit I: (15 hours)

Basic computer organization, processor and memory – main memory, secondary storage devices and storage hierarchy. Software – relationship between hardware and software – types of software. Planning the computer program – algorithm and flowcharts. Basics of operating systems.

Unit II: (15 hours)

Computer languages – machine language, assembly language, assembler, compiler, interpreter and programming languages - C language – introduction, C compiler, operating systems and preprocessor directives - variables, constants, operators, input and output functions.

Unit III: (15 hours)

Control structures – conditional, looping, goto, break, switch and continue statements, functions, arrays and pointers.

Unit IV: (15 hours)

Applications in Chemistry – calculation of the radius of the first Bohr orbit for an electron, calculation of half-life time for an integral order reaction, calculation of molarity, molality and normality of a solution, calculation of pressure of ideal or Vanderwaal's gas, Calculation of electro negativity of an element using Pauling's relation.

Unit V: (15 hours)

Applications in Chemistry - Calculation of empirical formulae of hydro carbon, calculation of reduced mass of a few diatomic molecules, determination of the wave numbers of spectral lines of hydrogen atom, calculation of work of expansion in adiabatic process, calculation of pH, solubility product and bond energy using Born - Lande equation, calculation of standard deviation and correlation coefficient.

Books for Reference:

1. K.V. Raman, Computers in Chemistry, 8th Edition, Tata McGraw Hill, 2005.
2. Venugopal and Prasad, Programming with C, 11th Edition, 1971.
3. E. Balaguruswamy, Programming in C, 2nd Edition, 1989.

SKILL-BASED ELECTIVE

(For B.Sc. Chemistry)

USCHC519 - SMALL SCALE CHEMISTRY

Objectives:

- To impart knowledge on small-scale industries.
- To acquire skills in the manufacture of various small – scale products.

Unit I: Small–Scale Industry

Objectives and characteristics of small-scale industries – types of SSI , role of SSI in Indian economy - Problems of SSI , steps in starting SSI, laws for SSI, finance management - Quality control – definition and advantages. Marketing and branding. Advertising – definition, objectives, advertising media.

Unit II: Soaps and Detergent

Soaps - definition, fatty and non- fatty raw materials, types of soaps, manufacture of laundry soap and bathing soap. Mechanism of cleansing action of soap - Composition, preparation and advantages of herbal soaps - Detergents – classification of surfactive agents (LABSA), manufacture of detergents. Shampoo – composition and manufacture of egg and herbal shampoo, anti dandruff and conditioners.

Unit III: Cosmetics and Perfumes

Cosmetics – definition, history, kinds of cosmetics - Preparation of face powder, face cream and lipstick. Perfumes – definition, essential ingredients in perfumes - Classification of essential oils – preparation of perfumes.

Unit IV: Small-Scale Products – I

Camphor – production, biosynthesis and applications - Bleaching powder - preparation, properties and uses – Biogas - composition, production and uses - Handmade paper from bagasse - composition of bagasse and uses - Asofoetida - composition, cultivation, manufactures and uses - Composition and manufacture of safety matches, agarbattis, candies and soft drinks.

Unit V: Small-Scale Products – II

Recycling of synthetic organic polymers – applications of PET, PVC, HDPE, and polystyrene - Reverse osmosis of water - production and applications - Coconut oil – manufacture by dry and wet processes and uses - Vulcanization of rubber, making an eraser - Pencils - forms of graphite, adhesion and lengthwise graphitization method and uses.

Hands on Training for the preparation of soaps, phenyl and Agarbattis (3hrs)

Books for Reference:

1. V. Balu, Entrepreneurship and Small Business Promotion, First Edition, Sri Venkateswara Publications, 2004.
2. B.N.Chakrabarty, Industrial Chemistry, Oxford & IBH Publishing Co. Pvt. Ltd., 1981.
3. A.N.Zamre, V.G.Ratolikar, A Textbook of Modern Applied Chemistry, M.G.Lomte Edition, S.Chand & Co., 1985.
4. Clarence Henry Eckles, Willes Barnes Combs and Harold Macy, Milk and Milk products, Tata McGraw- Hill Publishing Company, 2002.
5. B.K.Sharma, Industrial Chemistry, Goel Publishing House, 2008.
6. H.Panda, Herbal soaps detergents Hand Book, National institute of industrial research, 2011.

SEMESTER VI

UCCHJ19 – COORDINATION CHEMISTRY

Objective:

- To give students a thorough knowledge on Coordination Chemistry.

Unit I (12 Hours)

1.1 Co-ordination compounds: Molecular compounds, difference between double salts and complex compounds, Definition of terms used, classification of ligands – based on denticity and charge. Chelation – tendency of polydentate ligands to form chelates and applications of chelate formation.
1.2 Nomenclature of coordination compounds.
1.3 Isomerism in complexes: structural isomerism – conformation isomerism, ionization isomerism, hydrate isomerism, linkage isomerism, ligand isomerism, co-ordination isomerism, coordination position isomerism. polymerization isomerism, geometrical isomerism in 4- and 6- coordinate complexes.
1.4 Optical isomerism - optical activity, conditions, optical isomerism in 4- and 6-coordinated complexes.

Unit II (12 Hours)

2.1 Theories of coordination compounds - Werner's theory – postulates, designation and formation of Co(III) ammine complexes, experimental verification.
2.2 Sidgwick theory – electronic concept of coordinate bond, EAN rule, limitations.
2.3 Theory of bonding - valence bond theory – assumptions, VBT as applied to octahedral, (inner orbital and outer orbital), tetrahedral and square planar complexes - hybridization, geometry and magnetic properties, failures of VBT.

Unit III (12 Hours)

3.1 Crystal Field theory – salient features, splitting of d - orbitals in octahedral, tetrahedral and square planar complexes, crystal field stabilization energy - factors affecting the magnitude of Δ_o - spectrochemical series.
3.2 Filling up t_{2g} and e_g orbitals with electrons in octahedral and tetrahedral complexes - low spin and high spin complexes, calculation of CFSE in octahedral and tetrahedral complexes, uses of crystal field stabilization energy values.
3.3 Explanation of magnetic properties, colour and geometry using CFT, limitations of CFT, Comparison between VBT and CFT.

Unit IV (12 Hours)

4.1 Covalency in transition metal complexes - evidences for covalency. Molecular Orbital theory - postulates, metal orbitals and LGOs suitable for σ-bonding in octahedral geometry, construction of qualitative MO energy level diagrams for σ – bonding in octahedral complexes.
4.2 Metal orbitals and LGOs suitable for π -bonding in octahedral geometry, effect of π-bonding on the magnitude of Δ_o – construction of π MOs for donor and acceptor ligands, relation between pi bonding ability of ligands and spectrochemical series.
4.3 Comparison between CFT and MOT - similarities and differences.

Unit V (12 Hours)

5.1 Pi acceptor ligands: metallic carbonyls – synergic effect, synthesis, properties and uses of carbonyls of Ni, Cr and Fe.
5.2 Carbonyls of Co, Mn, Mo and W – synthesis, properties and uses.
5.3 Bonding, hybridization and structures of carbonyls of Ni, Cr, Fe, Co, Mn, Mo and W.

Books for Reference:

1. J.D. Lee, Concise Inorganic Chemistry, Von Nostrand, 3rd Edition, 1997.
2. P.L. Soni, Inorganic Chemistry, Sultan Chand & Co., 4th Edition. 1991.
3. Puri and Sharma Nagin, Inorganic Chemistry, Sultan Chand & Co., 9th Edition, 1979.
4. R. D. Madan, Inorganic Chemistry, S. Chand & Co., 2nd Edition, Reprint 2004.
5. Cotton and Wilkinson, Advanced Inorganic Chemistry, Wiley Eastern Ltd., 5th Edition, 1988.
6. A.K.De, A Textbook of Inorganic Chemistry, New age Wiley Eastern Ltd., 8th Edition, 2001.
7. M. Satake Y. Mido, Coordination Chemistry, 1st Edition, 2001.
8. Gurdeep Chatwal and M. S. Yadav, Coordination Chemistry, Himalaya Publishing House, First Edition, 1992.
9. R.Gopalan and V. Ramalingam, Concise Coordination Chemistry, Vikas Publishing House Pvt. Ltd., 2001.
10. Wahid U. Malik, G. D. Tuli and R. D. Madan, Selected Topics in Inorganic Chemistry, S. Chand & Company Ltd., 2005.

SEMESTER VI

UCCHK19 – ELECTROCHEMISTRY

Objective:

- To provide an in depth study on electrical conductance.
- To highlight the importance of different types of electrodes and cells.
- To throw light on the applications of electrodes and electrochemical cells.
- To understand the recent advances in fuel cells.

Unit I: (15 Hours)

1.1 Electrochemistry - conductance - metallic and electrolytic conductors, resistance, specific resistance, specific conductance, equivalent conductance and molar conductance - terms, definitions and units.

1.2 Measurement of conductance based on Wheatstone bridge principle. Variation of conductance with dilution for strong and weak electrolytes (qualitative explanation)

1.3 Transport number and its determination by Hittorf's method by using Pt and Ag electrodes.

1.4 Ionic mobility - determination of ionic mobility, effect of temperature and concentration on ionic mobility, Ionic conductance - Kohlrausch's law and its applications.

Unit II: (15 Hours)

2.1 Theory of strong electrolytes - Debye – Huckel's theory- postulates, Debye Huckel limiting law and verification, Debye Huckel Bronsted equation, Debye Huckel Onsager theory-verification of Onsager equation .

2.2 Wein effect and Debye Falkenhagen effect. Ionic strength and calculation of ionic strength.

2.3 Activity and activity coefficients of strong electrolytes. Mean ionic activity and mean ionic activity coefficients.

2.4 Applications of conductivity measurements – degree of hydrolysis and solubility product. Conductometric titrations- principle, experimental techniques and sketch of curves of various types of titrations – Acid-Base, mixture of acids versus base and Precipitation titrations. Advantages of conductometric titrations.

Unit III: (15 Hours)

3.1 EMF - construction of an electrochemical cell, definition of electrode and cell potentials, conventions regarding sign of emf, cell reaction and emf, Relationship between heat energy and electrical energy. Galvanic cells-reversible and irreversible cells. EMF and its measurement based on Poggendorff compensation principle.

3.2 Types of electrodes - metal-metal ion, gas, metal-metal insoluble salt, amalgam and oxidation-reduction electrodes. Reference electrodes: Primary reference electrode-Hydrogen electrode, Secondary reference electrode-Calomel electrode.

3.3 Derivation of Nernst equation for electrode potentials, Thermodynamics and emf-derivation of ΔG, ΔH, ΔS from emf data. Standard cell – working of Weston saturated and unsaturated standard cells.

3.4 Electrochemical series and its applications.

Unit IV: (15 Hours)

4.1 Chemical and concentration cells - chemical cells with and without transference and their applications.

4.2 Concentration cells - electrode concentration cells without transference and electrolytic concentration cells with and without transference - examples and derivation of expressions for their emf's - liquid junction potential. Functions of a salt bridge.

4.3 Applications of emf measurements-determination of pH using hydrogen, quinhydrone and glass electrodes.

4.4 Potentiometric titrations- acid - base, redox and precipitation titrations- advantages of potentiometric titrations. Titration of polybasic acids versus a base.

Unit V: (15 Hours)

5.1 Applications of concentration cells - determination of valency of ions, transport number, ionic product of water, solubility product.

5.2 Polarization - decomposition potential, back emf, definition and experimental determination. Hydrogen over voltage – definition, experimental determination and application. Electroplating.

5.3 Storage cells -lead acid battery - mechanism of discharging and recharging.

5.4 Fuel cells – types of fuel cells – low temperature fuel cells and high temperature fuel cells. Hydrogen – Oxygen fuel cell. Advances in fuel cell technology- An overview.

Books for Reference:

1. B. R. Puri, L. R Sharma and M.S Pathania, Principles of Physical Chemistry, 43rd Edition, Vishal Publishing Co., 2008.
2. P.L.Soni, Textbook of Physical Chemistry, Sultan Chand & Co, Reprint 2000.
3. Negi and Anand, Physical Chemistry, 2nd Edition, New Age copy right 1985, Eastern Wiley Pvt. Ltd.
4. Kundu and Jain, Physical Chemistry, 2nd Edition, S.Chand &Co.1987.
5. S.Glasstone, A Textbook of Physical Chemistry, 5thEdition, MacMillan (India) Ltd, New Delhi, reprint1978.
6. G.W.Castellan,Physical Chemistry, 3rd Edition., Addison-Wesley, Mass 1983.
7. Walter J.Moore, Physical Chemistry,-5th Edition Prentice-Hall, 1972.
8. Dogra, S. K., and Dogra S, Physical Chemistry Through Problems, Wiley Eastern Ltd., 1984.
9. Samuel H Maron and Carl F. Prutton., principles of Physical Chemistry, 4th Edition, Oxford and IBH Publishing Company, New Delhi, 1985.
10. M.S. Yadav, Electrochemistry, Second Revised Edition, Anmol Publications Pvt. Ltd, New Delhi, 2001.
11. B.K Sharma, Electrochemistry, 4th Edition, Goel Publishing House, 1990.

SEMESTER VI

MAJOR ELECTIVE II A

UECHC19 - CHEMISTRY OF NATURAL PRODUCTS

Objective:

- To impart knowledge on natural products such as carbohydrates, amino acids, proteins, vitamins, terpenes, alkaloids and flavones.

Unit I: (12 Hours)

1.1 Carbohydrates - classification, configuration-D,L, Ascending of carbon chain in sugars- Kiliani-Fischer synthesis, descending of carbon chain in sugars- Ruff's synthesis.
1.2 Constitution of glucose and fructose, reactions of glucose and fructose - osazone formation. Mutarotation and its mechanism.
1.3 Cyclic structure - pyranose and furanose forms, determination of ring size - Haworth projection formula, epimerisation, inter conversion of aldoses and ketoses.
1.4 Sucrose, maltose, starch and cellulose - structural elucidation.

Unit II: (12 Hours)

2.1 Amino acids and proteins - classification of amino acids - essential and non-essential amino acids.
2.2 Preparation of alpha amino acids- Strecker's synthesis, Gabriel Phthalimide synthesis, properties - zwitter ions, isoelectric points, reactions of amino, carboxyl and both amino and carboxyl groups.
2.3 Peptide synthesis, Proteins - classification based on physical and chemical properties and on physiological functions.
2.4 Primary and secondary structures of proteins - Helical and sheet structures, tertiary and quaternary structure. Denaturation of proteins.

Unit III: (12 Hours)

3.1 Nucleic acids – nucleoside, nucleotide, types of nucleic acids – RNA and DNA – structures and differences
3.2 Sequencing of DNA, synthesizing an oligonucleotide array
3.3 DNA replication, transcription and translation - protein synthesis.
3.4 Introduction to lipids, classification, oils and fats, common fatty acids present in oils and fats, Trans fats.

Unit IV: (12 Hours)

4.1 Terpenes - classification, isoprene rule, source and structural elucidations of citral
4.2 Source and structural elucidations of geraniol and α – pinene.
4.3 Alkaloids - classification, general methods of isolation and general methods of structural determination, source and structural elucidation of coniine.
4.4 Source and structural elucidation of piperine and nicotine.

Unit V: (12 Hours)

5.1 Carotenoids- introduction and general methods of structural determination.
5.2 Anthocyanins- introduction and general methods of structural determination.
5.3 Flavones- source, isolation, separation, purification, properties and structural elucidation of flavone.
5.4 Vitamins- source, classification, structural elucidations of Ascorbic acid and thiamine.

Books for Reference:

1. B.S. Bahl and Arun Bahl, Advanced Organic Chemistry, Sultan Chand &Co., Reprint 2008.
2. K.S.Tewari, S.N.Mehrotra, N.K.Vishnoi, A Text book of Organic Chemistry, 2nd Edition, Vikas Publishing House, 2001.
3. R.T.Morrison and Boyd, Organic Chemistry, 6th Edition, Prentice Hall India Pvt. Ltd., 2001.
4. I.L. Finar, Organic Chemistry, Vol II, 5th Edition, Addison Wesley, 2000.
5. Jerry March, Reaction, Mechanism and Structure, 4th Edition, John Wiley and Sons, 1992.
6. A.K.Bansal, A Textbook of Organic Chemistry, New Age International Pvt. Ltd., 1990.
7. P.L.Soni, Text book of Organic Chemistry, 25th Edition, Sultan and Chand, 1992.
8. M.K. Jain and S. C. Sharma, Modern Organic Chemistry, 1st Edition, S. Chand & Co 2004.
9. David L. Nelson and Michael M. Cox, Lehninge Principles of Biochemistry, 3rd Edition, Macmillan Worth Publishers, 2002.
10. Stryer, Jeremy M. Berg, John. L Tymoczko, Lubert, Biochemistry, 5th edition, International Edition, 2002.
11. O.P.Agarwal, Chemistry of Natural Products Vol I, 26th Edition, Goel Publication House, 2000.
12. O.P.Agarwal, Chemistry of Natural Products Vol II, 24th Edition, Goel Publication House, 2001.
13. Gurdeep Chatwal, Organic Chemistry of Natural Products, Vol. I, Himalaya Publishing House, Reprint, 2003.
14. Gurdeep Chatwal, Organic Chemistry of Natural Products, Vol. II, Himalaya Publishing House, Reprint, 2003.

SEMESTER VI – MAJOR ELECTIVE III A

UECHE19 - PHARMACEUTICAL CHEMISTRY

Objectives:

- To give basic knowledge of the different terms used in pharmaceutical chemistry.
- To know the examples, their actions, chemical compositions and uses of various drugs.
- To study in detail the causes, symptoms and preventive measures of certain diseases.

Unit I: (15 hours)

1.1 Definition of the following terms - drug, nature and sources of drugs, pharmacy, pharmacodynamics, pharmacokinetics, pharmacology, molecular pharmacology, pharmacophore, toxicology, bacteria, virus, difference between bacteria and virus, fungi, vaccine.

1.2 Causes, symptoms and drugs for anaemia, jaundice, cholera, malaria and filaria, dengue fever, chikungunya, typhoid.

1.3 Diagnostic test for sugar, salt and cholesterol in blood and urine.

1.4 Indian medicinal plants - medicinal uses and chemicals present in neem, keezhanelli, mango, adathoda, thoothuvalai, hibiscus, rose, tulsi, turmeric, curry leaves, ficus.

Unit II: (15 hours)

2.1 Sulphonamides – definition, synthesis and therapeutic uses of -prontosil, sulphathiozole, sulphafurazole, sulphapyridine, SAR of prontosil.

2.2 Antibiotics – definition, conditions, classifications. Properties, therapeutic uses and structure activity relationship of penicillin and streptomycin.

2.3 Properties, therapeutic uses and structural activity relationship of chloramphenicol, tetracyclines.

2.4 Antiseptics and disinfectants- definition and distinction, phenolic and chloro compounds.

Unit III: (15 hours)

3.1 Analgesics – definition, narcotic: natural, morphine and its derivatives, uses, SAR of morphine. Synthetic - pethidine , methodone, morphinan, benzomorphan – disadvantages and uses.

3.2 Non-narcotic analgesics - salicylic acid and its derivatives, para-aminophenol derivatives, pyrazole derivative, indolyl and aryl acetic acid derivatives, ibuprofen, ketoprofen – therapeutic uses and adverse effects.

3.3 Anaesthetics – definition, characteristics, classifications. Volatile general anaesthetics - ether, vinyl ether, chloroform, halothane, trichloroethylene, ethylchloride, nitrous oxide, cyclopropane – advantages and disadvantages.

3.4 Non-volatile general anesthetics - thiopental sodium, methohexitone, propanidid. Local anesthetics: requisites, natural- cocaine. Synthetic - benzocaine, procaine-uses, side effects.

Unit IV: (15 hours)

4.1 Cancer: definition, causes, treatment, drugs used (antineoplastics), alkylating agents, antimetabolites, plant products.

4.2 AIDS – causes, symptoms, prevention, AZT, DDC. Hypoglycemic drugs, diabetes – types – causes, control, insulin- preparation, uses. Oral hypoglycemic agents.

4.3 Anticonvulsant agents - definition, types. Barbiturates, hydantoins, oxazolidenediones, N- bromosuccinimides.

4.4 Blood - grouping, composition, Rh factor. Blood pressure - hypertension and hypotension, treatment.

Unit V: (15 hours)

5.1 Cardiovascular drugs – definition, action, cardiac glycosides, anti arrhythmic drugs – characteristics, classification, example – quinidine, propanol hydrochloride and uses.

5.2 Anti hypertensive agents – aldomet, pentolinium tartrate, reserpine.

5.3 Anti anginal agents – nitrites, dipyridamole, vasodilator, tolazoline hydrochloride, isoxsuprine hydrochloride, sodium nitroprusside, hydrallazine hydrochloride and papaverine.

5.4 Organic pharmaceutical aids- preservatives, properties, common preservatives used. Colouring agents- properties, common colouring agents used. Sweetening agents- properties, common sweetening agents used. Flavouring agents- properties and common flavouring agents used.

Books for Reference:

1. Jayashree Ghosh, A Textbook of Pharmaceutical Chemistry, 1st Edition, S.Chand & Co. Ltd, New Delhi, 2006.
2. Jayashree Ghosh, Fundamental concepts of Applied Chemistry , S.Chand & Co. Ltd, New Delhi, 2006.
3. S. Lakshmi - Pharmaceutical Chemistry, Sultan Chand & Sons, 2nd Edition, 1998.
4. P. Sasikala and D. Gajapathy, Pharmaceutical Chemistry, 1990.
5. Gurdeep Chatwal, Organic Chemistry of Natural Products, Vol. 2 - Himalaya Publishing House, Reprint, 2000.

SEMESTER VI – MAJOR ELECTIVE II B

UECHD19 - POLYMER CHEMISTRY

Objectives:

- To expose the students to the fascinating trends in the field of polymer chemistry.
- To study in detail mechanisms, techniques, characterization and applications of polymers.

Unit I: (15 Hours)

Introduction to Polymer Science: Monomers, Oligomers, Polymers and their characteristics, Polymer structure: Copolymers, Tacticity, Geometric Isomers.
Classification of polymers: Natural synthetic, linear, cross-linked and network, plastics, elastomers, fibres, homopolymers and co-polymers.
Bonding in Polymers: Primary and secondary bond forces in polymers: cohesive energy and decomposition of polymers - Molecular weight and its determination – Chemical and physical methods.

Unit II: (15 Hours)

Mechanism of Polymerization, chain growth polymerization, cationic, anionic, free radical polymerization, coordination polymerization, solution and template polymerization, bulk and block polymerization, electrochemical polymerization.
Stereo regular polymers: Ziegler Natta polymers. Step growth polymers.

Unit III: (15 Hours)

Techniques of Polymerization and Polymer Degradation: Bulk, Solution, Suspension, interfacial, plasma and gas phase polymerization - Types of Polymer Degradation, Thermal degradation, mechanical degradation, photodegradation, Photo stabilizers. Chemical structure determination: Vibrational spectroscopy, Nuclear Magnetic Resonance Spectroscopy.

Unit IV: (15 Hours)

Industrial Polymers: Raw material, preparation, fibre forming polymers, elastomeric material - Thermoplastics- Polyethylene, Polypropylene, polystyrene, Polyacrylonitrile, Poly Vinyl Chloride, Poly tetrafluoro ethylene, nylon and polyester.
Thermosetting Plastics: Phenol formaldehyde and epoxide resin.
Elastomers- Natural rubber and synthetic rubber, Buna -N, Buna-S and Neoprene.
Conducting Polymers: Elementary ideas; examples: poly sulphur nitriles, poly phenylene, poly aniline, poly pyrrole and poly acetylene.

Unit V: (15 Hours)

Introduction to Polymer Processing: Compounding: Polymer Additives: Fillers, Plasticizers antioxidants and thermal stabilizers, fire retardants and colourants.
Processing Techniques: Calendaring, die casting, compression moulding, injection moulding, blow moulding, extrusion moulding and reinforcing.

Books for Reference:

1. R.J. Young and P.A. Lovell., Nelson thornes, Introduction to Polymers, 1st edition, 2004.
2. P.Bahadur & N. V. Sastry, Principles of Polymer Science, 2nd edition, Narosa Publishing House, 2005.
3. G.S. Misra, Introductory Polymer Chemistry, 1st Edition, New Age International Publishers, 1993.
4. Bhatnagar M., A Textbook of Polymers, Vol. I, II & III, S. 1st Edition, S. Chand & Co., 2004.
5. Banerji (Samir K) ,A Textbook of Polymers, Vol I, 2nd Edition, 2003.

SEMESTER VI – MAJOR ELECTIVE III B

UECHF19 - APPLIED CHEMISTRY

Objective:

- To impart knowledge on biological, dairy, leather, soil and dye chemistry .

Unit I: (15 Hours) - Biological Chemistry

Elementary treatment of digestion and absorption of carbohydrates, proteins and fats - Elementary treatment of enzymes, cofactors, prosthetic groups and theory of enzyme action - Physiological functions of adrenaline, thyroxin, oxytocin, insulin and sex harmones - Micronutrients and their biological role in human systems.

Unit II: (15 Hours) - Dairy Chemistry

Milk - Definition, Physicochemical properties of milk, constituents of milk and their physicochemical properties, chemical change taking place in milk due to processing parameters- boiling, pasteurization, sterilization and homogenization - Definition and composition of creams, butter, ghee and ice creams - Milk powder - definition, need for making powder - Principles involved in drying process- spray drying and drum drying.

Unit III: (15 Hours) - Leather Chemistry

Introduction, chief process used in leather manufacture, structure of hide and skin, leather processing - process before tannage - tanning process- vegetable tanning and chrome tanning. Tannery effluent and by product problems and treatment

Unit IV: (15 Hours) - Soil Chemistry

Introduction - soil classification, properties of soil, soil water, soil air, soil temperature, soil minerals, soil colloids, soil reaction and buffering, soil pH, soil acidity, soil salinity and alkalinity, soil fertility and soil formation.

Unit V: (15 Hours) - Water Chemistry:

Hardness, degree of hardness, temporary and permanent hardness, scale formation, removal of hardness - Reverse osmosis and ion exchange methods – principle and functions.

Books for Reference:

1. G.R. Agarwal, Kiran Agarwal and O.P. Agarwal, Agarwal's Text Book of Biochemistry, 11th Edition, Goel Publishing House, 2000.
2. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, 1st Edition, S.Chand & Co. Ltd, New Delhi, 2006.
3. Clarence Henry Eckles, Willes Barnes Combs, Harold Macy, Milk and Milk Products, 4th Edition, Tata McGraw Hill Publishing Company Ltd, Reprint 2002
4. B.K.Sharma, Industrial Chemistry, 13th Edition, Goel Publishing House, Reprint 2008.
5. Dilip Kumar Das, Introductory Soil Science,1st Edition, Kalyani Publishers, Reprint 2002.
6. Gurdeep Chatwal, Organic Chemistry of Natural Products, Vol. 2, Himalaya Publishing House, Reprint, 2000.
7. M. Satake, Y. Mido, Chemistry of colour, 1st Edition, Discovery Publishing House, Reprint 2003.

SKILL-BASED ELECTIVE
(For B.Sc. Chemistry)

USCHD619 - FOOD CHEMISTRY

Objectives:

- To impart elementary ideas of various types of food, food additives, food poisons, food adulteration.
- To emphasize the importance of vegetables and fruits.

Unit I (6 Hours)

Food and food adulteration, food types, advantages and disadvantages - Food adulteration - adulteration in food grains, milk, butter, ghee, ice creams and cakes, pepper, turmeric, chilli powder, edible oils, coffee and tea powder, fruits and vegetables - Detection of adulterants by simple analytical techniques.

Unit II (6 Hours)

Food additives - definition, structure , advantages and disadvantages of artificial sweeteners -saccharin, cyclamate and aspartate. Food flavours-esters, aldehydes and heterocyclic compounds and spices - ajwain, aniseed, asafoetida, bay leaves, cardamom, cinnamon, clove. Food colours, emulsifying agents, preservatives and leavening agents-baking powder, baking soda, yeast and antioxidants- propyl gallate, butylated hydroxyl anisole and butylated hydroxyl toluene.

Unit III (6 Hours)

Food poison and beverages - food poisons- pesticides and chemical poisons - First aid for poison consumed victims - Beverages - soft drinks - soda, carbonated drinks, fruit juices, alcoholic beverages- examples and composition - Addiction to alcohol- diseases of liver. De-addiction measures.

Unit IV (6 Hours)

Edible oils - fats, oils, sources of oils, saturated and unsaturated fats, importance of MUFA and PUFA, iodine value, RM value, harmful effects of trans fat, saponification values and their significance. Rancidity- types, hydrolytic and oxidative, test for rancidity, prevention of rancidity.

Unity V (6 Hours)

Vegetables and Fruits - classification, composition, nutritive value of green leafy vegetables, roots and tubers, other vegetables - Pigments - water insoluble and water soluble pigments. Vegetable cookery- preparation, changes during cooking, loss of nutrients during cooking.
Fruits - classification, composition, ripening of fruits, chemical fruit ripening, storage of fruits.

Books for Reference:

1. Lillian Hoagland Meyer, Food Chemistry, 1st Indian Edition, CBS Publishers and Distributors, 1987.
2. Norman W. Desrosier, James N. Desrosier, The technology of food preservation, 4th Indian Edition, CBS Publishers and Distributors, 1987.
3. Norman N. Potter, Joseph H. Hotchkiss, Food science, 5th Edition, CBS Publishers and Distributors, 1996.
4. Vijay Kaushik., Dietotherapy, 1st Edition, Mangal Deep Publications, 2008.
5. B.Srilakshmi, Food Science, 3rd Edition, New Age International publishers, 2005.
6. Seema Yadav, Food Chemistry, 1st Edition, Anmol publications, 2006.

SEMESTER VI – PRACTICAL III

UCCHL19 - PHYSICAL CHEMISTRY PRACTICAL

1. Kinetics

   Determination of the order of the following reactions:
   a) Acid catalysed hydrolysis of an ester (methyl or ethyl acetate)
   b) Persulphate – Potassium iodide reaction kinetics
   c) Iodination of acetone

2. Polarimetry

   * Inversion of Sucrose

3. Molecular weight of a solute

   Rast's method using naphthalene, metadinitrobenzene and diphenyl as solvents

4. Heterogeneous equilibria

   a) * Phenol - water system - CST

5. Effect of impurity – 2% NaCl or succinic acid solutions on CST of phenol-water system - determination of the concentration of the given solution.

6. Determination of transition temperature of the given salt hydrate

   $Na_2S_2O_3.5\ H_2O$, $CH_3COONa.3H_2O$, $SrCl_2.6H_2O$, $MnCl_2.4H_2O$

7. Electrochemistry

   Conductivity
   a) Conductometric titration of a strong acid against a strong base.

8. Potentiometry

   a) Titration of a strong acid against a strong base
   b) Determination of pH

9. To construct the phase diagram of a two component system (Naphthalene-Biphenyl system) by cooling curve method.

   * Not to be given for examination

Continuous Assessment – 40 marks

II C.A. - 50

Average - 25

Performance during regular practicals-10

Regularity in submission of observation note-book and Record –5

I C.A. - 50

CA Examinations – 50 marks

Principle writing -5 marks

Viva-voce - 5 marks

Record - 5 marks

Experiment - 35 marks

1. Kinetics

Graph – 5 marks

Below a factor of 10 – 30 marks

By a factor of 10 – 20 marks

More than the above – 10 mark

2. Molecular weight & Effect of electrolyte

Error up to 10 % - 35 marks

10 – 20 % - 25 marks

20 – 30 % - 15 marks

> 30 % - 10 marks

3. Transition Temperature

Graph -5 marks

Error up to 2^{o}C difference – 30 marks

Error up to 7^{o}C difference –20 marks

Error above 7^{o}C difference – 10 marks

4. Conductivity / Potentiometric titrations /pH

Graph -5 marks

Error up to 10 % - 30 marks

Error up to 15 % - 25 marks

Error up to 20 % - 20 marks

Error above 20 % - 10 marks

(Proportionate marks are reduced for in between % of error)

Semester Practical examination – 60 marks

Principle writing – 5 marks

Viva-voce – 5 marks

Record – 10 marks

1. Kinetics

Graph – 5 marks

Below a factor of 10 – 35 marks

By a factor of 10 – 25 marks

More than the above – 10 mark

2. Molecular weight & Effect of electrolyte

Error up to 10 % - 40 marks

10 – 20 % - 35 marks

20 – 30 % - 20 marks

30 - 10 marks

3. Transition Temperature

Graph -5 marks

Error up to 2^{o}C difference – 35 marks

Error up to 7^{o}C difference –25 marks

Error above 7^{o}C difference – 10 marks

4. Conductivity / Potentiometric titrations /pH

Graph -5 marks

Error up to 10 % - 35 marks

Error up to 15 % - 25 marks

Error up to 20 % - 20 marks

Error above 20 % - 10 marks

(Proportionate marks are reduced for in between % of error)

PRACTICAL IV

UCCHM19– GRAVIMETRIC ESTIMATION

1. Estimation of sulphate as barium sulphate
2. Estimation of barium as barium sulphate
3. Estimation of barium as barium chromate
4. Estimation of lead as lead chromate
5. Estimation of lead as lead sulphate
6. Estimation of nickel as DMG complex

Continuous Assessment – 40 marks

I C.A. - 50

II C.A. - 50

Average - 25

Performance during regular practicals-10

Regularity in submission of observation note-book and Record –5

CA Practical examination – 50 marks

Viva-voce	-5
Record	- 5
≤ 2%	-40 marks
> 2 upto 3%	-30 marks
> 3 upto 4%	-20 marks
>4 %	-10 marks

Semester Practical examination – 60 marks

Viva-voce	-5
Record	-10
≤ 2%	-45 marks
> 2 upto 3%	-35 marks
> 3 upto 4%	-25 marks
>4 %	-15 marks

PRACTICAL V

UCCHN19 – MICRO SCALE ORGANIC ANALYSIS & PREPARATION

1. Organic Preparations

   a) Oxidation (benzaldehyde to benzoic acid)

   b) Hydrolysis (methyl salicylate or ethyl benzoate or benzamide to acid)

   c) Nitration (nitrobenzene to m-dinitrobenzene)

   d) Bromination (parabromoacetanilide from acetanilide)

   e) Benzoylation (betanaphthol to betanaphthyl benzoate)

   f) Acetylation (salicylic acid to aspirin)

2. Organic analysis: Reactions of the following functional groups:

   Aldehyde, ketone, carboxylic acid (mono and di), ester, carbohydrate (reducing and non reducing), phenol, aromatic primary amine, amide (mono and di), nitrocompound and anilide.

   Analysis of organic compounds containing one or two functional groups and characterization with a derivative.

Continuous Assessment – 40 marks

I C.A. - 50

II C.A. - 50

Average - 25

Performance during regular practicals-10

Regularity in submission of observation note-book and Record –5

CA Practical examination – 50 marks

Viva-voce - 5

Record - 5

Preparation - 10 (Quantity-5, Quality-5)

Organic Analysis - 30

Preliminary Tests - 3
Special element - 6
Aliphatic/Aromatic - 3
Saturated/unsaturated - 3
Functional group - 7
Other tests - 5
Derivative - 3

Semester Practical examination – 60 marks

Viva-voce	- 5
Record	- 10
Preparation	- 10 (Quantity-5, Quality-5)
Organic Analysis	- 35
Preliminary Tests	- 3
Special element	- 6
Aliphatic/Aromatic	- 4
Saturated/unsaturated	- 4
Functional group	- 8
Other tests	- 6
Derivative	- 4

B.Sc. COMPUTER SCIENCE

(Effective for the students admitted in the Academic Year 2019 – 2022)

1. Aim of the Course

- To open a channel of admission for computing courses for students, who have done the 10+2 and are interested in taking computing as a career.
- To train the students in basic knowledge in Computer Science, particularly in core areas and in developing application programs.
- To impart sufficient knowledge and skills for writing general application programs
- To enhance logical and reasoning capabilities of students
- To provide experience of Information Technology scenario

2. Eligibility for Admission

A candidate who has qualified in Higher Secondary Examination conducted by the Government of Tamil Nadu or an examination accepted as equivalent thereto with Mathematics as one of the subjects, is eligible for seeking admission to the B.Sc. Computer Science Course.

3. Course Duration

The duration of the course is three academic years consisting of 6 semesters.

The Structure and Scheme of Examination of B.Sc. Computer Science Course is:

Sem	Part	Paper Code	Title	Instr. Hours	Exam Hours		Credits	Marks
					Th	Pr		
I	I	ULTAA15	Tamil Paper – I	6	3	-	3	40+60
	II	UENGA17	English Paper – I	6	3	-	3	40+60
	III	UCCSA19	Programming in C	4	3	-	4	40+60
	III	UCCSB19	Practical – I : C	2	3	-	2	40+60
	III	UCCSC19	Practical – II: Digital Logics and Fundamentals	3	-	3	2	40+60
	III	UAMAA15	Allied I : Mathematics-I	6	3	-	5	40+60
	IV	-	Skill-Based Elective – I	2	2	-	2	40+60
	IV	UVEDA15	Value Education	1	-	-	-	-
Total							**21**	**700**

Sem	Part	Paper Code	Title	Instr. Hours	Exam Hours		Credits	Marks
					Th	Pr		
II	I	ULTAB18	Tamil Paper – II	6	3	-	3	40+60
	II	UENGB17	English Paper – II	6	3	-	3	40+60
	III	UCCSD19	Object Oriented Programming with C++	4	3	-	4	40+60
	III	UAMAB15	Allied II: Mathematics-II	6	3	-	5	40+60
	III	UCCSE19	Practical III: C++	2	-	3	2	40+60
	III	UCCSF19	Practical IV: Microprocessor	3	-	3	2	40+60
	IV	-	Skill-Based Elective – II	2	2	-	2	40+60
	IV	UVEDA15	Value Education	1	-	-	-	-
Total							**21**	**700**
III	I	ULTAC15	Tamil Paper III	6	3	-	3	40+60
	II	UENGC15	English Paper III	6	3	-	3	40+60
	III	UCCSG19	Java Programming	4	3	-	4	40+60
	III	UCCSI19	Data Structures	4	3	-	3	40+60
	III	UANAA15	Allied III: Numerical Analysis I	5	3	-	5	40+60
	III	UCCSH19	Practical V: Programming in Java	2	-	3	2	40+60
	IV	-	Skill-Based Elective III	2	2	-	2	40+60
	IV	UVEDA15	Value Education	1	-	-	-	-
Total							**22**	**700**

IV	I	ULTAD15	Tamil Paper IV	5	3	-	3	40+60
	II	UENGD15	English Paper IV	5	3	-	3	40+60
	III	UCCSJ19	Operating System	4	3	-	4	40+60
	III	UANAB15	Allied IV: Numerical Analysis II	5	3	-	5	40+60
	III	UCCSK19	Practical VI: Linux	3	-	3	2	40+60
	III	UCCSL19	Practical VII: Python Programming	3	-	3	2	40+60
	IV	UNEVS17	Environmental Studies	2	2	-	2	40+60
	IV	-	Skill-Based Elective IV	2	2	-	2	40+60
	IV	UVEDA15	Value Education	1	-	-	-	-
Total							**23**	**800**

Sem	**Part**	**Paper Code**	**Title**	**Instr. Hours**	**Exam**		**Credits**	**Marks**
					Th	**Pr**		
V	III	UCCSM19	Relational Database Management Systems	6	3	-	5	40+60
	III	UCCSO19	Software Engineering	5	3	-	5	40+60
	III	UCCSP19	Data Communications and Networks	5	3	-	5	40+60
	III	UECSA19	Elective - I A: Computer Architecture	5	3	-	5	40+60
	III	UCCSB19	Elective - I B: Computer Graphics					
	III	UCCSN19	Practical VIII: RDBMS	3	-	3	2	40+60
	IV	-	Non-Major Elective - I	3	3	-	2	40+60
	IV	-	Skill-Based Elective -V	2	2	-	2	40+60
	IV	UVEDA15	Value Education	1	-	-	-	-
Total							**24**	**700**

VI	III	UCCSQ19	.NET Programming	6	3	-	5	40+60
	III	UCCSS19	Internet and Web Programming	3	3	-	3	40+60
	III	UECSC19	Elective - II A: Cloud Computing	5	3	-	5	40+60
	III	UECSD19	Elective - II B: Information Security					
	III	UECSE19	Elective - III A: Artificial Intelligence	5	3	-	5	40+60
	III	UECSF19	Elective - III B: Data Mining					
	IV	UCCSR19	Practical IX: .NET	3	-	-	2	40+60
	IV	UCCST19	Practical X: Internet and Web Programming	-	-	2	2	40+60
	IV	-	Non-Major Elective - II	3	2	-	2	40+60
	IV	-	Skill-Based Elective - VI	2	2	-	2	40+60
	IV	UVEDA15	Value Education	1	2	-	2	40+60
Total							**28**	**900**
	V	Extension Activities (90 Hours)					1	
Grand Total							**140**	**4200**

Pattern of Question Paper

Practical - Total Marks 60

- **Practical:** 45 Marks
- **Record:** 10 Marks
- **Viva:** 5 Marks

Theory- Total Marks 100

- Section A (Answer ALL) - 10 x 3 = 30
- Section B (either OR) - 5 x 5 = 25
- Section C (3 out of 5) - 3 x 15 = 45

SBE - Total Marks 60

- Section A (Any 10 out of 15) - 10 x 2 = 20
- Section B
    - **Practical:** 35 Marks
    - **Record:** 5 Marks

NME - Total Marks 60

- Section A (Answer ALL) - 5 x 2 = 10
- Section B (Answer 3 out of 5) 3 x 5 = 15
    - **Practical:** 30 Marks
    - **Record:** 5 Marks

SEMESTER I

UCCSA19 - PROGRAMMING IN C

Objective

To introduce students to the concept of basic programming- thereby reducing the design complexity and increasing the reusability of a component.

Unit I

Algorithm and Flowchart – Basic Techniques: Sum of Two Given Numbers- Swapping Two Numbers - Simple Interest Calculation - Overview of C - Constants and Variables - Data Types.

Unit II

Operators and Expressions - Managing Input and Output Operations - Decision Making and Branching - Decision Making and Looping.

Unit III

Arrays – One Dimensional Array – Predefined Streams – Two Dimensional Array - Character Arrays and Strings - Reading and Writing String – Arithmetic Operation on Characters- Putting Strings together- Comparison of Two Strings-String Handling Functions - Other Features of Strings.

Unit IV

User Defined Functions: Introduction - Defining and Accessing Functions – Function Prototypes – Categories of Function - Passing Arguments – Nesting of Functions.

Unit V

Recursions - Passing Array to Functions-Passing Strings to Functions – Scope-Visibility and Lifetime of Variables - Structures and Unions.

Books for Study

1. Balagurusamy, “Programming in C”, run6th Edition, Tata McGraw Hill Publication, 2012
2. M. G. Venkateshmurthy, “Programming Techniques through C: A Beginner's Companion”, 1st Edition, Pearson India, 2006.

Book for Reference

1. Ashok N. Kamathane-“Programming with C”, Third Edition, Pearson Publication, 2011.

SEMESTER I

UCCSB19 - PRACTICAL - I: C

1. Input and Output Operations.
2. Decision Making Statements.
3. Arrays and Looping Statements.
4. Two Dimensional Arrays.
5. The Concept of Functions.
6. Recursion.
7. Character Arrays.
8. Structures and Unions.

SEMESTER I

UCCSC19 – PRACTICAL II: DIGITAL LOGIC AND FUNDAMENTALS

Objective:

To impart in-depth knowledge of Logic Gates, Boolean algebra, Combinational and Sequential circuits.

Unit I

Number systems - Conversion from one number system to another – Complements - Binary arithmetic - Binary codes - Binary Logic - Logic gates - Truth Tables. Boolean algebra: Axioms – Theorems.

Unit II

Simplification of Boolean Functions - Map Method (up to 5 variables) - Mc Clausky Tabulation Method - Adders – Subtractors - Decoders – Encoders - Multiplexer - Demultiplexer.

Unit III

Design of circuits using decoders/multiplexers - Sequential Logic - RS, JK, D and T flip-flops - Registers - Shift Registers - Serial addition using sequential logic.

Unit IV

1. Verify the truth table of logic gates.
2. Construct the Half Adder Circuit using Logic Gates.
3. Construct the Full Adder Circuit using Logic Gates.
4. Construct the Half Subtractor Circuit using Logic Gates.

Unit V

5. Construct the Full Subtractor Circuit using Logic Gates.
6. Implement the Karnaugh Map method in Sum of Product [SOP] using NAND Gate.
7. Implement the Karnaugh Map method in Product of Sum [POS] using NOR Gate.

Book for Study:

1. Morris M. Mano - Digital Logic Fundamentals – Pearson's Education – 5th edition- 2015.

Books for Reference:

1. Vijendran – Digital Computer Fundamentals, Edition 1 – Lakshmi Publication, 2001.
2. Thomas M.Floyd – Digital Fundamentals, 8th Edition – UBS Publication, 2009.

SEMESTER II

UCCSD19 - OBJECT ORIENTED PROGRAMMING WITH C++

Objective

To introduce students to the concept of object oriented programming. Thereby reducing the design complexity and increasing the reusability of a component.

Unit I

Principles of OOP – Basic concepts – Benefits – Applications – Introduction to C++ – Tokens – Keywords – Identifiers – Variables – Operators – Expressions and Control structures. Functions: Function Prototyping – Parameter Passing in Function – Values Returned by Functions – Inline Functions – Function Overloading

Unit II

Classes and Objects -Constructors and Destructors: Introduction – Types of Constructors – Destructors-Operator Overloading.

Unit III

Inheritance: Types – Virtual Base Classes – Abstract Classes – Constructors in Inheritance.

Unit IV

Virtual functions and Polymorphism: Pointers to Objects – this Pointer – Pointers to Derived Classes – Virtual Functions – Pure Virtual Functions.

Unit V

Mapping Console I/O Operations - Files: File streams – File operations – File pointers – Command Line Arguments-Exception handling.

Book for Study

1. Balagurusamy E., “Object Oriented Programming with C++”, Sixth Edition, Tata McGraw Hill Publication, 2014.

Books for Reference

1. Herbert Schildt, “The complete Reference C++”, Edition IV, Tata McGraw Hill Publication, 2015.
2. Yashawant P. Kanetkar, ” Let Us C++”, Edition II, BPB Publication, 2003.
3. John R. Hubbard, “Programming with C++”, Edition II, Schaum’s Outlines, Tata McGraw Hill Publication, 2009.

SEMESTER II

UCCSE19 - PRACTICAL III: C ++

1. Input and Output Operations.
2. String Manipulations.
3. Inline Functions.
4. Recursion.
5. Function Overloading.
6. Constructors and Destructors.
7. Operator overloading.
8. Inheritance.
9. Virtual Functions and Polymorphism.
10. File concepts.

SEMESTER II

UCCSF19 - PRACTICAL IV: MICROPROCESSOR

Objective:

To study the 8086 Microprocessor the students will understand the arithmetic logic unit its internal registers and most of its instructions are designed to work with 16- bit binary words.

Unit I

8086 Microprocessor: Introduction to Intel processors – Minimum mode and Maximum mode of 8086 – Pin functions of 8086 – 8086 – Architecture.

Unit II

8086 Instruction Set – I: Machine language and Assembly language – Programmer's model of 8086 – The 8086 addressing modes – Data transfer instructions.

Unit III

Arithmetic Instructions – Logic Instructions - Shift Instructions – Rotate Instructions – Compare Instructions – Jump Instructions – Loop Instructions – String Instructions.

Unit IV

1.Write the assembly code in Data Manipulation using 8 Bit.
2.Write the assembly code in Data Manipulation using 16 Bit
3.Write the assembly code to find the largest number in an array.

Unit V

4. Write the assembly code to sort the data in ascending order.
5. Write the assembly code for Block Move.
6. Write the assembly code to reverse array elements.

Books for Study:

1. V.Viyaendran – Fundamentals of Microprocessor: Architecture Programming Interfacing, 2012.
2. Ramesh Gaonkar - Microprocessor Architecture: Programming and Applications with 8085 – Sixth Edition –Penram International Publishing Limited, 2013.1.

Books for Reference:

1. Dr.D.K. Kaushik – An Introduction to Microprocessor 8085 – Dhanpat Rai Publishing Company.
2. Nagoor Kani – MicroProcessor 8086 Programming & Interfacing – RBA Publications, 2004.

SEMESTER III

UCCSG19 - JAVA PROGRAMMING

Objective

This course provides an introduction to object oriented programming (OOP) using the Java programming language. Its main objective is to teach the basic concepts and techniques which form the object oriented programming paradigm.

Unit I

Introduction to Java - Features of Java -Lexical issues Data types - Variables - Operators Type conversion and casting - Control Statements.

Unit II

Arrays - Strings Classes - Objects - Constructors - Overloading method - Access Control - Static and Fixed method - Inner Class - String class - Inheritance - Overriding Method - Using Super Class.

Unit III

Input/output: Exploring Java i/o: The Java I/O classes and Interfaces - File - The Stream Classes - Packages - Access Protection - Importing Packages - Interfaces

Unit IV

Exception Handling: try, catch - Throw and Throws - Finally - Thread - Multithreading: Creating a Thread - Synchronization - Deadlock.

Unit V

The Java Applet and Interface - getDocumentBase() and getCodeBase() - Event Handling - Working with Windows using AWT Classes.

Book for Study

1. Herbert Schildt - "The Complete Reference: Java 2", 10th Edition Tata McGraw Hill Publication, 2018.

Books for Reference

1. C. Muthu, "Programming with Java", 2nd Edition, Tata McGraw Hill Publishing, 2015.
2. E.Balagurusamy, "Programming with Java: A Primer", 4th Edition, Tata McGraw Hill Publication, 2015.

SEMESTER III

UCCSH19 - PRACTICAL V: PROGRAMMING IN JAVA

1. Implementing String manipulation using character Array.
2. Implementing Input and Output Stream.
3. Implementing Packages and Interface.
4. Implementing Exception handling.
5. Implementing Real time application using multithread.
6. Implementing Applet using Graphics class.
7. Implementing AWT controls.
8. Implementing Colors and fonts.
9. To create any applications using Applets and AWT.

SEMESTER III

UCCSI19 - DATA STRUCTURES

Objective

On learning this paper students will gain the knowledge on different types of data along with the structures and its algorithm.

Unit I

Introduction - Data structure operations - Complexity and Time Space of Algorithms - Mathematical Notation and Functions - Algorithmic Notation - Control Structures - Complexity of Algorithms - Sub Algorithms - Variables - Data Types - String Processing: Basic Terminology - Storing Strings - Character Data Type - String Operations.

Unit II

Linear Arrays Representation in Memory - Traversals - Inserting and Deleting - Sorting - Searching - Multidimensional Arrays - Pointer Arrays.

Unit III

Linked Lists: Representation in Memory - Traversing a Linked List - Searching - Garbage Collection - Insertion and Deletion - Headers - TwoWay Lists - Application Stacks - Array Representation - Arithmetic Expressions- Recursion - Queues - Application Circular queues - Priority Queues.

Unit IV

Trees - Binary Trees - Representation in Memory - Tree Traversals - Binary Search Trees - Searching Inserting and Deleting - Path Lengths - General Trees.

Unit V

Graphs - Sequential Representation - Adjacency Matrix - Path Matrix - Heap Sort - Warshall's Algorithm for Shortest Path - Linked Representation - Graph Traversals – Hashing.

Book for Study

1. Seymour Lipschutz, "Data Structures: Schaum's Outline Series", Revised Edition, McGraw Hill Publication, 2011.

Books for Reference

1. Ellis Horowitz,Sartaj Sahni,Susan Andeson Freed, "Fundamentals of Data Structures in C", 2nd Edition, Universities Press Pvt Ltd, ,2018
2. Yashavant P.Kanetkar, " Data Structures through C" , 2nd Edition, BPB Publications, 2003.
3. Alfred V.Aho, John E.Hopcroft, Jeffrey D.Ullman , "Data Structures and Algorithms" , 1st Edition, Pearson Education, 2004.

SEMESTER IV

UCCSJ19 - OPERATING SYSTEMS

Objective

Operating systems are an essential part of any computer system. On learning this paper students will get a clear description of the fundamental concepts of an operating system.

Unit I

LINUX: Introduction, Brief history. Unix Components/Architecture - Features of Unix. - Basic Commands: Directory and File Commands : pwd, ls, cd, cp, mv, rm, mkdir, rmdir, chmod.Full and Relative Pathnames, File and Directory - Naming Conventions. Wildcard Characters ? * [ ] -Ownership and Permission : chmod, chgrp, chown.

Unit II

Shell Programming Language: Naming Shell Programs .Shell Variables and Arguments. - Command Line Arguments - Looping and Conditional Execution: if..then..else..elif..fi, while .. do, for..do..done, for, while, until and case statements, break and continue, true and false commands.

Unit III

System calls - Types of System calls Process Management: Process Concepts - Inter Process Communication - Multithreaded Programming: Multithreading Models. Process Scheduling: Basic Concepts - Scheduling Criteria - Scheduling Algorithms. Deadlock: Deadlock Characterization - Deadlock Avoidance.

Unit IV

Memory Management: Background - Swapping - Contiguous Memory Allocation - Paging -Structure of the Page Table - Segmentation - Virtual Memory Management: Demand Paging - Page Replacement - Thrashing.

Unit V

File System: File Concept - Access methods - Directory Structure - Implementing File Systems: File System Structure and Implementation - Allocation Methods - Free Space Management -- Secondary Storage Structure Disk Structure - Disk Scheduling.
Case Study LINUX and WINDOWS.

Books for Study

1. Behrouz A. Forouzan, Richard F. Gilberg.Thomson, “Unix and shell Programming”, 1st Edition, 2002.
2. Meeta, Tilak & Rajiv, “The ‘C’ Odyssey UNIX - The Open, Boundless C”, First Edition, BPB Publication 1992.
3. Silberschatz Galvin Gagne, “Operating System Principles”, 7th Edition, Prentice Hall, 2011.

Books for Reference

1. Your UNIX the ultimate guide, Sumitabha Das, 2nd Edition, TMH, 2007.
2. UNIX for programmers and users, 3rd edition, Graham Glass, King Ables, Pearson Education.
3. Richard Rosinski, Douglas Host, Kenneth Rosen, Rachel Klee, "UNIX: The Complete Reference", Second Edition, 2007.
4. Andrew S. Tanenbaum, "Operating Systems, Design and Implementation", 2nd Edition, Prentice Hall of India, 2012.

SEMESTER IV

UCCSK19 - PRACTICAL VI: LINUX

1. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
2. Write a shell script that displays a list of all files in the current directory to which the user has read, write and execute permissions.
3. Write a shell script to find the factorial of a given number.
4. Write a C program that makes a copy of a file using standard I/O and system calls.
5. Implement in C the following Linux commands using system calls:
   (a) cat (b) ls (c) mv
6. Write a C program to list every file in a directory, its inode number and file name.
7. Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: ls -l | sort.
8. Write a C program that illustrates suspending and resuming processes using signals.
9. Write a C program that implements a producer-consumer system with two processes (using semaphores).
10. Write a C program that illustrates two processes communicating using shared memory.

SEMESTER IV

UCCSL19 - PRACTICAL VII: PYTHON PROGRAMMING

Objective

Python programming focuses on Introduction to Programming, I/O and Visualization.

Unit – I

Introduction - Numbers and Expressions: Large Integers – Hexadecimals and Octal - Variables – Statements – Functions - Modules, List and Tuples. Working with Strings: Single-Quoted Strings and Escaping Quotes - Concatenating Strings - String Representations, str and repr - input vs. raw_input - Long Strings, Raw Strings, and Unicode String Operations, String Methods.

Unit – II

Dictionary: Dictionary Uses - Creating and Using Dictionaries - The dict Function- Basic Dictionary Operations - String Formatting with Dictionaries - Dictionary Methods Conditionals - Loops: while Loops - for Loops - Treating Over Dictionaries - Some Iteration Utilities - Breaking Out of Loops - else Clauses in Loops Abstraction: Abstraction, Object Classes, Exceptions.

Unit – III

Files and Staff: Opening Files - File Modes - Buffering - Basic file Methods: Reading and Writing - Piping Output - Reading and Writing Lines - Closing Files - Using the Basic File Methods - Iteration over file contents: Doing It Byte by Byte - One Line at a Time - Reading Everything - Lazy Line Iteration with fileinput - File Iterators - Graphical user Interfaces: Basic concepts.

Unit IV

1. Write a Program to implement Calendar, Date and Time.
2. Write a Program to accept the User's first and last name and prints them in reverse order with a space between them.
3. Write a program to iterate over dictionary.
   a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure.
   b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.
   c) Write a program combine lists that combines these lists into a dictionary.
4. Write a unique function to find all the unique elements of a list.

Unit V

5. Write a program read first n lines of a file.

6. Write a program using class variables and instance variable and illustration of the self variable
   a) Robot.
   b) ATM.

7. Write a program for Graphical user Interfaces.
   a) Write a GUI for an Expression Calculator using tk.
   b) Write a program to implement the following figures using turtle.

Book for Study

1. Ljubomir Perkovic, "Introduction to Computing Using Python: An Application Development Focus", John Wiley & Sons, 2012

Books for Reference

1. Martin C. Brown , "Python: The Complete Reference" , McGraw Hill Education, 4th edition March 2018.
2. N. Ryan Marvin, Amo S omondi , "Python Fundamentals", Packet publishing, 2018.
3. Magnus Lie Hetland , "Beginning Python from Novice to professional", A press Pulishers, 3rd Edition, 2008.

SEMESTER V

UCCSM19 - RELATIONAL DATABASE MANAGEMENT SYSTEMS

Objective

On learning this paper students will gain the knowledge of database management with its techniques.

Unit I

File System vs. DBMS Database System Applications View of Data Database language Data Storage & Querying Data Architecture Database Users and Administrators History of Database Systems; Relational Model Structure of Relational Databases Database Schemas Relational Query Languages Relational Operations.

Unit II

Introduction to SQLSQL Data Definition Basic Structure Additional Basic Operations Set Operations Aggregate Functions Null Values Nested Sub queries Modification of the Database; Intermediate SQL Join Expressions Views Transactions Integrity Constraints SQL Data Types and Schemas Advanced SQL Triggers.

Unit III

Database Design and the E_R Model Entity Relationship Model Constraints Removing Redundant Attributes ER Diagrams Reduction to Relational Schemas ER Design Issues Extended ER Features Alternative Notations for Modeling Data; Functional Dependencies - Features of Relational designs Decomposition and Normalisation using Functional Dependencies and Multi valued Dependencies Join dependencies Domain key Normal form.

Unit IV

Storage and File Structure Overview of Physical Storage Media Magnetic disksRAID Tertiary Storage File Organization Organization of records in Files DataDictionary Storage Ordered Indices B+ Tree Index Files.

Unit V

Distributed Databases Homogeneous and Heterogeneous DatabasesDistributed Data Storage Distributed TransactionsCommit Protocols Concurrency Control Object Based Databases - Complex Data types - Structured Types and Inheritance in SQL-Object identity and ReferenceTypes in SQLXMLstructure of XML data XML Document Schema Querying and Transformation.

Book for study

1. Abraham Silberschatz, Henry F.Korth and S.Sundarshan "Database System Concepts", Sixth Edition, McGraw Hill, 2010.

Book for Reference

1. R Elmasri, S.B. Navathe - "Fundamentals of Database Systems", Seventh Edition - Pearson Education/Addison Wesley, 2011.
2. C.J.Date, A. Kannan and S.Swamynathan - "An Introduction to Database System", Eighth Edition - Pearson Education, 2006.

SEMESTER V

UCCSN19 - PRACTICAL VIII: RDBMS

1. Creating data base tables and using data types. Create table Modify table Drop table
2. Practical Based on Data Manipulation Adding data with Insert Modify data with Update Deleting records with Delete
3. Practical Based on Implementing the Constraints NULL and NOT NULL Primary Key and Foreign Key Constraint Unique, Check and Default Constraint
4. Practical for Retrieving Data Using following clauses Simple select clause Accessing specific data with Where Ordered By Distinct and Group By
5. Practical Based on Aggregate Functions AVG -COUNT - MAX -MIN -SUM - CUBE
6. Practical Based on implementing all String functions and Date and Time Functions, union, intersection, set difference.
7. Implement Nested Queries & JOIN operation.
8. Practical Based on implementing use of triggers, cursors & procedures.
9. Make Database connectivity with front end tool VB and Oracle as back end perform Insertion, Deletion and Updation for the following:
    - Staff Information System
    - Electricity Bill Processing System

SEMESTER V

UCCSO19 - SOFTWARE ENGINEERING

Objective

On learning this paper students will gain the knowledge of developing software with its techniques.

Unit I

Introduction-Computer Based System Engineering-Emergent System Properties-System and Their Environment-System Modeling - System Engineering Process-System Procurement -Software Processes: Software Process Models-Process Iteration-Software Design and Implementation-Software Validation-Software Evolution-Automated Process Support.

Unit II

Project Management: Management Activities-Project Planning-Project Scheduling-Risk Management. Software Requirement: Functional and Non Functional Requirements - User Requirements-System Requirements Software Requirements Documents.

Unit III

Requirement Engineering Processes: Feasibility Study-Requirement Elicitation And Analysis-Requirement Validation - Requirements Management. System Model: Context Models -Behavioural Models - Data Models - Object Models.

Unit IV

Architectural Design: Architectural Design Decisions-System Organization-Modular Decomposition Styles-Control Styles - User Interface Design: Design Issues-User Interface Design Process-User Analysis-User Interface Prototyping.

Unit V

Software Testing: System Testing - Component Testing - Test Case Design - Test Automation. Software Cost Estimation: Productivity - Estimation Techniques - Algorithmic Cost Modelling -Project Duration and Staffing.

Book for Study

1. Ian Sommerville, “Software Engineering”, Edition 10, Pearson Education, 2011.

Books for Reference

1. Roger S.Pressman, “Software Engineering: A Practitioner’s Approach”, Edition 7, McGraw Hill, New York, 2016.
2. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Edition 3, Narosa Publication, 2018.

SEMESTER V

UCCSP19 – DATA COMMUNICATIONS AND NETWORKS

Objective

This subject brings the students right to the forefront of the latest advances in the networking field. It uses a bottom up approach by teaching data communications before teaching networking. Updated coverage on newer technology like Wireless Networking is included.

Unit I

Data Communications: Data Networking and the Internet - Data Communications and Networking for Today's Enterprise - Communications Model - Data Communications Networks - The Internet Protocol Architecture - TCP/IP and Internet Based Applications The Need for a Protocol Architecture - The TCP/IP Protocol Architecture - The OSI Model Standardization within a Protocol Architecture - Traditional Internet Based Applications - Multimedia Data Transmission - Concepts and Terminology - Analog and Digital Data Transmission - Transmission Impairments - Channel Capacity.

Unit II

Transmission Media - Guided Transmission Media - Wireless Transmission - Wireless Propagation – Line of Sight Transmission - Signal Encoding Techniques - Digital Data Digital Signals - Digital Data Analog Signals - Analog Data Digital Signals - Analog Data Analog Signals - Digital Data Communication Techniques - Asynchronous and Synchronous Transmission - Types of Errors - Error Detection - Error Correction - Line Configurations.

Unit III

Data Link Control Protocols - Flow Control Error Control – High Level Data Link Control (HDLC) - Multiplexing - Frequency Division Multiplexing - Synchronous Time Division Multiplexing - Statistical Time Division Multiplexing - Asymmetric Digital Subscriber Line - xDSL - Spread Spectrum - The Concept of Spread Spectrum - Frequency Hopping - Spread Spectrum - Direct Sequence Spread Spectrum – Code Division Multiple Access.

Unit IV

Circuit Switching and Packet Switching - Switched Communications Networks - Circuit Switching Networks - Circuit Switching Concepts - Softswitch Architecture - Packet Switching Principles - X.25 - Frame Relay - Asynchronous Transfer Mode - Protocol Architecture - ATM Logical Connections - ATM Cells - Transmission of ATM Cells - ATM Service Categories.

Unit V

Routing in Switched Networks - Routing in Packet Switching Networks - Examples: Routing in ARPANET – Least Cost Algorithms - Congestion Control in Data Networks - Effects of Congestion - Congestion Control - Traffic Management - Congestion Control in Packet Switching Networks - Frame Relay Congestion Control - ATM Traffic Management -ATMGFR Traffic Management.

Book for Study

1. William Stallings, "Data and Computer Communications", 8th Edition , Pearson Education, Inc., 2016.

Books for Reference

1. Andrews S. Tanenbaum , "Computer Networks", 4th Edition , Prentice Hall of India Private Limited, 2011
2. Leon Garcia and Widjaja , "Communication Networks , Fundamental Concepts and Key Architecture ", 2nd Edition, Tata McGraw Hill, 2001.
3. Behrouz A. Forouzan , "Data Communications and Networking" , Fourth Edition, Tata McGraw Hill, 2017.

SEMESTER V

UECSA19 - ELECTIVE I A: COMPUTER ARCHITECTURE

Objective:

This subject brings the students to know computer architecture as well as computer organization and design and to acquire knowledge of digital systems constructed with individual gates and flip-flops.

Unit I

Basic Computer Organization and Design: Instruction codes - Computer Registers - Computer Instructions – Timing and control – Instruction Cycle – Memory – Reference Instructions - Programming the Basic Computer: Introduction – Assembly Language – The Assembler.

Unit II

Program Loops - Programming Arithmetic and Logic Operations – Subroutines – Input-Output Programming Micro programmed Control: Control Memory – Address Sequencing – Micro program Example – Design of Control Unit.

Unit III

Central Processing Unit: Introduction – General Register Organization – Stack Organization – Instruction formats – Addressing Modes – Data Transfer and Manipulation – Program Control – RISC .

Unit IV

Input-Output Organization: Peripheral Devices – Input – Output Interface – Asynchronous Data Transfer – Modes of Transfer – Priority Interrupt – Direct Memory Access .

Unit V

Memory Organization: Memory Hierarchy – Main Memory – Auxiliary Memory – Associative Memory – Cache Memory – Virtual Memory – Memory Management Hardware.

Books for Study:

1. M.Morris Mano – Computer System Architecture, 3rd Edition – Prentice Hall,2013.
2. William Stallings – Computer Organization and Architecture Designing for Performance, 7th Edition, 2006.

Books for Reference:

1. Vincent P. Herring and Harry F. Jordan – Computer System Design and Architecture, 2nd Edition, Pearson Education, 2005.
2. N. Malarvizhi – Computer Architecture and Organization – Eswar Press, 2007.
3. Kai Hwang and Faye A. Briggs – Computer Architecture and Parallel Processing – Tata McGraw Hill International Edition, 1985.

SEMESTER V

UECSB19- ELECTIVE I B: COMPUTER GRAPHICS

Objective

- Understand two dimensional graphics and their transformations.
- Gain knowledge about graphics hardware devices and software used.
- Understand three dimensional graphics and their transformations and to become familiar with clipping techniques.

Unit I

Overview of graphics Systems: Video Display Device - Refresh Cathode-Ray tubes Raster - Scan Displays Random - Scan Displays - Color CRT Monitors -Direct view Storage tubes Flat - Panel Displays Three - Dimensional Viewing Devices - Stereoscopic and Virtual - Reality Systems.

Unit II

Raster - Scan Systems Video Controller - Random - Scan Systems Video Controller - Random-Scan Systems - Input device - Keyboard Mouse - Trackball and Space ball . Joysticks - Data Glove – Digitizers Image Scanners - Touch Panels - Light pens. Voice Systems – Hard - Copy Devices - Line Drawing Algorithms DDA Algorithms - Circle generating Algorithm Properties of Ellipses.

Unit III

Two Dimensional Geometric Transformation: Basic Transformations - Translation - Rotation - Scaling - Matrix Representations and Homogeneous Coordinates - Other Transformations Reflections Two Dimensional Viewing

Unit IV

Three Dimensional Concepts: Three Dimensional Display method - Parallel projection - Depth cueing visible line and surface - Three Dimensional Geometric and modeling Transformations: Translation - Rotation - Scaling - Composite Transformations. Three Dimensional Viewing: Viewing pipeline - Viewing Coordinates - Projections - Parallel Projections - Perspective Projections.

Unit V

Windows to view point coordinate Transformations - Clipping Operations - Point Clipping - Line Clipping - Curve Clipping - Text Clipping - Exterior Clipping. Visible Surface Detection Methods: Classification Visible Surface Detection Algorithms - Back Face Detection - Depth - Buffer Method - A-Buffer Method - Scan line method

Books for Study

1. Donald Hearn, M. Pauline Baker, "Computer Graphics", 2nd Edition, Prentice Hall of India Publication, 2011.
2. Donald Hearn, M. Pauline Baker Warren Carithers, "Computer Graphics with Open GL", 4th Edition, Pearson Publication, 2014.

Books for Reference

1. Apurva A. Desai - "Computer Graphics", 1st Edition, Prentice Hall of India Publication, 2008.
2. ISRD Group - "Computer Graphics", Second edition, McGraw Hill Book Company, 2008.

SEMESTER VI

UCCSQ19 - .NET PROGRAMMING

Objective

To gain knowledge about the methodologies behind ASP.Net and help the students to develop .Net based application using ADO.NET

Unit I

Introduction to ASP.NET: .NET Framework (CLR, CLI, BCL) - ASP.NET Basics - ASP.NET - Page Structure - Page Life Cycle - Controls: HTML Server Controls - Web Server Controls - Web User Controls - Validation Controls - Custom Web Controls.

Unit II

Form validation: Client side validation - Server side validation - Validation Controls: Required Field Comparison Range - Calendar Control - Ad rotator Control - Internet Explorer Control - State Management: View State - Control State - Hidden Fields - Cookies - Query Strings - Application State - Session State.

Unit III

Architecture of ADO.NET - Connected and Disconnected Database - Create Database – Create Connection using ADO.NET Object model - Connection Class - Command Class - Data Adapter Class - Dataset Class - Display data on data bound controls and Data Grid.

Unit IV

Database accessing on Web Applications: Data Binding Concept with web - Creating Data Grid - Binding standard web server controls - Display data on web form using Data Bound Controls.

Unit V

Writing Datasets to XML - Reading datasets with XML - Web Services: Remote method call using XML - SOAP - Web service description language - Building and Consuming a web service - Web Application deployment.

Books for Study

1. Bill Evjen , Devin Rader , Farhan Muhammad, Scott Hanselman Srivakumar, First Edition, “Professional ASP.NET 1.1", Wrox, 2016.
2. Matthew MacDonald TMH, “The Complete Reference ASP.NET”, First Edition, Mcgraw Hill, 2002.

Books for Reference

1. Dino Esposito “Introducing Microsoft ASP .NET 2.0”, First Edition, PHI Publisher.
2. Matthew MacDonald, “Pro ASP.NET 4 in C#”, 4th Edition, A Press, 2010.
3. Kogent Learning Solutions Inc, “ASP.NET 2.0 Black Book”, Platinum Edition, DreamTech Press, 2006.

SEMESTER VI

UCCSR19 - PRACTICAL IX: .NET

1. Write a VB.NET program to design a Calculator.
2. Write a VB.NET program to develop a Quiz Application (Use Timer Control).
3. Write a VB.NET program to generate a bill for a Departmental Store by applying appropriate validation techniques in E-Mail registration form using validation controls.
4. Create a Shopping Web application using image buttons.
5. Create an Employee Payroll application using Master Pages.
6. Create a Banking application with menu option using Data Source Controls to retrieve data from the table.
7. Write a Program to displaying data with the Grid View.
8. Write a Program to implement ad rotator control.
9. Write a Program to View State and Session State.
10. Write a Program to implement Validation Controls**.**
11. Write a Program to implement State Management Techniques.
12. Write a Program to access data sources through ADO.NET.

SEMESTER VI

UCCSS19: INTERNET AND WEB PROGRAMMING

Objectives

- Enhance the programming experience with the help of tools like editors and debuggers that makes JavaScript coding easier and more interactive.
- Develop dynamic and interactive web pages using the powerful tool and server scripting language like PHP.
- Understanding File handling concepts to connect, access, and update a MySQL database.

Unit I: JAVASCRIPT

Introduction - Values - Numbers - Strings - Unary Operators - Boolean Values - Empty Values - Automatic Type Conversion. Program Structure : Expressions and Statements- Bindings - Binding Names - The Environment – Functions - The Console Log Function - Return Values - Control Flow - Conditional Execution - While and Do Loops - Indenting Code - For Loops - Breaking out of a Loop - Updating Bindings Succinctly - Dispatching on a Value with Switch – Capitalization – Comments.

Unit II

Functions - Bindings and Scopes - Functions as Values - Declaration Notation - Arrow Functions - The Call Stack - Optional Arguments - Closure – Recursion - Growing Functions. Data Structures: Objects and Arrays : The Were Squirrel - Data Sets – Properties – Methods - Objects – Mutability - The Lycanthrope's Log - Computing Correlation - Array Loops - The Final Analysis - Further Arrayology - Strings and their Properties - Rest Parameters - The Math Object - Destructuring – JSON.

Unit III: PHP PROGRAMMING

Web Server – Apache - PHP Introduction - PHP Install - PHP Syntax - PHP Variables- PHP Echo / Print - PHP Data Types - PHP Strings - PHP Constants - PHP

Operators - Control Structures - PHP Functions - Directory Functions - File System Functions - PHP Arrays PHP Sorting Arrays PHP Super Global - String Functions - Date and Time Functions-Mathematical Functions - Miscellaneous Functions.

Unit IV

Basic Form Processing (GET And POST Method) - PHP Form Handling - PHP Form Validation - PHP Form Required – URL - E-Mail - PHP Form Complete PHP MYSQL Functions -Connect - Create DB - Create Table- Insert Data - Get Last ID - Insert Multiple - Prepared-Select Data - Delete Data - Update Data - Limit Data - Table Join - Database Driven Application.

Unit V

PHP Arrays Multi-PHP Date and Time - PHP Include-PHP File Handling-PHP File Open/Read - PHP File Create/Write - PHP File Upload-PHP Cookies - PHP Sessions-PHP Filters - PHP Filters Advanced - PHP Error Handling - PHP Exception-COM-DOM-CURL-SOAP

Books for Study

1. Mariji Haverbeke, “Eloquent Javascript, A Modern Introduction to Programming”, Third Edition, Published by No Starch Press, 2018.
2. Julie C Meloni, Sams “Teach yourself PHP, MySQL and Apache”, 6th edition, Sams Publishing, 2012.

Book for Reference

1. Phil Ballard , JavaScript in 24 Hours, 6th Edition, Sams Teach Yourself, 2015.
2. Ed LeckyThompson Steven D. Nowicki Thomas Myer, “Professional PHP6”, Wrox
   Press, Paperback Edition, 2011.
3. VikramVaswani, “How to do Everything with PHP & MySQL, 1st Edition, McGraw Hill, 2005

SEMESTER VI

UCCST19 - PRACTICAL X: INTERNET AND WEB PROGRAMMING

1. Implementing factorial of a number in JavaScript.
2. Animation in JavaScript.
3. Addition and Multiplication of two numbers in JavaScript.
4. Convert the first letter of each word of the sting to Uppercase in JavaScript.
5. Implementing Arrays in JavaScript.
6. Implementing Control Statements and Looping in PHP.
7. Implementing Functions in PHP.
8. Implementing Form Processing (GET & POST) in PHP.
9. Implementing Validation in PHP.
10. Implementing Cookies in PHP.

SEMESTER VI

UECSC19 - ELECTIVE II A: CLOUD COMPUTING

Objective

- To introduce the broad perceptive of cloud architecture and model
- To understand the concept of Virtualization and design of cloud Services
- To understand the concept of Cloud security

Unit I

Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

Unit II

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.

Unit III

Cloud Computing and service models- Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Public Cloud Platforms: GAE, AWS, and Azure.

Unit IV

Parallel and Distributed Programming Paradigms – MapReduce, Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim.

Unit V

Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design –Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

Book for Study

1. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud”, Illustrated Edition, O'Reilly, 2009.

Books for Reference

1. John W.Rittinghouse and James F.Ransome, “Cloud Computing: Implementation, Management, and Security”, 1st Edition, CRC Press, 2010.
2. Gautam Shroff, “Enterprise Cloud Computing”, 1st Edition, Cambridge University Press, 2011.
3. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From ParallelProcessing to the Internet of Things”, First Edition, Morgan Kaufmann Publishers, 2012.

SEMESTER VI

UECSD19-ELECTIVE II B: INFORMATION SECURITY

Objective:

To understand the importance of information security and also to enable secure transaction, to establish a good security policy in a business environment.

Unit I

Introduction to Computer Security - information security and network basics - information security and its role in an organization - legal and regulatory issues - government homeland security initiatives and how they impact business and individuals

Unit II

Threats - internal threats – employees – contractors - third parties - external threats – criminals- corporate espionage – hackers - cyber warfare - cyber terrorism - psychology of computer criminals and info-terrorists and associated ethical issues.

Unit III

Cryptography - Secret Key Cryptography - Public Key Cryptography - Key Distribution and Management.

Unit IV

OS Security - Access Control - Vulnerability Analysis - Computer Viruses and Worms.

Unit V

Network Security - TCP/IP Security - Application Level Protocol Security - Web Security - Intrusion Detection.

Books for Study:

1. M. Bishop, Computer Security Art and Science, Addison Wesley.
2. Michael E. Whitman and Herbert J. Mattord , Principles of Information Security , Thomson/Course Technology.

Book for Reference:

1. Christopher King, Ertem Osmanoglu, Curtis Dalton Security Architecture: Design, Deployment and Operations , McGraw-Hill Osborne Media; 1st edition (July 30, 2001).

SEMESTER VI

UECSE19 - ELECTIVE III A: ARTIFICIAL INTELLIGENCE

Objectives

To provide in depth knowledge in the following areas:

- Searching Techniques
- Knowledge Representation
- Learning

Unit I

AI Meaning History of AI Intelligent Agents - Agents and Environments - Good Behavior -- Problem Solving - Uniformed Search Strategies.

Unit II

Solving Problems By Searching Informed Search Strategies: Greedy Best First Search - A* Search - Hill Climbing Search - Genetic Algorithm - Local Search In Continuous Spaces Constraint Satisfaction Problems (CSP) - Backtracking Search and Local.

Unit III

Logical Agents: Knowledge Based Agents - Logic - Propositional Logic - Reasoning Patterns in Propositional Logic - Syntax and Semantics of First Order Logic.

Unit IV

Learning from Observations - Forms of Learning - Inductive Learning- Knowledge in Learning - Explanation Based Learning - Learning using Relevant Information - Inductive Logic Programming.

Unit V

Communication - Communication as Action - Formal Grammar for a Fragment of English - Syntactic Analysis - Augmented Grammars - Semantic Interpretation - Ambiguity and Disambiguation.

Book for Study

1. Stuart Russell Peter Norvig, “Artificial Intelligence - A Modern Approach” Second Edition Pearson Education / Prentice Hall of India 2010.

Books for Reference

1. Nils J. Nilsson, “Artificial Intelligence: A new Synthesis”, First Edition, Harcourt Asia Pvt. Ltd., 1998.
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Third Edition, Tata McGraw Hill, 2017.
3. George F. Luger “Artificial Intelligence Structures And Strategies For Complex Problem Solving”, Third Edition, Pearson Education / PHI, 1997.

SEMESTER VI
UECSF19 - ELECTIVE III B: DATA MINING

Objective

To discover knowledge from Database and to learn techniques of implementing Data Mining.

Unit I

Basic Data Mining Tasks – Data Mining Versus Knowledge Discovery In Databases – Data Mining Issues – Data Mining Metrics – Social Implications Of Data Mining – Data Mining From A Database Perspective. Data Mining Techniques: Introduction – A Statistical Perspective on Data Mining – Similarity Measures – Decision Trees – Neural Networks – Genetic Algorithms.

Unit II

Classification: Introduction – Statistical – Based Algorithms- Distance- Based Algorithms – Decision Tree- Based Algorithms- Neural Network – Based Algorithms – Rule-Based Algorithms – Combining Techniques.

Unit III

Clustering: Introduction – Similarity and Distance Measures – Outliers – Hierarchical Algorithms – Partitional Algorithms - Association Rules: Introduction - Large Item Sets – Basic Algorithms – Parallel and Distributed Algorithms – Comparing Approaches – Incremental Rules –Advanced Association Rules Techniques – Measuring the quality of Rules

Unit IV

Web mining: Introduction – Web content Mining –Crawlers - Web Structure Mining – Web Usage Mining - Spatial Mining: Overview – Primitives – Generalization and specialization – Spatial Rules- Spatial Classification Algorithm.

Unit V

Temporal Mining: Introduction – Modeling temporal events – Time series – Pattern detection – Sequences – Temporal Associations Rules.

Books for Study

1. Margaret H.Dunham - “Data Mining: Introductory and Advanced Topics”, 1st Edition, Pearson Education 2012.
2. Jiawei Han and MichelineKamber - “Data Mining Concepts and Techniques” - Elsevier Fifth Edition, 2009.

Books for Reference

1. Soumendra Mohanty - “Data Warehousing DesignDevelopment and best practices”, First Edition, TataMcGraw Hill, 2005.
2. William H Inmon - “Building the Datas warehousing”, Fourth Edition, Wiley India.
3. Rajan Chattamvelli“Data Mining Methods”, Second Edition, Narosa Publishing House Pvt. Ltd. New Delhi, 2016.

SEMESTER V/VI

USCSEn19 - SKILL BASED ELECTIVE: INTERNET PROGRAMMING

Objectives

- To impart knowledge in designing web pages with text and images.
- To validate and perform actions on web pages through scripting languages.
- To learn and implement XML Concepts.

Unit I

Introduction to HTML: Working with Text in HTML- Working with List - Adding Graphics to HTML Documents - Creating Tables - Working with Links and URLs-Working with HTML Frames

Unit II

Dynamic HTML: Overview of CSS - Font and Text Styles- Color and Backgrounds Attributes in CSS-Border and List-Class - External Style Sheets - Working with DIV and SPAN Tag - XML Overview: Working with Basics of XML-XML Namespaces - DTD-XML Schema - Extensible Style Sheets and XSL Transformation.

Unit III

JavaScript: Introduction to Scripting-Advantages of JavaScript – Basic Programming Techniques - Operators and Expression – Conditional and Super Controlled Loops – Functions in JavaScript - User Defined Functions - Object Model.

Unit IV (Practical)

1. Write a program to design Bio-data using Basic HTML tags.
2. Write a program in HTML to develop a College Website.
3. Write a program to create Time Table preparation using HTML tags.
4. Write a program to create Simple Calculator in Java Script.
5. Write a JavaScript program to Scroll your name in the Scroll bar.

Unit V (Practical)

6. Write a program to create a JavaScript code block using arrays to generate the current date in words.
7. Write a program to display even and odd numbers using Javascript
8. Write a program to flip the text using XML.
9. Write a program to create our department details using CSS.
10. Write a program for food menu in hotel using CSS.

Book for Study

1. Ivan Bayross, “Web Enabled Commercial Application Development Using HTML, DHTML Java Script and PHP”, BPB Publications, 4th Edition, 2010.
2. Paul J. Deitel, Harvey Deitel, Abbey Deitel, “Internet and World Wide Web How to Program”, Edition 5, Pearson, 2011.

Books for Reference

1. Kogent Learning Solutions Inc,”Html5 Black Book: Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP and jQuery”, Dreamtech Press, 2011.
2. Heather Williamson, “XML: The Complete reference”, Indian Edition, Tata McGraw Hill Pub, 2001.
3. Deitel, Nieto, Lin, Sadhu, “XML HOW TO PROGRAM”, 1st Edition, Pearson Education, 2002.

SEMESTER V/VI

USCSFn19 - SKILL BASED ELECTIVE: VISUAL PROGRAMMING USING C#

Objective:

- To understand the various types of applications
- To get expertise in visual programming
- To understand the functionalities of middleware platform

Unit – I

Introduction - C# - Extensible Markup Language (XML) - Introduction to Microsoft .NET - The .NET Framework and the Common Language Runtime - Introduction to Object Technology.

Unit – II

Introduction to C# Applications - Creating a Simple Application in Visual C# Express - Formatting Text with Console.Write and Console.WriteLine - Another C# Application: Adding Integers – Arithmetic - Decision Making: Equality and Relational Operators - Strings and Characters.

Unit – III

Introduction - Classes, Objects, Methods, Properties and Instance Variables - Declaring a Class with a method and instantiating an Object of a Class - Declaring a Method with a Parameter.

Unit – IV

1. Write a C# Program to print "Hello Auxilians!" message.
2. Write a C# Program to print the numbers from 1 to 15 using while loop.
3. Write a C# program to find out the leap years from 1900 to 1950.
4. Write a C# Program to Find Greatest among 2 numbers.

Unit – V

5. Write a C# Program to Swap 2 Numbers.
6. Write a C# Program to Compute Average for the Set of Values.
7. Write a C# program to print Fibonacci series.

Book for Study:

1) Paul Deitel & Harvey Deitel, "C# 2010 for Programmers", Pearson Education, 4th Edition 2011.

2) Ian Griffiths- Matthew Adams- Jesse Liberty- "Programming C# 4.0"- Sixth Edition- O'Reilly- 2010.

SEMESTER V/VI

USCSGn19 - SKILL BASED ELECTIVE: DESIGN AND ANIMATION

Objective

To provide knowledge about the latest computer animations like Photoshop and Flash and enables the students to develop and manage pictures, changing the colors, animation and different Tweening options.

Unit I

Introduction to Multimedia – The Elements of Multimedia System – Using Multimedia: Benefits of using Multimedia - Multimedia Platforms: Multimedia Hardware – System Software – Future Directions. Storage for Multimedia: Choice of Storage – Magnetic Media – Optical Media.

Unit II

Introduction – Bitmaps and Vectors – Toolbox: Selection tools – Painting tools – Editing tools – Retouching Tools – Colours setting. Layers: Working with Layers – Layer Styles – Locking Layers – Merging Layers – Managing Layers Components – Palette.

Unit III

Introduction flash – Basics – Creating objects – Editing objects – Color and text – Symbols and instances – Library – Text Animation – Motion Tweening – Shape Tweening – Motion Guide – Movie Clip – Working with ActionScript.

Unit IV

1. Create an Action in Photoshop.
2. Color Transformation Using Photoshop.
3. Design a Book Cover in Photoshop.
4. Create an Animation using Photoshop.

Unit V

5. Traffic Light Control Using ActionScript in Flash.
6. Create a Slide Show Presentation in Flash.
7. Design a Greeting Card Using Button in Flash.
8. Create a Public Service Awareness Using ActionScript in Flash.

Books for study:

1. Jeffcoate Judith – Multimedia in Practice – Pearson Education, 2009.
2. Photoshop CS6 in Simple Steps Paperback – Kogent Learning Solutions Inc , 2012.
3. Flash CS5 in Simple Steps – Kogent Learning Solutions Inc., Dreamtech Press Publication, 2011.
4. Chris Grover with E.A.Vander Veer-Flash CS4-Pogue Press O'Reilly,2008.

SEMESTER V/VI

SKILL BASED ELECTIVE

USCSHn19 - R PROGRAMMING

Objective

To enrich the students in R programming language and train them in a software environment for statistical computing and graphics supported by the R Foundation for Statistical Computing.

Unit I

Introduction to R, R Studio, Basic Objects: Vector, Matrix, Array, Lists, Data Frames, Functions.

Unit II

Basic Expressions: Assignment Expressions, Conditional Expressions, Loop Expressions. Basic Objects: Object Functions, Logical Functions, Math functions, Numeric Methods Statistical function, Apply – Family Functions.

Unit III

Working with Strings, Working with Data, Meta programming, Object Oriented Programming.

Unit IV

1. Write a program that prints 'Hello World' to the screen.
2. Write a program that asks the user for a number n and prints the sum of the numbers 1 to n
3. Write a program that prints a multiplication table for numbers up to 12.
4. Write a function that returns the largest element in a list.

Unit V

5. Write a function that computes the running total of a list.
6. Write a function that tests whether a string is a palindrome.
7. Implement the following sorting algorithms: Selection sort, Insertion sort, Bubble Sort
8. Implement linear search.

9. Implement binary search.
10. Implement Matrices Addition, Subtraction and Multiplication

Books for Study

1. Kun Ren, “Learning R. Programming, Packt Publishing” - ebooks Account (October 28, 2016).
2. Dr. Mark Gardener, “Beginning R: The Statistical Programming Language”, Paperback, 2013.

Books for Reference

1. Colin Gillespie, Robin Lovelace, “Efficient R Programming: A Practical Guide to Smarter Programming”, O'Reilly Media, 1st Edition (October 25, 2016); eBook (2017-04-10).
2. Daniel Navarro, “Learning Statistics with R”, lulu.com (2015); eBook (University of Adelaide, 2018. Updated Continuously)

SEMESTER I/II

SKILL BASED ELECTIVE

MULTIMEDIA USING FLASH

Objective

To train the students to create powerful animations using the tool Flash. They can build interactive and complex elements that can be embedded in Web pages.

Unit I

Introduction Flash – Basics – Creating Objects – Editing Objects - Colour and Text – Symbols and Instances – Library – Bitmap, Sound and Videos

Unit II

Frames and Layers - Animation Basics – Understanding - Animation – Scenes – Frame by Frame Animation - Text Animation – Motion Tweening - Shape Tweening.

Unit III

Motion Guide – Movie Clips - Making Buttons – Creating Animated Buttons – Creating Linear Videos.

Unit IV

1. Draw an Object using Basic Tools.
2. Draw and Import the symbol and Instances.
3. Create a background using Frame – by – Frame Animation.
4. Create an Animation using Onion skin.

Unit V

5. Planet Rotation using motion Tweening.
6. Text Animation using shape Tweening
7. Creating and editing Buttons with mask.
8. Create a movie using Guide Layer and Tweening.

Books for Study

1. Macromedia Flash 8 for Dummies – Ellen Finkelstein and Gurdy leete – Wiley Publishing, Inc, 2006.
1. Macromedia Flash Mx 2004 For Windows And Mc Intosh: Visual Quickstart Guide, Peachpit Pr, 2003.

SEMESTER III/IV

SKILL BASED ELECTIVE - PHOTOSHOP

Objective

To train the students in photo editing software usage. They can manipulate, crop, resize, and correct color on digital photos.

Unit I

Introduction – Bitmaps and Vectors – Pixels and Resolution – Photoshop screen Environment: Toolbox – Documents size – File Formats – Opening and saving files – File Browser.

Unit II

Toolbox: Selection Tools – Painting tools – Editing tools – Retouching tools – Color Settings.

Unit III

Layers: Working with layers – Linking Layers – Layer styles – Locking Layers – Managing Layer Components.

Unit IV

Palette: Information palette – History palette – Type palette – Brush palette – Path palette – layer palette.

Unit V

1. Convert Black and White Images into Color Images.
2. Apply Rain Effects using Filter tools for a particular image.
3. Enhancing an image using retouching tool.
4. Design a Banner.
5. Creating web page.
6. Creating and modifying text using Mask effect.

Book for Study

2. "Photoshop CS6 in Simple Steps" - Dreamtech Press Publication, Edition 2012.

Books for Reference

1. Brad Dayley , DaNae Dayley , "Adobe Photoshop CS6 Bible", 1st Edition, Wiley, 2012.
2. Easy Adobe Photoshop Elements 4 (Paperback), Kate Binder, 2005.

SEMESTER V/VI

NON MAJOR ELECTIVE

WEB DESIGNING USING DREAMWEAVER

Objective

To train the students in building quality web sites. Develop skills in analyzing the usability of a web site. Learn techniques of responsive web design.

Unit I

Opening the Document Window – Locating the Little Bar – Menu Bar Components – Menu Bar – Toolbar – Status Bar – Design View – Object Panel – Launchers – Property Inspector – Creating a New Site – Local Vs. Remote Site – Designing a Local Site – Creating and Opening a Site – Setting up the Sitting Window – Accessing the Site.

Unit II

Working with HTML Tags - Code Inspector – Quick Tag Editor – Importing HTML – Creating Web Pages: Opening and Closing Pages – Copying and Pasting Test Working with Text and Property Inspector – Working with Background Colors.

Unit III

Leaving Links – Working with Anchors – Working with Image Link – Creating a Email Links.

Unit IV

Definition of a Tables – Creating Tables – Preformatted Tables - Editing a Table – Frames and Frameset: Creating and Editing Frames – Adding Multimedia to a Website.

Unit V

CSS – Applying Style Sheet to a Webpage – CGI – Form – Adding Form in the Project – Creating Layers – Customizing Dreamweaver.

Practical

1. Create and design a webpage for Clipart Gallery.
2. Design an E-Book with appropriate navigation.
3. Create a webpage for online shopping.
4. Create a webpage.
5. Create a webpage using Rollover images and CSS.

Books for Study

1. Candue Garrod, 'Dreamweaver Rapid Web Design", Prentice Hall of India, 2001.
2. Jim Maivald Publisher, "Adobe Dreamweaver CC Classroom in a Book", (2019 Release), First Edition, Adobe Press, 2018.

Books for Reference

1. Hirdesh Bhardwaj, "Web Designing", 1st Edition, Pothi.com, 2016.

SEMESTER V/VI

NON MAJOR ELECTIVE - STATISTICAL PACKAGE FOR SOCIAL SICENCE

Objective

To study the SPSS the students will understand the data analysis, define variables and perform variable manipulation and transformation.

Unit I

SPSS: Introduction – Task Bar and Start Menu – Common Buttons – Commonly used Windows Creating and Editing a Data File – Select Case – Sort Case – Merging Files – Painting Results.

Unit II

Graphs and Charts: Producing Graphs and Charts – Bar Charts – Line Graphs – Pie Charts – Box Plots – Error Bar Charts – Histograms – Scatter Plots – Frequencies.

Unit III

Descriptive Statistics: Normal Distribution Mean, Median, Mode – Variance & Standard Deviation – Skewness & Kurtosis – Maximum, Minimum, Range And Sum – Standard Error.

Unit IV

1. Creating data file, assigning names and value to variables and saving it.
2. Creating data file and find the percentage of subjects in each group.
3. Running a simple analysis to create a frequency table.
4. Creating a new variable based on an existing variable.
5. Creating charts for different Variables.

Unit V

6. Statistical application to obtain central tendency or dispersion values.
7. Editing of tables & charts, fixing tables and charts in word document.
8. Running a simple analysis to create different correlation
9. Running a simple analysis to create different ‘t’ tests.
10. Creating two-way tables and to obtain Chi – Square values.

Book for Study

1. Darren George & Paul Mallery – SPSS for Windows step by step, Pearson Education in South Asia, Eighth edition.

Books for Reference

1. Sabine Landau & Brain S.Everitt - A Handbook of Statistical Analyses using SPSS, A CRC Press Company – 2004
2. Jesus Salcedo, Keith McCormick – SPSS Statistics for Data Analysis and Visualization , 2017

B.Sc. PHYSICS

(Effective for those admitted from the Academic Year 2019 – 2020)

Sem	Part	Paper Code	Title of the Paper	Hours/ Week	Exam		Credits	Marks
					Th	Pr		
I	I	ULTAA15	Tamil Paper – I	6	3	-	3	40+60
	II	UENGA17	English Paper – I	6	3	-	3	40+60
	III	UCPHA19	Properties of Matter and Acoustics	6	3	-	5	40+60
	III	UCPHC19	Practical – I	3	-	-	-	-
	III	UAMAA15	Allied - I: Mathematics - I	6	3	-	5	40+60
	III	-	Skill-Based Elective – I	2	3	-	2	40+60
	IV	UVEDA15	Value Education	1	-	-	-	-
Total							**18**	**500**
II	I	ULTAB15	Tamil Paper – II	6	3	-	3	40+60
	II	UENGB17	English Paper - II	6	3	-	3	40+60
	III	UCPHB19	Thermal Physics and Statistical Mechanics	6	3	-	5	40+60
	III	UCPHC19	Practical – I	3	-	3	4	40+60
	III	UAMAB15	Allied - II: Mathematics - II	6	3	-	5	40+60
	IV	-	Skill-Based Elective –II	2	3	-	2	40+60
	IV	UVEDA15	Value Education	1	-	-	-	-
Total							**22**	**600**
III	I	ULTAC15	Tamil Paper – III	6	3	-	3	40+60
	II	UENGC17	English Paper – III	6	3	-	3	40+60
	III	UCPHD19	Mathematical Methods and Classical Mechanics	6	3	-	5	40+60
	III	UCPHF17	Practical – II	3	-	-	-	-
	III	UACHA316	Allied - III: Chemistry - I	4	3	-	4	40+60
	III	UACHC416	Allied Practical: Chemistry	2	-	-	-	-
	III	-	Skill-Based Elective - III	2	3	-	2	40+60
	IV	UVEDA15	Value Education	1	-	-	-	-
Total							**17**	**500**

Sem	Part	Paper Code	Title of the Paper	Hours/ Week	Exam		Credits	Marks
					Th	Pr		
IV	I	ULTAD15	Tamil Paper – IV	6	3	-	3	40+60
	II	UENGD17	English Paper – IV	6	3	-	3	40+60
	III	UCPHE19	Optics	5	3	-	5	40+60
	III	UCPHF19	Practical – II	3	-	3	4	40+60
	III	UACHB416	Allied - IV: Chemistry - II	4	3	-	4	40+60
	III	UACHC416	Allied Practical: Chemistry	2	-	3	2	40+60
	IV	-	Skill-Based Elective - IV	2	3	-	2	40+60
	IV	UNEVS17	Environmental Studies	2	3	-	2	40+60
	IV	UVEDA15	Value Education	1	-	-	-	-
Total							**25**	**800**
V	III	UCPHG19	Electricity and Magnetism	5	3	-	5	40+60
	III	UCPHH19	Atomic Physics and Spectroscopy	5	3	-	5	40+60
	III	UCPHI19	Basic Electronics	4	3	-	4	40+60
	III	UCPHL19	Practical - III: General Practical	3	-	-	-	-
	III	UCPHM19	Practical - IV: Applied Electronics	2	-	-	-	-
	III	UEPHA19	Elective - I A: Solid State Physics	5	3	-	5	40+60
	III	UEPHB19	Elective - I B: Astro and Plasma Physics					
	IV	-	Non Major Elective - I	3	3	-	2	40+60
	IV	USPHC519	Skill-Based Elective -V	2	3	-	2	40+60
	IV	UVEDA15	Value Education	1	-	-	-	-
Total							**23**	**600**
VI	III	UCPHJ19	Nuclear Physics	5	3	-	5	40+60
	III	UCPHK19	Relativity and Quantum Mechanics	5	3	-	5	40+60
	III	UCPHL19	Practical - III: General Practical	3	3	-	4	40+60
	III	UCPHM19	Practical - IV: Applied Electronics	2	-	3	4	40+60
	III	UEPHC19	Elective - II A: Digital Electronics	5	3	-	5	40+60
	III	UEPHD19	Elective - II B: Material Science					
	III	UEPHE19	Elective - III A: Microprocessor 8085	5	3	-	5	40+60
	III	UEPHF19	Elective - III B: Communication Physics					
	IV	-	Non Major Elective – II	3	3	-	2	40+60
	IV	USPHD619	Skill-Based Elective - VI	2	2	-	2	40+60
	IV	UVEDA15	Value Education	1	2	-	2	40+60
			Total				**34**	**900**
	IV		Extension Activity (90 Hours)				1	-
Total							**140**	**3900**

SEMESTER I

UCPHA19 - PROPERTIES OF MATTER AND ACOUSTICS

Objectives:

- To develop in the minds of the students of the students the sensitivity towards nature and to enable them to see the principles of physics in operation and to teach them the elementary ideas of properties of matter.
- To impart to the students the basic concepts of Elasticity, Surface Tension, Viscosity, Osmosis and to make them realize these concepts in day-to- day life situations
- To make the students to acquire the basic principles of acoustics and ultrasonics.

Unit I:

Basic ideas of elastic moduli – Hooke's law - Work done in stretching and Twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus and moment of inertia using torsional pendulum (with and without mass) - q, n, σ by Searle's method - Compound pendulum – moment of inertia – determination of radius of gyration by graph.

Unit II:

Bending of beams- Expression for bending moment - cantilever - Determination of Young's Modulus by cantilever oscillations-Non-uniform bending- Determination of Young's Modulus by Koenig's method-Uniform bending - Expression for elevation-Experiment to determine young's modulus using pin and microscope – Poisson's ratio – Relationship between the three moduli of elasticity

Unit III:

Surface Tension:

Definition and dimension of surface tension-Excess of pressure – Problems - Relation between curvatures, pressure and surface tension - its application to spherical and cylindrical drops and bubbles – problems - Jaegar's method- Variation of surface tension with temperature

Viscosity:

Viscosity - definition – stream line flow - turbulent flow – Reynold's number _ Searle's Viscometer - Meyer's formula for the rate of flow of a gas through a capillary tube – Poissuille's formula – Comparison of Viscosity using Oswald's Viscometer - Stoke's formula – determination of co-efficient of viscosity.

Osmosis:

Osmosis and osmotic pressure - Laws of osmotic pressure-Determination of osmotic pressure by Berkeley and Hartley method-Osmosis and vapour pressure of a solution-Osmosis and boiling point of a solution – Osmosis and freezing point of a solution.

Unit IV:

Progressive wave-Characteristics of progressive wave - Simple harmonic motion - Expression for free, Damped and Forced oscillations - Expression for velocity and sound in a string - Melde's string- Determination of frequency of the vibrator in transverse and longitudinal mode - Determination of Specific gravity of solid and liquid by Melde's string

Acoustics of Building:

Reverberation Time -Sabine's Formula - Absorption coefficient - Acoustic aspects of halls and auditorium.

Unit V:

Ultrasonics – Characteristic properties of ultrasonic waves- Stationary waves and resonance (half wave length and quarter wave length resonance) – Attenuation-Sources of ultra sound - Piezo electric method – Magnetostriction Method - Low frequency /high intensity applications (Welding, Echo Sounder, sensor for temperature and pressure) - High frequency/ low intensity applications (NDT, Holography) - Different types of scans-Clinical Applications (Obstetrics, Examination of heart) – SONAR

Books for Study:

1. Murugeshan. R.S. - Properties of Matter, 1st Edition- Chand & Co.Pvt Ltd., New Delhi, Reprint 2005.
2. D.S.Mathur - Elements of Properties of Matter, 1st Edition - Shyamala Charitable Trust, New Delhi, 2005.
3. Brijilal & Subramaniyam N. - Properties of Matter, 1st Edition - Vikas Publication House, New Delhi, 2001.
4. Brijilal & Subramaniyam N – Textbook of Sound, 1st Edition - Vikas Publication House, New Delhi, 2005.
5. M.N.Srinivasan - Textbook of Sound – Himalayan Publication, 1991.
6. Brijilal & Subramaniyam N - Waves and Oscillations - Vikas Publication House, New Delhi,1994.

Books for Reference:

1. K.Halliday, R.Resnick and K.S.Krane and J.Walker - Fundamentals of Physics, 6th Edition - Wiley, N.Y., 2001.
2. R.P.Feynmann, R.B., Leighton and M.Stands - The Feynmann Lectures on Physics, Vol 1,2 and 3-Narosa, New Delhi,1998,Vol.1,1st Edition, 1998, Vol 2. 2nd Edition, 1998, Vol.3. 3rd Edition, 2001.
3. Arora C.L - Mechanics and Properties of Matter, 1st Edition - Chand & Co. Pvt. Ltd., New Delhi,1999.

SEMESTER I

UAMAA15 – ALLIED - I: MATHEMATICS – I

Objective:

To induce in the students Love and Zeal for Mathematics

Unit I: **Matrices**

Symmetric, Skew symmetric, Hermitian, Skew Hermitian, Orthogonal, Unitary matrices - Eigen values and Eigen vectors - Cayley-Hamilton Theorem (without proof) - Verification and computation of inverse – Diagonalisation of a matrix.

Unit II: Theory of Equations

Polynomial equations - Irrational roots – Complex roots - Reciprocal equations – Descarte's Rule of signs - Approximation of roots of polynomial equation by Newton's and Horner's methods.

Unit III: Trigonometry

Expansions of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$, $\sin^n\theta$, $\cos^n\theta$ - Expansions of $\sin\theta$, $\cos\theta$, $\tan\theta$ in terms of θ - Logarithm of a complex number.

Unit IV: Differential Calculus

Curvature and radius of curvature in Cartesian Coordinates, Polar Coordinates, p-r equations - Evolutes and Involutes

Unit V: Integral Calculus

Integration by parts-Bernoulli's formula - Reduction formulae $(\sin^n x, \cos^n x, \tan^n x, \operatorname{cosec}^n x, \sec^n x, \cot^n x)$.

Books for Study:

S.Narayanan and others – Ancillary Mathematics – Volumes I, II, III and IV – S. Viswanathan Printers and Publishers Private Limited, 2007.

Books for Reference:

1. T.K.Manikavachogam Pillay and others – Algebra – Volume II – S. Viswanathan Printers and Publishers Private Limited, 2006
2. T.K.Manikavachogam Pillay and others – Differential Calculus - S.Viswanathan Printers and Publishers Private Limited – Volume I, 2007
3. T.K.Manikavachagom Pillay and others – Integral Calculus - S.Viswanathan Printers and Publishers Private Limited - Volume II, 2007
4. P.R. Vittal - Allied Mathematics – Margham Publications - Third Edition, 2002
5. S.G. Venkatachalapathy – Allied Mathematics - Margam Publications.

SEMESTER II

UCPHB19 - THERMAL PHYSICS AND STATISTICAL MECHANICS

Objectives:

- To make the students to understand the day to day applications of thermal physics like thermal conductivity, thermal diffusivity.
- To make the students to understand the concepts of entropy and enthalpy and to know about the manifold applications of thermodynamics.
- To introduce to the students the branch of physics that deals with the study of most probable behavior of assembly of particles.

Unit I:

Thermal Conduction: Coefficient of Thermal Conductivity - Thermal Diffusivity – Rectilinear Flow of Heat along a Bar - Forbe's Method - Thermal Conductivity of Bad Conductors - Lee's Disc Method - Relation between Thermal and Electrical Conductivities – Widemann - Franz Law.

Radiation: Stefan's Law - Derivation of Newton's Law of Cooling From Stefan's Law - Laboratory Determination of Stefan's Constant - Planck's Quantum Theory of Radiation - Deduction of Wien's Law and Raleigh – Jeans Law from Planck's Law - Solar Constants - Temperature of the Sun - Solar Spectrum

Unit II: Thermodynamics - I

Heat Engines- Ideal Heat Engine – Statement of First Law of Thermodynamics - Statement of Second Law – Concept of Entropy –Entropy of an Ideal Gas - Reversible and Irreversible Process and their Entropies - Carnot Theorem – Proof of Carnot Theorem - Internal Combustion Engine - Petrol and Diesel Engines –Efficiency- First Latent Heat Equation and Second Latent Heat Equation

Unit III:Thermodynamics – II

Thermodynamic Scale of Temperature or Work Scale of Temperature and its Relation to Perfect Gas Scale - Entropy Temperature Diagram - Maxwell's Thermodynamic Equations and its Applications - Gibb's Helmholtz Equation - Definition of Free Energy, Enthalpy - Third Law of Thermodynamics - Phase transistion - first order and second order transistion

Unit IV: Low Temperature Physics

Joule Kelvin Effect – Temperature of inversion – Theory of Joule Kelvin effect - Liquefaction of Hydrogen – Liquefaction of Helium - Kammerling One's Method - Helium I and Helium II - Lambda Point- Production of Low Temperature - Adiabatic Demagnetization - Practical Applications of Low Temperature - Refrigerators and Air Condition Machines - Super Fluidity

Unit V: Statistical Mechanics

Definition of Phase Space - Micro And Macro States – Different Types of Ensembles - Definition of Probability - Relation Between Entropy and Probability - Classical Statistics - Maxwell Boltzmann Statistics - Expression For Distribution of Energy By Maxwell Boltzmann Statistics - Quantum Statistics - Fermi Dirac Statistics - Electron Gas - Bose Einstein Statistics - Photon Gas – Comparison of Three Statistics.

Books for Study:

1. Brijilal and Subrahmanyam S. - Heat and Thermodynamics – Chand & Co., New Delhi, Reprint 1998.
2. D.S. Mathur - Heat and Thermodynamics - Sultan Chand & Sons, New Delhi, V Edition, 2005
3. Arora. C.L. – A Textbook of Heat and Thermodynamics - Chand & Co., New Delhi, Reprint 1998.

Books for Reference:

1. A.B.Gupta and H.Roy – Thermal Physics – Books and Allied Pvt. Ltd., Reprint 2005.
2. D.Halliday, R.Resnick and J.Walker – Fundamental of Physics, 6^{th} Edition - Wiley N.Y., 2001.
3. Roy - Thermal and Statistical Physics – S Chand & Co., 2001.
4. R.Murugeshan – Thermal Physics – S.Chand & Co. Publication, Reprint 2004.

SEMESTER II

UCPHC19 - PRACTICAL – I

(All experiments are compulsory)

1. Compound Pendulum – Determination of g and k.
2. q by Non-Uniform Bending – Pin and Microscope.
3. q by Non-Uniform Bending – Optic Lever.
4. Torsional Pendulum – n of a wire (without masses).
5. n by Static Torsion (Mirror and telescope method).
6. Surface tension and interfacial surface tension by drop weight method.
7. Focal Length and Refractive Index of Convex Lens (UV and Conjugate foci method for 'f' and direct reflection method for R).
8. Focal Length and Refractive Index of short focal Concave Lens (Combination method, in contact and out of contact methods for 'f' and direct reflection method for R).
9. Spectrometer - μ of solid prism.
10. Specific heat capacity of a liquid – Method of Mixtures (Barton's correction).
11. Sonometer – Determination of AC Frequency of the given steel wire.
12. Sonometer – Determination of AC Frequency of the given Brass wire.
13. Potentiometer – Calibration of low range voltmeter.
14. Field along the axis of a coil – B_H using deflection magnetometer.
15. Torsional Pendulum – M, n and I (with mass).
16. Lee's Disc – Thermal conductivity of bad conductors and emissivity.
17. Spectrometer - μ of hollow prism.

SEMESTER II

UAMAB15 – ALLIED - II: MATHEMATICS – II

Objective:

To induce in the students Love and Zeal for Mathematics

Unit I: Differentiation of vectors

Scalar and vector point functions, Differentiation of vectors, Differential operators, Directional derivatives, Gradient, Divergence and Curl.

Unit II: Integration of vectors

Line, Surface and Volume Integrals, Statements of Gauss, Green, Stokes- Application and Verification

Unit III: Partial Differential Equations

Formation of Partial Differential equations by eliminating arbitrary constants and arbitrary functions – Solutions of standard types of first order equations – $f(p,q) = 0$;
$f(x,p,q) = 0$; $f(y,p,q) = 0$; $f(z,p,q) = 0$; $f_1(x,p) = f_2(y,q)$; $z = px + qy + f(p,q)$.

Unit IV: Laplace Transformations

Definition - Laplace transforms of standard functions – Inverse Laplace Transforms - Solving ordinary differential equations of second order with constant coefficients using Laplace transforms

Unit V: Fourier Series

Definition - Finding Fourier coefficients for a given periodic function with period 2π - odd and even functions – Half range series.

Book for Study:

S.Narayanan and others – Ancillary Mathematics – Volumes I, II, III and IV – S. Viswanathan Printers and Publishers Private Limited, 2007.

Books for Reference:

1. T.K.Manikavachagom Pillay and others – Ancillary Mathematics Volume I and Volume II - S.Viswanathan Printers and Publishers Private Limited, 2004
2. P.Kandasamy and K.Thilagavathi - Allied Mathematics Volume I and Vloume II - S.Chand and Co, New Delhi, 2004.
3. S.G. Venkatachalapathy - Allied Mathematics - Margam Publications.

SEMESTER III

UCPHD19 - MATHEMATICAL METHODS AND CLASSICAL MECHANICS

Objectives:

- To introduce the students the basic methods of applied mathematics to solve the physical problems that arises in conventional physics such as electricity and magnetism, classical and quantum mechanics and spectroscopy.
- To make the student acquire the mathematical skills in solving the basic numerical problems.

Unit I: Vector algebra and Matrices

Gradient of a scalar field – Physical Interpretation- Line, Surface and Volume integrals – Divergence of a vector function - Curl of a vector function and its physical significance – vector identities - Gauss divergence theorem - Application of vector to hydrodynamics, heat flow in solids, gravitation and electromagnetic field.

Matrices

Introduction to Matrices – Eigen value -Eigen vectors -Characteristics equation of a matrix -Cayley Hamilton's theorem – Diagonalization of matrices.

Unit II: Special function

Beta function – Symmetry property of beta function –Evaluation of beta function – Gamma function – Evaluation of gamma function – Legendre's differential equation and Legendre's function – Generating function of Legendre's polynomial – Orthogonal properties of Legendre's polynomials – Recurrence formulae – Bessel's differential equation – Recurrence formulae.

Unit III: Statistics

Introduction to statistics – Measures of central tendency – Arithmetic mean, Median, Mode – Measures of dispersion, Range, Quartile deviation, Mean deviation, Standard deviation – Measures of skewness – Karl Pearson's coefficient of skewness and Bowley's coefficient of skewness – Distribution models – binomial distribution- Poisson distribution- normal distribution

Unit IV: Classical Mechanics – I

Mechanics for a system of particles – Constraints – Holonomic and non-Holonomic constraints – Degrees of freedom- Generalized coordinates – Principle of virtual work – D'Alembert's principle - Lagrange's equation from D'Alembert's principle –Lagrange's equation for system containing dissipative forces – Application of Lagrange's equation- Atwood's machine – simple pendulum- compound pendulum – Central force- Equation of motion and first integrals.

Unit V: Classical Mechanics – II

Phase space –The Hamiltonian function – Hamilton's equation – Physical significance of Hamiltonian function – Application of Hamiltonian equations – Simple pendulum – Compound pendulum – Poisson's bracket – properties of poisson's bracket – Lagrangian and Hamiltonian of a charged particle.

Books for Study:

1. Sathya Prakash - Mathematical Physics – S.Chand & Sons, Reprint 2006.
2. P.N. Arora, Sumeet Arora – Comprehensive Statistical Methods – S. Chand Publication, 2012.
3. Guptha Kumar - Classical Mechanics – Pragathi Prakashan, 2008.

Books for Reference:

1. B.D. Gupta – Mathematical Physics, 3rd Edition – Vikas Publishing House Pvt. Ltd., 2007.
2. B.S.Rajput – Mathematical Physics – Pragati PrakashanPublication, 2005.
3. H.K.Dass – Mathematical Physics - S.Chand and Co. Ltd., 2007.
4. Herbert Goldstein – Classical mechanics – Narosa Publications, 2001.

SEMESTER III

UACHA316 – ALLIED - III: CHEMISTRY – I

Objectives:

- To help the students understand the concepts in industrial and polymer chemistry.
- To impart knowledge on aromatic compounds and heterocyclic compounds.
- To highlight the importance of chemical kinetics.
- To learn the methods of separation through chromatographic techniques.

Unit I: (12 hours)

Industrial Chemistry: Cement – setting of cement, Glasses – types of glasses, Paints and Adhesives, Fuel gases - natural gas, water gas, semi water gas, carburetted water gas, oil gas and producer gas (composition and uses only), explosives-preparation and applications of TNT, nitroglycerine and dynamite.

Unit II: (12 hours)

Aromatic compounds-Aromaticity-Huckel's rule - examples of benzenoid compounds (benzene, naphthalene, anthracene, pyridine andquinoline) and non-benzenoid compounds (azulene and ferrocene) - Preparation, properties and uses of naphthalene and anthracene - Heterocyclic compounds-preparation, properties and uses of furan, thiophene, pyrrole andpyridine

Unit III: (12 hours)

Chemical Kinetics - Rate of chemical reactions, factors affecting the rate of reaction, Order and molecularity - differences between order and molecularity - Derivations of rate constant for first order reaction and half life period (simple problems) - Measurement of rate of the reaction by volumetric and polarimetric methods - Effect of temperature on reaction rate - Arrhenius equation and energy of activation

Unit IV: (12 hours)

Polymer Chemistry-Introduction, classification of polymers, natural and synthetic rubber, Preparation and uses of polyamide, polyurethane, polyvinyl chloride, polyesters, polyethylene, protein fibres - wool and silk, characteristics of polymers

Unit V: (12 hours)

Chromatography - Principles and applications of column, paper, ion exchange and thin layer chromatography

References:

1. R.D.Madan - Modern Inorganic Chemistry - S.Chand and Co., Reprint 2004.
2. B.R Puri, L. R Sharma, Kalia K. C. - Principles of Inorganic Chemistry - Shoban Lal, Nagin Chand and Co, 29th Edition, 2004.
3. P.L Soni, O.P Dharmarha, U.N Dash - Textbook of Physical Chemistry - S. Chand and Co, Reprint 2000.
4. B. R. Puri, L. R Sharma, M.S. Pathania - Principles of Physical Chemistry – Shoban Lal, Nagin Chand and Co, 41st Edition, 2004.
5. V.Veeraiyan and A.N.S. Vasudevan - Textbook of Allied Chemistry - High Mount Publishing House, 2003.
6. B.SBahl, ArunBahl - Advanced Organic Chemistry - Sultan Chand and Co., Ltd., Reprint 2007.
7. P.L Soni, H.M Chowla - Textbook of Organic Chemistry - Sultan Chand and Sons, 25th Revised Edition, 1992.
8. G.S.Misra - Introduction to Polymer Chemistry - New Age International Pub., 2005.

SEMESTER IV

UCPHE19 – OPTICS

Objectives:

- To make the students understand the dual nature of light through the different branches of optics like Geometrical optics and Physical optics.
- To teach them the aberration in lenses in optical instruments.
- To introduce to them an important application of interference, diffraction and polarization.

Unit I: Geometrical Optics

Convex lens – optic center of the lens – Principal foci and Principal points – Thick lens formula - power of thick lens – defects in lenses – various defects and its minimizing method - Method of minimizing spherical aberration – contact method and out of contact method - Chromatic aberration in lenses – Condition for achromatism of two thin lenses in contact and out of contact- Basic ideas of eyepiece - Ramsden's and Huygen's eyepiece and comparison.

Unit II: Dispersion

Dispersion- Dispersion produced by a thin prism- angular dispersion – dispersive power of a prism – resolving power of a prism – Combination of prisms to produce – dispersion without deviation – deviation without dispersion – achromatic prism – direct vision spectroscope – constant deviation spectrometer – determination of refractive index of the material of small angled prism.

Unit III: Interference

Interference: Interference – condition for interference – theory of interference in reflected system

Interference in thin films: Thin films- air wedge - determination of diameter of a thin wire by air wedge method – test for optical flatness - Newton's rings – Determination of refractive index of a liquid - Michelson's interferometer – theory – application - determination of wavelength and resolution of spectral lines - refractive index of gases - Jamin's and Rayleigh's interferometer – Fabry - Perot interferometer.
Holography: Holography – principle - construction and reconstruction – application

Unit IV: Diffraction

Fresnel's Diffraction: Diffraction - Fresnel's ideas of wave fronts - Fresnel's explanation of rectilinear propagation of light - half period zones – comparison of half period one and convex lens - diffraction at a circular aperture, straight edge.

Fraunhofer diffraction: Fraunhofer diffraction at single slits and double slits - theory of plane diffraction grating – determination of wavelength using grating – Dispersive power of a grating - absent spectra - overlapping spectra - resolving power of a grating – difference between prism and grating - difference between Fresnel and Fraunhofer diffraction.

Unit V:Polarization

Polariszation - Double refraction- Huygens explanation of double refraction in uniaxial crystals – Nicol prism as a polarizer and analyzer – Quarter and half wave plates – production and detection of a plane, circularly and elliptically polarized light – optical activity – Fresnel's explanation - experimental verification - specific rotatory power – determination of specific rotatory power by Laurent's half shade polarimeter - Kerr effect and Faraday Effect- LCDs.

Books for Study:

1. Subramanyam, Brijlal – A Text of Optics – S.Chand & Co. Ltd., 2006.
2. Murugesan R – Optics and Spectroscopy - S.Chand & Co. Ltd., 2005.

Books for Reference:

1. Khanna D.R, Gulati H.R. - Optics - S.Chand and Co. Ltd., Reprint 2002.
2. Raj M.G. - Fundamentals of Optics – Anmol Publications Ltd., New Delhi, 1996.
3. C.L.Arora – Optics, 1st Edition - S.Chand and Co. Ltd., New Delhi, 1999.
4. Eugene Hecht - Optics, 4th Reprint – Pearson Education Publication, 2004.

SEMESTER IV

UCPHF19 - PRACTICAL – II

(Any 17 experiments)

1. Bifilar Pendulum.
2. Young's modulus of the beam-Uniform bending – Pin and Microscope.
3. Young's modulus of the beam-Uniform bending – Optical lever.
4. Young's modulus by cantilever – Mirror and Telescope method.
5. Surface Tension – Capillary rise method – Radius by Mercury Pellet method.
6. Sonometer – Specific gravity of Solids and Liquids.
7. Melde's String – Frequency of Vibrator.
8. Melde's String-Specific gravity of Solids and Liquids.
9. Air wedge- Determination of thickness of a thin wire.
10. Specific heat capacity of a liquid –Newton's law of cooling
11. Spectrometer – i-d curve.
12. Spectrometer - grating – normal incidence – standardization – wavelength of mercury lines.
13. Spectrometer – grating – Minimum deviation – wavelengths of mercury lines.
14. Potentiometer – Calibration of ammeter.
15. Potentiometer – Resistance and Specific resistance.
16. P.O Box- Measurement of temperature and co-efficient of Resistance.
17. Figure of Merit - Aperiodic Galvanometer.
18. Determination of M and B_H using deflection and vibration magnetometers – Tan A and Tan B position.

SEMESTER IV

UACHB416 – ALLIED – IV: CHEMISTRY – II

Objectives:

- To help the students understand the concepts in coordination and medicinal Chemistry.
- To throw light on stereochemistry.
- To highlight the importance of electrochemistry and photochemistry.
- To impart knowledge on solid state chemistry.

Unit I: (12 hours)

Co-ordination Chemistry - Nomenclature of simple complexes - Theories of Werner and Pauling - Examples and effects of chelation- Chemistry of EDTA, haemoglobin and chlorophyll - Applications of complexes in qualitative and quantitative analysis

Unit II: (12 hours)

Stereo Chemistry- Elements of symmetry, R-S notation (one asymmetric carbon atom), E-Z nomenclature, isomerism of tartaric acid and lactic acid – racemisation and resolution - Geometrical isomerism of maleic and fumaric acids - Keto-enoltautomerism.

Unit III: (12 hours)

Electrochemistry - Ionic equilibria – strong and weak electrolytes, acid – base, common ion effect, pH, buffer solutions and buffer action in biological systems and salt hydrolysis (definition, examples and equations only – no derivations) - Electrophoresis, electro osmosis, electro dialysis - Corrosion: Types of corrosion, Prevention.
Note: Numerical problems wherever possible.

Unit IV: (12 hours)

Photochemistry – Laws of light absorption – Lambert's law and Beer Lambert's law (Statements only) - Laws of photochemistry- Grotthus – Draper's law and Stark – Einstein's law of photochemical equivalence - Quantum yield - Examples of photochemical reactions – hydrogen and chlorine reaction, photosynthesis - Phosphorescence, Fluorescence, Chemiluminescence and photosensitization – definition with examples

Unit V: (12 hours)

Solid state – Differences between crystalline and amorphous solids, Elements of symmetry, space lattice and unit cell, Bravais lattices, Law of rational indices, Miller indices, Weiss indices, Bragg's equation, X-ray diffraction technique, simple cubic, body centred cubic(CsCl) and face centred cubic (NaCl) lattices

Books for Reference:

1. R.D.Madan - Modern Inorganic Chemistry - S.Chand and Co., Reprint 2004.
2. B.S Bahl, Arun Bahl - Advanced Organic Chemistry - Sultan Chand and Co., Ltd, Reprint 2007.
3. B.R Puri, L. R Sharma, Kalia K. C. - Principles of Inorganic Chemistry – Shoban Lal, Nagin Chand and Co, 29th Edition, 2004.
4. P.L Soni, O.P Dharmarha, U.N Dash - Textbook of Physical Chemistry - S. Chand and Co, Reprint 2000.
5. V.Veeraiyan and A.N.S. Vasudevan - Textbook of Allied Chemistry - High Mount Publishing House, 2003.

6. Jayashree Ghosh - A Textbook of Pharmaceutical Chemistry - S.Chand and Company Ltd., Reprint 2005.
7. K.S.Tewari - A Textbook of Organic Chemistry - Vikas Publishing House Pvt. Ltd., 1998, Reprint 2001.
8. A.R. West - Solid State Chemistry and Its Applications - John Wiley, Reprint 2011.

UACHC416 – ALLIED PRACTICAL: CHEMISTRY

I. Volumetric Analysis:

1. Estimation of sodium hydroxide using standard carbonate.
2. Estimation of HCl using standard oxalic acid.
3. Estimation of oxalic acid using standard sulphuric acid.
4. Estimation of borax using standard sodium carbonate.
5. *Estimation of temporary and permanent hardness of water.
6. Estimation of ferrous sulphate using standard Mohr's salt solution.
7. Estimation of oxalic acid using standard ferrous sulphate.
8. Estimation of ferrous ion using diphenyl amine as internal indicator.
9. *Estimation of zinc using EDTA – standard $MgSO_4$.

* Need not be given for examination

II. Organic Analysis:

Reactions of aldehyde (aromatic), *ketone (aliphatic and aromatic), carbohydrate, carboxylic acid (mono and dicarboxylic), phenol, aromatic primary amine, amide and diamide.

Systematic analysis of organic compounds containing one functional group and characterization by confirmatory tests or derivatives.

Continuous Assessment – 40 marks

I C.A.
II C.A. - 50
Average - 25
Performance during regular practicals -10
Regularity in submission of observation notebook and Record – 5

Semester Practical examination – 60 marks

Record – 10 marks, Viva Voce – 5 marks

Volumetric Analysis – 25

≤ 2% - 25 marks, 2 – 3% - 20 marks
3 – 4% - 15 marks, > 4% - 10 marks

Organic Analysis – 20

Preliminary Tests – 3, Special Elements – 5, Aliphatic / Aromatic – 2,
Saturated / Unsaturated – 2, Functional Group – 6, Other tests – 2

SEMESTER V

UCPHG19 - ELECTRICITY AND MAGNETISM

Objectives:

- To make the students understand the principles and theory of electrostatics, current electricity, thermo electricity, electromagnetism and alternating current.
- To familiarize the students with different kinds of magnetism such as para, dia, Ferro and anti Ferro magnetism and the various theories of magnetism.

Unit I: Electrostatics

Coulomb's law – Permittivity of free space – Relative permittivity – Gauss Law – applications of Gauss Law – Electric field due to a uniformly charged sphere – Electric Potential – electric potential as line integral of electric field – Relation between electric potential and electric field – Potential due to a uniformly charged conducting sphere – Electric dipole – dipole moment – Electric Potential and Electric field due to a dipole – Poisson's and Laplace's equations.

Unit II: Capacitors & Thermoelectricity

Capacitance – Definition - Principle – Energy of a charged capacitor – Loss of energy on sharing of charges – Force of attraction between the plates of a charged capacitor – Electrometers - Theory of quadrant electrometer – Measurement of potential and dielectric constant – Heterostatic and Idiostatic uses.

Thermoelectricity – Seeback effect - Expression for Peltier and Thomson Co-efficient – Thermo-electric diagrams and its uses –Maxwell's thermodynamics of thermocouple - Potentiometer – principle - Emf of thermocouple using Potentiometer.

Unit III: DC and AC circuits

Transient current (DC) – Growth and decay of current in a circuit containing inductance and resistance (LR) – Growth and decay of charge in a circuit containing capacitance and resistance (CR) – Determination of high resistance by leakage – Growth and decay of charge in LCR circuit – Conditions for oscillations – Alternating current – Peak, average and RMS values of AC voltage – Power factor and current values in an AC circuit containing LCR – Series resonant circuit – sharpness of resonance – Power in AC circuit.

Unit IV: Electromagnetism

Biot and Savart's law (Vector treatment) - Magnetic induction due to a circular coil carrying current – Force on a current carrying conductor placed in a uniform magnetic field – Moving coil Ballistic Galvanometer – Construction and theory – Damping correction - Conditions for dead beat – Experimental method for figure of merit – Absolute capacity of a capacitor – Comparison of capacitances - Comparison of EMFs of cells - Self inductance and Mutual inductance - self inductance of a long solenoid – mutual inductance of co-axial solenoids – Eddy current and its uses.

Unit V: Magnetism

Magnetic Induction (B) – Magnetization (M) – Magnetic susceptibility - Permeability – Relation between B, H and M – Hysteresis loss - Experiment to draw M-H curve (hysterisis-horizontal model) – Importance of hysterisis curves - Ferrites.

Properties of dia, para and ferro magnetic materials – Langevin's theory of dia and para magnetism – Weiss theory of ferro magnetism.

Books for Study:

1. R.Murugeshan – Electricity and Magnetism – S.Chand & Co. Ltd., New Delhi, 2009.
2. D.N. Vasudeva – Electricity and Magnetism – S.Chand & Co. Ltd., New Delhi, 2009

Books for Reference:

1. David J.Criffittts – Introduction to Electro Dynamics – Prentice Hall of India Pvt. Ltd., New Delhi 2002
2. Duggal B.D. and Chabra C.L – Fundamentals of Electricity and Magnetism – Shoban Lal Nagin.Chand & Co. Jallundui, Delhi, 1997
3. Halliday D., R.Resnich and J.Walker – Fundamentals of Physics, 6th Edition - Wiley New York, 2001.
4. Tayal D.C. - Electricity and Magnetism – Himalayan Publishing House, Bangalore, 1999.
5. Tewari K.K. – Electricity and Magnetism – S.Chand & Co. Ltd., New Delhi, 2001.

SEMESTER V

UCPHH19 - ATOMIC PHYSICS AND SPECTROSCOPY

Objectives:

- To provide the students with basic ideas of properties of atoms and ions when subjected to
- Electric and magnetic fields.
- To make the students to acquire the knowledge about the salient features of vector atom
- Model and to explain to them the fine structure of spectral lines.
- To provide a brief understanding of the principles of Spectroscopy.

Unit I: Positive Ray Analysis

Positive rays – Properties-e/m of positive rays-Thomson's parabola method - Aston's and Dempster's mass spectrograph – Critical potentials (ionization and excitation potential) - Experimental determination of critical potentials-Frank and Hertz experiment-Davis and Goucher's experiment.

Unit II: Photo Electric Effect

Photo electric emission-laws-Lenard's experiment-Richardson and Compton experiment-Einstein's photoelectric equation – Experimental Verification of Einstein's photoelectric equation by Millikan's experiment-photoelectric cells - photo-emissive cell - photo-voltaic cell - photoconductive cell - applications of photo electric cell.

Unit III: Vector Atom Model

Sommerfeld atom model - Vector Atom Model - Spatial Quantization – Electron spin - Various quantum numbers - Coupling scheme - L-S and j-j Couplings-Pauli's Exclusion Principle - Electronic configuration of elements and periodic classification - Magnetic dipole moment of electron due to orbital and spin motion- Bohr magnetron - Stern and Gerlach experiment - Spin Orbit Coupling.

Unit IV: Fine Structure of Spectral Lines

Spectral terms and notations - Selection rules - Intensity rule and interval rule - Fine structure of Sodium D lines - Spectrum of Helium - Zeeman effect (experimental arrangement for the normal Zeeman effect) - Larmor's theorem - Debye's explanation of normal Zeeman effect - Anamalous Zeeman effect-Theoretical explanation - Lande's g factor and explanation of splitting of D1 and D2 lines of sodium – coalescence of spectral lines.

Unit V: Spectroscopy

Spectrum - Emission and absorption spectra - Types of emission spectra - Types of Absorption Spectra - Electromagnetic spectrum - Laws of Absorption - UV rays -Sources of UV – detection – IR rays - Sources – Detection - Double Beam Spectrophotometer - Scattering of light - Rayleigh's scattering - Raman effect - Experimental study of Raman effect - Quantum theory of Raman effect - Comparison of Raman and IR Spectra.

Books for Study:

1. N.Brijial & N.Subrahmanyam - Atomic and Nuclear Physics - S.Chand & Co. Publication, New Delhi, 2006.
2. R.Murugeshan Kiruthiga Sivaprasanth - Modern Physics, First Edition - S.Chand – 2007.
3. S.N.Ghoshal - Atomic Physics - S.Chand & Co. Publication, New Delhi, 2010.
4. B.K.Sharma – Spectroscopy, 20th Edition - GOEL Publishing House, 2007.
5. O.D.Tyagi and M.Yadav - A Textbook of Spectroscopy - Anmol Publications,1996.

Books for Reference:

1. C.L.Arora - Atomic and Moleculant Physics - S.Chand & Co.Publication, New Delhi, 1999.
2. Raj Kumar - Atomic and Molecular Physics, First edition - Campus Books International, 2003.
3. D.K.Jha - Textbook of Atomic Physics - Discovery Publishing House, New Delhi, 2005.
4. V B Patania – Spectroscopy – Campus Books International, 2006.
5. Chang Raymond - Basic Principle of Spectroscopy,4th Edition - Tata McGraw Hill Publication Co. Ltd., New Delhi, 1971.

SEMESTER V

UCPHI19 - BASIC ELECTRONICS

Objectives:

- To present a clear and consistent picture of the internal behavior of semiconductor devices such as diode, transistors, FET, UJT and SCR.
- To give an account of working of semiconductor circuits such as rectifiers, Amplifiers, oscillators, and multivibrators.

Unit I: Semiconductor Devices

Semiconductor: Semiconductors – P-type - PN junction diode – V-I characteristics – Zener diode - Zener diode as a voltage regulator

Rectifier and filters: Half wave and full wave rectifiers – Theory of full wave rectifier - Bridge rectifiers – expression for efficiency and ripple factor for half wave and full wave rectifiers — Filters - Types of filter circuits –Action of filter circuits - π section filter – Diode voltage doubler – Diode voltage multiplier-Clipping and Clamping.

Unit II: Transistors

Transistors: Junction transistors - CB, CE modes - α, β of a transistor

Transistor Amplifier: Transistor amplifier – Methods of transistor biasing - voltage divider method – Two-port representation of a transistor – h-parameters – AC equivalent circuit of a transistor amplifier (common emitter only) – expressions for current gain, voltage gain, input impedance, output admittance and power gain.

RC coupled amplifier – Frequency response curve – Power amplifiers – Classification of amplifiers – class A power amplifier – Push -pull amplifiers - class B power amplifier - Emitter follower.

Unit III: Oscillators

Feedback in amplifier – Positive and negative Feedback – Advantages of negative feedback – Oscillators – Oscillations in tank circuit- Barkhausen criterion – Hartley and Colpitts oscillators – Phase shift and Wien Bridge oscillators – Expressions for thefrequency of oscillation and conditions for oscillations in h parameters.

Unit IV: Special devices

Field effect transistor-JFET – construction and working – Output characteristics – difference between FET and bipolar transistor – Parameters of JFET – MOSFET – Depletion and Enhancement type MOSFETS- Description and working – UJT – construction and working – V-I-characteristics – Silicon controlled rectifier – construction and working – V-I Characteristics.

Unit V: OP-AMP and Multivibrators

Differential amplifier – Differential gain - Common mode rejection ratio (CMRR) – Operational amplifiers – characteristics of an ideal OP-AMP – Expression for voltage gain inverting and non-inverting amplifier– Voltage follower - Summer - Differentiator – Integrator - Multivibrators – Astable - Monostable and Bistable multivibrators using transistors and op- amp

Books for Study:

1. Mehta V.K. – Principles of Electronics, 6th Edition – S.Chand & Co. Ltd., 2003.
2. Badge M.K. Singh S.P. – Elements of Electronics - S.Chand & Co. Ltd., 2002.
3. Subramanyam .A - Applied Electronics – The National Publishing Company, 2006.

Books for Reference:

1. Theraja B.L. Basic Electronics – S.Chand and Co. Pvt. Ltd., 2000.
2. Chattopadhaya – Foundation of Electronics – New Age International Pvt. Ltd., Publishers, New Delhi, 1999.
3. Gupta and Kumar – Hand Books of Electronics, 24th Revised Edition – Pragathi Prakasham, 1998.
4. Theodre F.Bogart – Electric Circuit, 2nd Edition – Glenco Pvt.Ltd., 1996.
5. Puri & Chand – Handbook of Electronics – Anmol Publication, Reprint, 1996.
6. Albert Paul Nalvino – Principles of Electronics, 6th Edition - Tata Mc Graw Hill Publications Co., 1999.
7. Sedha R.S. – Applied Electronics - S.Chand and Co. Pvt. Ltd., 1998.

SEMESTER V

UEPHA19 – ELECTIVE I A: DIGITAL ELECTRONICS AND COMMUNICATIONS

Objectives:

- To learn the basic methods for the design of digital circuits and provide the fundamental concepts used in the design of digital systems.
- To understand the basic principles of Communication and Television

UnitI: Boolean Algebra

Decimal and binary systems – Decimal to binary and binary to decimal conversion – Boolean operations, logic expressions, rules and laws of Boolean algebra – DeMorgan's theorems, Simplification of Boolean expressions using Boolean algebra Techniques – Fundamental products – Sum of products – Karnaugh map – pair, quads and octet.

Logic gates

NOT gate, OR gate, AND gate, NAND gate, NOR gate, EX – OR and EX – NOR gates – NAND and NOR as universal gates.

Unit II: Arithmetic Circuits and Logic Families

Arithmetic circuits – Adders – Half Adder – Full Adder – Subtractor – Half Subtractor – Parallel binary adders – BCD adder - Multiplexers and DeMultiplexers with suitable example – Digital logic family - RTL NOR gate – DTL NAND gate – TTL NAND gate – Charcteristics of TTL family.

Unit III: Flip Flop and Counters , D/A Conversion & A/D Conversion

Flip flops – RS flip flop – clock pulses – clocked RS flip flop – Preset and clear – JK flip flop – Race around condition – JK Master slave flip flop – D flip flop – T flip flop

Counters – Asynchronous counter - 3 bit binary counter – Mod 7 counter - Asychronous counter with feedback – synchronous counters- mod8 parallel counter – combination counter - Decade counter.

D/A conversion: Binary weight – Resistance divider method – Binary ladder method

A/D conversion: Simultaneous conversion

Unit IV: Modulation and Demodulation

Modulation – Amplitude modulation – Mathematical analysis of AM wave – Modulation index (modulation factor) – Power in AM wave – Frequency modulation – Expression for frequency modulated voltage – Demodulation - Ratio Detector – Block diagram of AM transmitting system - AM receiver: Principle of Superhetrodyne receiver - Block diagram of FM transmitting & receiving system

Unit V: Propagation of Radio Waves and Radar

Antenna - Dipole and Folded type Antennas – array of antennas - Propagation of Radio waves – Propagation of ground waves – Space wave propagation – Sky wave propagation – The ionosphere – Effect of ionosphere on propagation of radio waves – Eccles Larmor theory – Skip distance and maximum usable frequency – Fading.

Principle and working of radar - Duplexer – Range equation for radar – Applications of Radar.

Book for Sudy:

1. Malvino and Leech – Digital Principles and Applications, 5th Edition – Tata McGraw Hill, 2002.
2. A.Subramanyam - Applied Electronics –National Publishing Company, 2006.
3. R.Murugeshan Kiruthiga Sivaprasath - Modern Physics – S.Chand, 2007.

Books for Reference:

1. Mano Morris – Digital Logic and Computer Designs, 23rd Edition – Prentice Hall Publication, 2000.
2. R.S. Sedha – A Textbook of Electronics – S.Chand Publication, 2001.
3. Gupta & Kumar - Handbook of Electronics – Pragati Prakasan Publication, 2002..
4. T.L.Floyd – Digital Fundamentals, 3rd Edition – Universal Book Stall, New Delhi, 2002.
5. V.K.Puri – Digital Electronics, 5th Reprint – Tata Mc Graw Hill Publication, 2003.

SEMESTER V

UEPHB19 - ELECTIVE I B: ASTRO AND PLASMA PHYSICS

Objectives:

- To make the students acquaint the knowledge about the solar system, sun, the galaxy
- To provide a brief understanding of the Plasma Physics

Unit I: Theories about solar system and The Sun

Theories on solar system - Geo-centric theory – Helio-centric theory –Kepler's laws of gravitation – Newton's law of gravitation – Basic ideas of the solar system.

The Sun - Temperature distribution near the photosphere – Chromosphere boundary – Solar granulation – Chromospheres – Spicules, plages and filaments – Solar corona – Solar flares - Radio emission from the sun – Solar wind – Syroheliometer.

Unit II: The Stars

Colour Index of stars – Stellar Evolution – Birth of a star – Maturity – Ageing of stars – Death of a star – Types of Stars – Binary, multiple, variable, erupting and exploding stars - Nebulae – Novae – Super Novae – White Dwarfs - Electrons in white Dwarfs – Neutron stars – Pulsars – Quasars – Black holes.

Unit III: Cosmic Rays, The Galaxy and Instrumentation

Cosmic rays - Discovery of Cosmic rays – Latitude effect – Azimuth effect – Altitude effect – longitude effect – Primary cosmic rays – Secondary rays – Cosmic ray showers – Vanallen belts

The Galaxy - Hubble's law – Schematic representation of the general structure of galaxy – The nucleus, the galactic disc and the galactic halo – The black matter.
Astronomical Instruments: Reflecting and refracting telescopes – Radio telescopes – Hubble space telescope (HST).

Unit IV: Basic Concepts of Plasma

Introduction to Plasma – Composition and characteristics of plasma – Collisions – elastic collisions – Inelastic collisions – space plasma – Interstellar space plasma – Earth's atmospheric plasma – Atmosphere of other planets – Nuclear reactions in steller plasma – Proton-Proton cycle.

Unit V: Characteristics and Applications of Plasma

Properties of plasma in a magnetic field – Force on plasma in a magnetic field – Current in magnetized plasma – Collisions in fully ionized magneto-plasmas – pinch effect.

Applications of plasma - Controlled thermonuclear reactions – Heating and confinement of plasma – stellarator and tokamak.

Books for Study:

1. K.S.Krishnaswamy – Astro Physics: A Modern Perspective – New Age International Pvt. Ltd., New Delhi, 2002.
2. G.K.Sasidharan – The Great Universe – S.Chand & Company Ltd., New Delhi, 2008
3. R.Murugeshan Kiruthiga Sivaprasath - Modern Physics – S.Chand & Co. Publication, 2007.

Books for Reference:

1. Baidyananth Basu – An Introduction to Astro Physics – Prentice Hall of India, 2004.
2. V.B.Bhatia – Textbook of Astronomy and Astro Physics with Elements of Cosmology – Narosa Publishing House, New Delhi, 1998.
3. R.R.Danial – Concepts of Space Science – University Press, Reprint 2002.
4. K.Cosmic Kapoor – Space Book – Lotus Press, 2005.
5. Goswami – Elements of Plasma Physics – New Central Book Agency, Reprint 2000.

SEMESTER V

USPHC519 – SKILL-BASED ELECTIVE:

PHYSICS FOR COMPETITIVE EXAMINATIONS

Objectives:

- To make the students familiar with problems in Physics.
- To prepare the students for various Entrance examinations.

Unit I: Mechanics and Waves

Mechanics: Newton's laws of motion and its application Conservative forces and frictional forces -Centrifugal and Coriolis forces– Kepler's laws – Escape velocity and artificial satellite - Gravitational Law and field- Motion under a central force - Moments of Inertia and products of Inertia - Principal moments and axes- Rigid body motion, fixed axis rotations - Bernoulli's theorem – Elasticity

Waves: Waves and Simple Harmonic motion – Lissajous figures- Damped and Undamped oscillators – Wave equation -Resonance – Doppler effect in sound- Ultrasonics and applications.

Unit II: Light

Thick lens formulae - power of a lens - Fermat's Principle – Rayleigh criterion - resolving power of a prism and grating - Conditions for constructive and destructive interferences - Newton's rings - Calculation of radius of curvature – Air wedge – Calculation of bandwidth - Fresnel and Fraunhofer diffraction – Linear, circular and elliptic polarization - double refraction and optical rotation - Specific rotatory power of an optically active substance

Unit III: Electricity and Magnetism

Electric Charge - Coulomb law – Gauss law – Electric potential - Capacitors – Energy stored in a capacitor–Dielectric and polarization- Ampere's law - Biot Savart law – Faraday's laws of electromagnetic induction – Self-inductance – Mutual inductance – Alternating currents - Growth and decay of current and charge in LR circuit – RC circuit – LCR circuit - Magnetic permeability and susceptibility, Dia, para and ferromagnetism, Measurement of susceptibility, Hysteresis loop.

Unit IV: Atomic and Nuclear Physics

Atomic physics: X-ray spectrum – Compton Effect – Compton wavelength - Photoelectric effect – Calculation of DeBroglie wavelength of electrons- wave velocity and group velocity for DeBroglie waves - Uncertainty principle - Pauli Exclusion Principle

Nuclear physics: Mass defect - Binding energy – Radioactive disintegration law – half life – Q value of nuclear reactions – Nuclear fission and fusion

Unit V: Electronics

Semiconductors - Rectifiers – Zener diode as voltage regulator - Transistor as an Amplifiers – Relation between α and β – Feedback amplifier – Oscillators - Amplitude and frequency modulation - OR, AND, NOR and NAND gates – OP amps

Books for Study:

1. D S Mathur – Mechanics – S. Chand Publication, 2001.
2. Brijlal Subramaniyam - Properties of Matter (Unit I) – Eurasia Publication House Pvt. Ltd., 2001
2. Nelkan and Parker – Advanced Level Physics – Heinemann Longmann Education International Publication, 1995. (Unit II)
3. C.L Arora - Simplified Course in B.Sc Physics – S.Chand, 1999. (Unit III)
4. S.L.Kakani – Objective Physics – S.Chand and co. Ltd., New Delhi, 2001. (Unit IV)
5. R.S.Sedha – Basic Electronics – S.Chand Publications, New Delhi, 2006 (Unit V)
6. Dr.N.K.Nayyar - Unique Quintessence of physics – Unique Publishers, 2010.

Books for Reference:

1. Dr.Surekha Singh – UGC CSIR/NET/JRF/SLET – UpkarPrakashan Publishers.
2. Karen Cummings, Priscilla Laws, Edward Redish, Patrick Cooney - Understanding Physics, 6th Edition – Wiley Student Education, 2005.
3. The Pearson Guide to Objective Physics – S.Chand Publishing House, 2007.
4. Sathya Prakash Arya – Objective Physics – MTG Books Publishers, 2007.
5. S.L.Kakani - Objective Physics, 10th Edition - S.Chand Publishing House, 2007.
6. K.C.Jain, C.LArora – Numerical Problems in Physics - S.Chand Publishing House, 2005.

SEMESTER VI

UCPHJ19 - NUCLEAR PHYSICS

Objectives:

- To understand the basic properties of nucleus.
- To expose to the students the processes of Radioactivity, nuclear fission, nuclear fusion and their applications in various fields.
- To introduce a brief account of the elementary particles and cosmic rays.

Unit I: Properties of Nuclei and Nuclear Structure

Introduction – Classification of nuclei – General properties of Nucleus – Binding energy – Mass defect - Packing fraction – Nuclear Stability

Nuclear forces – Meson theory of Nuclear forces –Nuclear models – Liquid drop model – Weizacker's semi empirical mass formula –-Shell model – Evidences for magic numbers – Collective Model

Unit II: Radioactivity

Fundamental laws of radio activity – Laws of radio active disintegration – Mean life – Half life – Measurement of decay constants – Law of successive disintegration – Age of the earth – Biological effects of nuclear radiations.

Discovery of natural radioactivity – Gamow's Theory of alpha decay - Alpha ray spectra – beta decay – Beta decay spectra – Origin of the line and continuous spectrum – Neutrino theory of beta decay – Gamma ray spectra – Origin of gamma rays – Nuclear isomerism .

Unit III : Particle Detectors and Particle Accelerators

Particle Detectors: Geiger Muller Counter –Wilson Cloud Chamber – Bubble Chamber - Scintillation counter - ionization chamber.

Particle Accelarators: Linear Accelerator – Betatron - Synchrocyclotron – Protonsychrotron

Unit IV: Artificial Transmutation of Elements

Artificial transmutation of elements – Nuclear reactions - Q value for a nuclear reaction – types of nuclear reactions – Conservation laws of nuclear reaction – Threshold energy of an endoergic reaction – Discovery of neutron – Detection and properties of neutron – Thermal neutron – Induced radioactivity – Applications of radio isotopes in medicine, agriculture, industry – Carbon dating.

Unit V: Nuclear Fission and Fusion

Discovery – Nuclear fission – Calculation of energy in amu - Energy released in fission - Bohr wheeler's theory of nuclear fission – chain reaction – atom bomb – nuclear reactors – power reactor – Breeder reactor - Nuclear fusion – source of stellar energy - thermo nuclear reaction - carbon – nitrogen cycle, proton – proton cycle –- Hydrogen bomb
Elementary particles – Baryons – Hyperons – leptons – mesons – the quark model.

Books for Study:

1. R.Murugeshan Kiruthiga Sivaprasath - Modern Physics – S.Chand, 2007.
2. M L Pandya & R P S Yadav - Elements of Nuclear physics – Ramnath Meerut Publication, 7th reprint, 2006.
3. D.C.Tayal - Nuclear Physics – Himalaya Publishing House, 2006.
4. B.N. Srivatsav - Basic Nuclear Physics, 17th Edition – Pragathi Prakasham, 2001.

Books for Reference:

1. Nuclear Physics – Narosa Publishing House, New Delhi, 19th reprint, 1998.
2. J.B .Rajam - Nuclear Physics – S.Chand and Co. Pvt. Ltd., Reprint 2000.
3. S.B.Patel – Introduction to Nuclear Physics – New Age International Publication, Reprint 2003.
4. Beiser - Concept of Modern Physics - McGraw Hill Publications Co. Ltd., 2005.
5. C.L.Arora - B.Sc physics: Nuclear Physics – S. Chand & Co.Pvt. Ltd., 1999.
6. G.Chatwal - Nuclear Physics, Vol. I and II – Dominant Publication, 2007.

SEMESTER VI

UCPHK19 - RELATIVITY AND QUANTUM MECHANICS

Objectives:

- To make the students understand the inadequacy of classical mechanics and the birth of quantum mechanics.
- To impart the knowledge about the postulates of quantum mechanics and operators.
- To impart to the students about fundamentals of relativity concepts.

Unit I: Relativity

Inertial and non-inertial frames – Galilean transformation equation – Michelson Morley Experiment – Postulates of special theory of relativity – Lorentz transformation equations – Length contraction – Time dilation – Relativity of simultaneity – Addition of velocities – Variation of mass with velocity – Mass energy relation – Minkowski's four dimensional space – Elementary ideas of general theory of relativity and its significance – Red Shift.

Unit II: Wave Nature of Matter

De Broglie wavelength – Phase velocity and group velocity of de Broglie waves – relationship between phase velocity and group velocity - Experimental study of matter waves – Davisson and Germer's experiment – G.P.Thomson's experiment – wavelength of motion of particles like electron – Electron microscope – Heisenberg's uncertainty principle –γ- ray microscope – Application – Diffraction of electron beam by single slit- Non existence of electrons inside the nucleus – Explanation of Bohr radius – Minimum energy of Simple Harmonic Oscillator.

Unit III: Schrodinger Equation

Wave function – Physical interpretation of wave function -Schrodinger's equation – Time dependent and time independent equation – Eigen value equation- Eigen values and Eigen functions – Postulates of quantum mechanics – Operators for physical quantities – Expectation values – Expectation values of observables – Ehrenfest's theorem

Unit IV: One dimensional Problems

Free particle solution of Schrodinger's equation - Bound state problems: Particle in a box – Wave equation and solution for the particle - Eigen values of energy – Normalization of the wave functions - Simple harmonic oscillator – Square well potential of finite depth – Rectangular potential barrier - Tunneling effect.

Unit V: Spherically Symmetric Potential Problems:

Schroedinger equation in Spherical polar coordinates - Reduction of two body problems in to one body problem – Hydrogen atom – Wave equations for the hydrogen atom - Separation of variables - Azimuthal, polar and Radial wave equations - Solution for Azimuthal and polar wave equation – Rigid Rotator- Moment of inertia of a rigid rotator - Wave equation for rigid rotator and its energy levels- wave functions for the rigid rotator.

Books for Study:

1. R.Murugeshan – Modern Physics – S.Chand Publication, Reprint 2007. (Units I, III)
2. Arthur Beiser – Concepts of Modern Physics – McGraw Hill Publication, 2002.
3. S.P.Singh, M.K.Badge & Kamal Singh – Quantum Mechanics – S.Chand & Co.Ltd., Reprint 2001. (Unit – IV)
4. G.Aruldass – Introduction to Quantum Mechanics – Prentice Hall of India, Reprint 2005. (Unit – IV)
5. D.Devanathan, - Introduction to Quantum Mechanics – Narosa Publications, 2006.
6. Kamal Singh, S.P.Singh – Elements of Quantum Mechanics – S.Chand Publications, 2005.
7. Sathya Prakash – Advanced Quantum Mechanics – S.Chand Publications, Revised Edition, 2012.

Books for Reference:

1. Gupta Kumar Sharma – Quantum Mechanics - Jai Prakash Nath Publications
2. B.K.Agarwal, Aruldha S G – QuantumMechanics – Prentice Hall of India Pvt. Ltd., 2005.
3. Sathya Prakash - Mathematical Physics – S.Chand & Sons, Reprint 2006.

SEMESTER VI
UEPHC19 – ELECTIVE II A: SOLID STATE PHYSICS AND MATERIAL SCIENCE

Objectives:

- To know about the crystal structure, bonding in crystals and some basic crystal growth techniques.
- To understand the polarization mechanisms in dielectric materials.
- To understand the physics behind super conducting materials.

Unit I: Crystal Structure

Crystal lattice-Primitive and unit cell - Seven classes of crystals - Bravais lattice - Miller indices - Structure of Crystals – Simple cubic - Face centered cubic structure - body centered cubic structure - Hexagonal Close packed structure - Reciprocal lattice - Properties of reciprocal lattice - Bragg's law- Determination of crystal structure - The laue method of X-ray diffraction - Powder crystal method (Debye-Scherrer method).

Unit II: Band Theory of Solids and Defects

Energy bands in solids – electron in a periodic potential – Brillouin Zones construction - Crystal imperfections - Point defects-line defects - surface defects - Effects of crystal imperfections.

Unit III: Dielectric properties

Dielectrics - Dielectric Polarisability - Dielectric constant - Different types of electric polarization(Ionic,electronic and orientational polarization) - Frequency and temperature effects on polarization-Dielectric loss-Local field or internal field – Clausius – Mosotti Relation - Determination of dielectric constant - Dielectric breakdown - Properties of different types of insulating materials.

Unit IV: Bonding in Crystals and Lattice Vibrations

Types of bonds in crystals - Ionic,covalent, metallic, Vanderwaal's and Hydrogen bonding - Phonons of mono atomic one dimensional lattice - Specific heat of solids - Atomic heat - Dulong and Petit's law – Einstein's and Debye's theory of specific heat – Cohesive energy of ionic crystals.

Unit V: Superconductivity

Introduction - Properties of superconductors - Type I and Type II superconductors – BCS theory of super conductors – Cooper pair – Electron – Lattice – electron interaction - Meissner effect – Ac and Dc Josepson effect - High temperature superconductors - Application of superconductors.

Books for Study:

1. R.Murugesan, Kiruthiga Sivaprasath - Modern Physics, First Edition - Ltd, New Delhi, 2007.
2. Guptha Kumar – Solid State Physics, 9th Edition - K.Nath & Co.Education, 2006.
3. S.O.Pillai - Solid State Physics, 6th Edition - S.Chand & Co., 2005.
4. D Velmurugan – Elements of Crystallography – M J P Publishers, 2008.

Books for Referenc:

1. H.C.Guptha - Solid State Physics - Vikas Publishing House, 2013.
2. S.L.Kakani - Solid State Physics: Theory, Application and Problems – 2005.
3. P.K.Palaniswamy - Solid State Physics - SciTech Publication, 2003.
4. J.P.Srinivastva - Elements of Solid State Physics - Prentice Hall of India, 2004.
5. Wahab - Solid State Physics: Structure and Properties of Materials, 2nd Edition – Narosa Publishing Huse, 2008.
6. V Rajendran, A Marikani - Material Science – Tata McGraw Hill Publishing Company, 2005.

SEMESTER VI

UEPHD19 – ELECTIVE II B: MATERIAL SCIENCE

Objectives:

- To brief the theory of the electrical, thermal, mechanical and magnetic properties of materials.
- To understand the different types of materials and their characterization with respect to their applications
- To expose the students the different NDT available in industry.

Unit I: Material Classification - Corrosion and Oxidation

Materials - Material classification - Properties of Engineering material - Mechanical properties - Effect of heat treatment - Effect of atmospheric exposure – Creep - Creep resisting materials - Factors influencing corrosion - Types of corrosion - Basic mechanisms of corrosion - Corrosion testing – Oxidation - Corrosion control.

Unit II: Properties of Materials

Heat capacity - Specific heat - Thermal expansion - Melting Point - Thermal conductivity - Thermal shock resistance – Thermalstability – Magneticproperties – Permeablity – Superconductivity – Coerciveforce – Hysteresis - Electrial property – Resistivity - Conductivity - Temperature coefficient of resistance - Dielectric strength - Thermoelectricity - Optical properties - Refractive index – Absorptive - Reflectivity.

Unit III: Non-destructive Testing

NDT – Advantages of NDT - Defects in materials - Selection of the NDT method - Visual inspection - Basic principle - Liquid penetration testing - Physical principle -Magnetic Particle Testing (MPT) - Principle of MPT – Sensitivity – Limitation - Eddy Current Testing (ECT) – Principle - Instrument for ECT – Application - Limitations.

Unit IV: Nano Technology

Introduction to Nano technology – Position control – Self assembly – Positional devices – stiffness – Top- down method – Bottom-up method - Enabling Technologies – Characteristics of Self assembly – Zeolitic materials – Application of Nano Technology – Scanning electron microscope (SEM) – Transmission electron microscope (TEM) – The Scanning tunneling microscope.

Unit V: Nano Particles

Fabrication of nano particles – Grinding with Iron balls – Gas condensation – Laser ablation – Thermal and ultrasonic decomposition – Atom optics – Sol Gels – precipitation of quantum dots – Characterization of nano particles – Optical measurement – Electrical measurement – Application of nano particles

Books for Study:

1. O.P. Khanna – Material Science and Metallurgy – Dhanpat Raj Publication – Reprint 1998.
2. W.R.Fahrner (Ed) – Nanotechnology and Nanoelectronics – Springer Private Limited, 2006.
3. Richard Booker and Earl Boysen – Nano Technology – Wiley Publication, 2005.

Books for Reference:

1. K.G. Aswani – Material Science, 2nd Edition – S.Chand & Company, Ltd., 2001.
2. M.Arumugam – Physics II – Anuradha Agencies, Reprint 2005.
3. K.Goser, P.Glosekotter, J.Dienstuhl – Nanoelectronics and Nano Systems – Springer Publication, 2008.

SEMESTER VI

UEPHE19 – ELECTIVE III A MICROPROCESSOR 8085

Objectives:

- To make the students understand the concepts that are involved in the Microprocessor-8085
- To make the students understand about the Instruction sets, timings, memory and I/O interfaces.

Unit I: Digital Fundamentals and Architecture of 8085

Binary and Hexa decimal system – Binary coded decimal and basic logic gates – High impedance state – D flip flop and D latches – Registers– Multiplexers and Demultiplexers – ROM and RAM – Microprocessor as CPU –Input and output unit – System and Bus structure – Execution of an instruction – Pin functions and Architecture 8085.

Unit II: Instruction Sets of 8085

Machine language and assembly language – Programmer's model of 8085 – Data transfer instructions I – Arithmetic, logic and special instructions – Assembly language to Hex code – Data transfer instruction II – Branch instructions – Stack and stack related instructions – I/O and Machine control instructions – 8085 Addressing modes.

Unit III: Timings Diagrams and Interrupts

Introduction – Memory read cycle – Memory Write cycle – Wait states – Halt state – Timing diagrams for some instructions (MOV, MVI, LXI, STA, DCX) – Delay calculations.

Interrupts – INTR and INTA – RST 5.5, RST 6.5, RST 7.5 AND TRAP – Triggering levels – Priority levels – Programmable Peripheral Interface 8255

Unit IV: Interface

Memory interface basics – Demultiplexing address/data bus – Generating control signals – ROM / EPROM interface (2K X 8 EPROM, 4K X 8 ROM)– RAM interface (2K X 8 RAM interface, 2K X 8 RAM interface using Decoders) – IN instruction and its timing diagram – Out instruction and its timing diagram – Memory mapped I/O –difference between Memory Mapped I/O and I/O Mapped I/O.

Unit V: Assembly Level Programming

Simple programs- code conversion - BCD to Hex - Hex to BCD - 8 bit addition, subtraction, multiplication and division - arranging number in ascending and descending orders - 16 bit addition using DAC

Books for Study:

1. V.Vijayendran – Fundamentals of Microprocessor 8085 – Edition 2007.
2. Ramesh Gaonkar – Microprocessor Architecture, Programming and Applications with 8085 – Penram International Publishing Private Limited., 2012

Books for Reference:

1. Anokh Singh, A K Chhabra –Microprocessors and its Applications,– S. Chand Publications, 2005.
2. A Nagoorkani – Microprocessor and Microcomputer – Tata McGraw Hill Publications, 2012.
3. Sumitra Kumar Mandal – Microprocessors and Microcontrollers – Tata McGraw Hill Publication, 2012.

SEMESTER VI

UEPHF19 - ELECTIVE III B: COMMUNICATION PHYSICS

Objective:
To teach the students the principles of physics underlined in all types of communications.

Unit I: Radio Communication Systems
Name propagation – Propagation of sky waves – Direct waves and ground waves – Modulation – Amplitude modulation generation of SSB signals – Detector – Receivers – Simple receiver – Super heterodyne receiver.

Unit II: Microwave Communication
Introduction – Generation of Microwaves – Klystron oscillator – Reflex klystron – Television picture tube – Iconoscope – Image orthicon – Scanning synchronization – TV transmission – TV reception – Fundamentals of colour TV – Fundamentals of RADAR – RADAR equations – Type A and PPI displace – Automatic tracking RADAR applications of RADAR.

Unit III: Satellite Communication
Introduction – Kepler's I, II, III laws – Station keeping – Satellite attitude – Power systems – Transmission path – Path loss – Satellite earth station – Satellite station – Introduction to Indian Satellites.

Unit IV: Fiber Optics Communication
Introduction – Principles of Light transmission in a fiber – Propagation within a fiber – Effect of index profile on propagation – Modes of propagation – Listing of losses in fibers – Light sources of fiber optics – LED, laser diodes, - Detectors – Photo diodes – Avalanche photo diode.

Unit V: Transmission Lines and Facsimile transmission
Introduction – Transmission Lines – Hertz experiment – Fundamentals of Aerials – Radiation filed – Radiation resistance power radiated for a dipole antenna – Facsimile transmitter – Cylindrical scanning – Facsimile receiver – Photographic reception – Direct recording reception.

Books for Reference:

1. Gupta and Kumar – Hand Book of Electronics, 24th Revised Edition – Pragathi Prakasham, 1998.
2. Theodre F.Bogart – Electric Circuit, 2nd Edition – Glenco Pvt. Ltd., 1996.
3. Puri & Chand – Handbook of Electronics – Anmol Publication, Reprint 1996.
4. Albert Paul Nalvino – Principles of Electronics, 6th Edition, Tata McGraw Hill Publications Co., 1999.
5. Sedha R.S. – Applied Electronics - S.Chand and Co. Pvt. Ltd., 2009.
6. Dennis Reddy and John Coolean - Electronic Communication - Tata McGraw Hill Publications Co., 2000.

SEMESTER VI

USPHD19– SKILL-BASED ELECTIVE: MOBILE COMMUNICATION

Objectives:

- To make the students acquire knowledge about mobile phones.
- To have the basic understanding of working of cell phones.

Unit I: Introduction to Cellular Mobile Communication

Zero generation - push to talk – First generation – Advanced mobile phone system – Second generation – Advantages and disadvantages - Third generation – Fourth generation.

Unit II: Cellular Concept

Frequency Reuse concept – Channel Assignment- Handoff technique – Trunking and Grade of service – Cell splitting – Cell sectoring.

Unit III: Mobile Radio Propagation

Free Space propagation model – Fraunhofer region – Properties of Radio waves – Concept of Reflection-Concept of Diffraction – Scattering – Interference.

Unit IV: Cell coverage for Signal and Traffic

Introduction - Propagation in near in distance - Curves for near in propagation - Long distance propagation - Mobile to Mobile Propagation - Doppler shift.

Unit V: Multiple Access Techniques

Introduction – FDMA-TDMA-CDMA-Synchronous CDMA - soft handover – hard handover – Roaming – SDMA

Books for Study:

1. G.K.Behera – Lopamudra: Mobile Communication - Scitech Publication Pvt. Ltd., 2009. (Unit I & V)
2. V.Jeyasri Arokiamary – Mobile Communication - Technical Publications, Pune, 2008. (Unit II & III.)
3. G.Radha Krishna – Cellular and Mobile Communications – BS Publications, 2010. (Unit IV)

Books for Reference:

1. T.G. Palanivelu, R.Nakkeeran - Wireless and Mobile Communication - PHI Learning Pvt Ltd., 2009.

SEMESTER VI

UCPHL19 - PRACTICAL III

(Any 18 experiments)

1. Young's modulus by Non uniform bending – Koenig's Method
2. Spectrometer – i-i' Curve.
3. Spectrometer – Dispersive power of a prism.
4. Spectrometer – Narrow angled prism.
5. Spectrometer –grating –normal incidence – dispersive power.
6. Spectrometer – prism – Cauchy's constant
7. Newton's rings – Determination of R and μ.
8. Newton's rings - Refractive index of water.
9. Conversion of Galvanometer into Voltmeter and its calibration
10. Conversion of Galvanometer into Ammeter and its calibration.
11. Potentiometer – Calibration of high range Voltmeter.
12. Potentiometer – emf of thermocouple.
13. Deflection of Magnetometer - Tan C position.
14. Mirror Galvanometer - emf of a thermocouple-Direct deflection method.
15. Quantity Sensitiveness of B.G.
16. Absolute capacity of a condenser – B.G.-Damping correction.
17. Comparison of Capacitances – B.G.
18. Comparison of EMF'S – B.G
19. Internal resistance of the cell – B.G.
20. Determination of B_H using Deflection-bar magnet - Null deflection method.
21. Vibration Magnetometer – Determination of B_H - Field along the axis of coil apparatus.

SEMESTER VI

UCPHM19 – PRACTICAL IV: APPLIED ELECTRONICS

1. Construction of full wave rectifier-solid state(using 2 diodes)
2. Voltage stabilization using Zener diode and IC 7805
3. Single stage amplifier using transistor- Frequency response, voltage gain and variation with load
4. Construction of Hartley Oscillator (using transistor) –Frequency determination using CRO
5. Construction of Colpitt's Oscillator (using transistor) –Frequency determination using CRO
6. OR, AND gates using diodes, NOT using transistors.
7. NAND and NOR gates – Universal building block
8. Verification of Demorgan's theorem
9. OP – AMP - Summer and subtractor
10. OP – AMP - Inverting and non inverting amplifier
11. FET – Characteristics
12. Flip-flop - RS, JK, D using NAND gate
13. Half adder, Full adder using logic gates
14. Modulus Counters using 7490.
15. Simplification of Boolean equation using K-map using NAND gates only
16. Astable Multivibrator using IC 555
17. Single stage amplifier using FET - Frequency response, voltage gain and variation with load.
18. Addition and subtraction using 8085.
19. Multiplication and division using 8085.
20. Code conversion binary to HEX.
21. Construction of dual power supply 7805,7905.

B.Com. (Banking and Insurance) Degree Course

(Effective from the Academic year 2019 - 2020)

Structure of Study and Examination

Total No. of weeks per Semester - 15

Sem	Part	Subject Code	Title of Subject	Instruc-tional Hours/ Week	Exam Hours	Credits	Marks
I	I	ULTAA18	Tamil Paper – I	6	3	3	40+60
	II	UENGA17	English Paper – I	6	3	3	40+60
	III	UCBIA16	Banking Theory, Law and Practice	5	3	4	40+60
	III	UCBIB16	Financial Accounting – I	5	3	4	40+60
	III	UABMA15	Allied I : Business Mathematics and Statistics	5	3	5	40+60
	IV	-	Skill-Based Elective I	2	2	2	40+60
	IV	UVEDA15	Value Education	1	-	-	-
	Total			**30**		**21**	**600**
II	I	ULTAB18	Tamil Paper II	6	3	3	40+60
	II	UENGB17	English Paper II	6	3	3	40+60
	III	UCBIC16	Principles of Insurance	5	3	4	40+60
	III	UCBID16	Financial Accounting II	5	3	4	40+60
	III	UASOR15	Allied II : Statistics & Operations Research	5	3	5	40+60
	IV	-	Skill-Based Elective II	2	2	2	40+60
	IV	UVEDA15	Value Education	1	2	-	-
	Total			**30**		**21**	**600**
III	III	UCBIE19	Legal & Regulatory Aspects of Banking	6	3	4	40+60
	III	UCBIF19	Cost Accounting	6	3	4	40+60
	III	UCBIG16	Business Management	5	3	4	40+60
	III	UEBIA16	Elective I A: Marketing in Banking and Insurance	5	3	5	40+60
	III	UEBIB16	Elective I B: Entrepreneurship Management				
	III	UAMEA16	Allied III: Managerial Economics	5	3	5	40+60
	IV	-	Skill-Based Elective III:	2	2	2	40+60
	IV	UVEDA15	Value Education	1	2	-	-
	Total			**30**		**24**	**600**

Sem	Part	Subject Code	Title of Subject	Instruc-tional Hours/ Week	Exam Hours	Credits	Marks
IV	III	UCBIH17	Legal Aspects of Business and Insurance	5	3	4	40+60
	III	UCBII16	Accounting for Management	5	3	4	40+60
	III	UCBIJ16	Research Methodology	5	3	4	40+60
	III	UCBIK16	Income Tax : Law and Practice	5	3	5	40+60
	III	UAIBA19	Allied IV: International Business	5	3	5	40+60
	IV	UNEVS17	Environmental Studies	2	2	2	40+60
	IV	-	Skill Based Elective IV:	2	2	-	40+60
	IV	UVEDA15	Value Education	1	2	-	-
	Total			**30**		**24**	**700**
V	III	UCBIL16	Accounting for Banking and Insurance	6	3	4	40+60
	III	UCBIM19	Corporate Laws	6	3	5	40+60
	III	UCBIN16	Practical Auditing	6	3	5	40+60
	III	UCBIO19	Project	6	3	5	40+60
	IV	UGBIA19	Non-Major Elective – I:	3	3	2	40+60
	IV	USBIC516	Skill Based Elective -V : Practical Aspects of Income Tax and E-Filing	2	2	2	40+60
	IV	USBID519	Skill Based Elective -V : Banking and Business Correspondence				
	IV	UVEDA15	Value Education	1	2	-	-
			Total	**30**		**23**	**600**
VI	III	UCBIP17	Skills for Competitive Examinations	6	3	5	40+60
	III	UCBIQ16	Financial Management	6	3	5	40+60
	III	UCBIR17	E-Commerce, E-Banking and Tally	4	3	3	40+60
	III	UCBIS16	Tally Practical	2	3	2	40+60
	III	UEBIC16	Elective – II A: Business Financial Services	6	3	5	40+60
	III	UEBID16	Elective – II B: Marketing				
	IV	-	Non-Major Elective – I: Banking System in India	3	3	2	40+60
	IV	USBIC619	Skill Based Elective -V : Practical Aspects of Income Tax and E-Filing	2	2	2	40+60
	IV	USBID619	Skill Based Elective -V : Banking and Business Correspondence				
	IV	UVEDA15	Value Education	1	2	2	40+60
			Total	**30**		**26**	**800**
	V	UXTEN15	Extension Activities (90 Hours)			**1**	**-**
			Grand Total			**140**	**3900**

SEMESTER III

UCBIE19 – LEGAL AND REGULATORY ASPECTS OF BANKING

Objective:

To teach the students the legal and regulatory framework of the Banking system.
To impart the knowledge about various laws and enactments governing Banking operations.

Unit I: Regulations and Compliance

Definition and concepts of Non Banking Financial Companies - Legal Framework of Regulation of Banks – Control over Organization of Banks – Regulation of Banking Business.

Unit II: Legal Aspects of Banking operations

Indemnities – Bank Guarantees – Letter of Credit – Deferred Payment Guarantee – Laws Relating to Bill Finance – Laws Relating to Securities and Modes of Charging I – Law Relating to Securities and Modes of Charging II – Registration of Firms, Incorporation of Companies.

Unit III: Banking Related Laws (Insolvency Act)

Insolvency and Bankruptcy Code, 2016 – Definition – Regulations – Central Registry – Offences and Penalties – Non-Performing Assets (NPA).

Unit IV: Recovery of Debts due to Banks and Financial Institutions Act (DRT Act) Preliminary

Establishment of Tribunal and Appellate Tribunal – Jurisdiction, Powers and Authority of Tribunals – Procedure of Tribunals – Recovery of Debts determined by the Tribunal and Miscellaneous Provisions – The Banker's Evidence Act, 1891 – Lok Adalats.

Unit V: Other Aspects

The Consumer Protection Act, 1986 – Preamble, Extent and Definitions – Consumer Protection Councils – Consumer Disputes Redressal Agencies.

Textbook:

Legal and Regulatory Aspects of Banking - Indian Institute of Banking and Finance – Macmillan Publisher – Third Edition – Reprint 2016.

Books for Reference:

1. Kandasami K.P., Nararajan S and Parameswaran R. – Banking – S. Chand &Co. Ltd., New Delhi, Reprint 2010.
2. Dr. Guruswamy S. – Banking Theory, Law and Practice – Vijay Nicole Imprints Pvt. Ltd., Reprint 2017.
3. Natarajan S. and Parameswaran R. – Indian Banking – S. Chand & Co. Ltd., New Delhi, Reprint 2013.
4. Vasudevan S.V. – Theory of Banking – S. Chand & Co. Ltd., New Delhi, Reprint 2015
5. Sundharam and Varshney – Banking Law and practice – S. Chand & Co. Ltd., New Delhi, Reprint 2015.

SEMESTER III

UCBIF19 – COST ACCOUNTING

Objective:

To introduce the students the system of Cost Accounting and its applications.

Unit I: Introduction to Cost Accounting and Cost Statements

Definition of Cost, Costing, Cost Accounting and Cost Accountancy – Cost Accounting Vs Financial Accounting – Classification of cost – Cost Centers and Cost Units – Advantages and Limitations of Cost Accounting – Methods of Costing – Techniques or Types of Costing - Preparation of Cost Statements – Tenders and Quotations.

Unit II: Material Control

Meaning of Material Control – Purchase procedure – Stock levels – Economic Ordering Quantity – Bin Card Vs Stores Ledger – Pricing of Issue of Materials – Actual Price Methods (FIFO, LIFO, HIFO, Base Stock and Specific Price) – Average Price Methods (Simple Average, Weighted Average with returns and losses).

Unit III: Labour and Overheads

Labour Turnover – Causes – Measurement – Calculation of Labour Cost – Calculation of Normal and Overtime Wages – Methods of payment of remuneration and incentive – Time and piece wages – Taylor, Merrick, Halsey and Rowan.
Overheads: Allocation and Apportionment of Overheads – Primary Distribution Summary – Secondary Distribution Summary (Direct Reapportionment, Step Ladder, Simultaneous Equation, Repeated Distributed and Trial and Error Methods) –Machine Hour Rate.

Unit IV: Process Costing

Process Costing – Meaning – Process Accounts – Normal Loss and Scrap – Calculation and treatment of Abnormal Loss and Abnormal Gain.

Unit V: Contract Costing

Contract Costing – Profit or loss on Contracts – Treatment of Plant – Completed Contracts – Incomplete Contracts – Treatment of Profit – Contracts with losses (including Balance Sheet problems).

Theory: Problem – 20: 80

Textbook:

Reddy T.S. & Hari Prasad Reddy Y. – Cost and Management Accounting – Margham Publications, Chennai, Reprint 2017.

Books for Reference:

1. Jain S.P. & Narang K.L. – Cost Accounting – Kalyani Publishers, New Delhi, 2016
2. Khanna, Ahuja and Pandey – Cost Accounting – S. Chand & Co. Ltd., New Delhi, 5th Edition, 2013.
3. Pillai R.S.N. and Bagavathi V – Cost Accounting – Sultan Chand & Sons, New Delhi, Revised Edition, 2015.
4. Murthy A and Gurusamy S – Cost Accounting – Vijay Nicole Imprints Private Limited, Chennai, Second Edition, 2014.

SEMESTER IV

UAIBA19 – ALLIED - IV: INTERNATIONAL BUSINESS

Objective:

To teach the students the concepts, structure, theories and procedures in International Business.

Unit I: Introduction to International Business

Globalisation - Drives of Globalisation - Difference between Domestic Business and International Business – Advantages - Problems in International Business - Mode of Entry into International Business - International Business Environment - Economic Indicators – Principles of International Business Law.

Unit II: International Trade Organisation

An Overview - Policy framework for Global Trade - Instruments of Trade Policy – Development of World Trade System - International Organisations and Arrangement - World Trade Organisation (WTO) - Establishment - Principles - World Trade Organisation (WTO) and India-United Nations Conference on Trade And Development (UNCTAD) – Export Promotion Council.

Unit III: Regional Economic Coopeartion

Integration and its Impact-Integration efforts among countries in Europe and Asia - International Financial Environment- Investment decisions–Financial decisions-Money management decisions.

Unit IV: Organisational Structure For International Business Operations

Operation Management-Financial Management - Human Resource Management-Marketing Management- Conflicts and Negotiation in International Business.

Unit V: Export Import Procedure and Documentation

Export Procedures in India-Export/Import Documents- Import Finance.
Multinational Enterprises – Types of Multinational Enterprises-Characteristics-Factors influencing growth of Multinational Enterprises (MNEs) - Impact of MNEs on Host Countries- Multinational Enterprises for emerging economies - Emergence of Indian Multinationals – Trade Agreement and Tariff - Bill of Lading - Bill of Entry - Clearing and Forwarding Agents.

Textbook:

Jeyarathnam. M – International Business Management – Himalaya Publishing House, Mumbai 2016.

Books For Reference:

1. Dr.C.B. Gupta- International Business – Sultan Chand Publications, New Delhi, 2014.
2. Sankaran. S – International Business and Environment, Margham Publications, 1st Edition, 2012.
3. Francis Cherunilam – International Business, Prentice Hall of India, 5th Edition, 2010.
4. Charles W.L. Hill and Arun Kumar Jain – International Business: Competing in the Global Market Place – Mc Graw Hill, 2013.
5. Justin Paul – International Business, Prentice Hall of India, 5th Edition, 2016.

SEMESTER V

UCBIM19 – CORPORATE LAWS

Objective:

To teach the various Acts and Laws governing the Companies.

Unit I: The Companies Act, 2013

Introduction – Tabulation of All important Changes in the provisions between the Companies Act 1956 and the Companies, Act 2013 - Kinds of Companies – Registration – Documents for Registration – Memorandum and Articles of Association – Preliminary Prospectus – Lifting the Corporate Veil – Doctrine of Indoor Management – Doctrine of Constructive Notice

Unit II: Company Management

Reasons for Separation of Ownership and Management - Structure of Company Management – Legal position of Directors – Appointment of Directors – Retirement of Directors – By Rotation - Re-appointment of retiring Directors – Appointment of new directors other than retiring directors – Appointment of Independent Directors – Code of Conduct for Independent Directors.

Unit III: Company Meetings: Law, Practice and Procedure

Meaning – Kinds of Company Meetings – General objects and puposes of Meetings – Statutory Meetings – Annual General Meeting – Statutory Provisions relating to Annual General Meeting – Duties of Company Secretary during Annual General Meeting – Extraordinary General Meetings – Board Meetings – Committee Meetings – Class Meetings – Creditors' Meetings – Statutory Meeting – Stautory Report – Provisions relating to holding of Satutory Meeting – Secretarial Duties relating to Statutory Meetings - Proxies – Minutes of Resolutions.

Unit IV: Laws relating to the Employees

The Employee's Provident Fund and Miscellaneous Act, 1952 - Definitions – Scheme – Features – Determination od Moneys due from Employer – Recovery of Money due from Employers – The Payment of Bonus Act, 1956 – Objectives – Definitions – Determination of Bonus – The Payment of Gratuity Act, 1972 – Definitions – Payment of Gratuity – The Employees State Insurance (ESI) Act, 1948 – Definitions –Types of Benefits under the Act.

Unit V: Winding Up of the Company

Meaning of Winding Up – Winding Up and Dissolution – Modes of Winding Up – Winding Up by the Tribunal - Official Liquidator – Power excercisable with the sanction of the Tribunal – Voluntary Winding Up – Procedure of Compulsory and Voluntary winding up – Powers and duties of Company liquidator in Voluntary winding up.

Text Books:

Santhi. J - Company Law – Margham Publications, Chennai, 2018, Latest edition.

Books for Reference:

1. Kapoor N.D – Business Law – Sultan Chand & Publications, New Delhi, 2016.
2. Kapoor N.D – Mercantile Law – Sultan Chand & Publications, New Delhi, 2013.
3. Company Law and Secretarial Practice – Balachandarn - Sultan Chand & Publications, New Delhi, 2016.

SEMESTER V

UCBIO19 – PROJECT

Objective:

To encourage the aptitude of research among the students.

- During the fifth semester every student shall undertake a Project under the guidance of a supervisor/ guide from among the Staff members in the Department.
- The student shall select a topic related to Banking/ Insurance sectors and carry out the research study in a Public/ Private Sector Banks/ Insurance Companies.
- A Questionnaire shall be framed and Sample Size shall be about 35.
- The student shall submit the dissertation at the fifth semester.
- The dissertation shall be valued for 100 marks.
- The allotment of marks shall be as follows:

  Internal Valuation – 40 Marks.

  External Valuation of the dissertation – 40 Marks.

  Viva Voce by the External Examiner – 20 Marks.

.**SEMESTER V/ VI**

USBIF519 / USBIF619 - SKILL-BASED ELECTIVE – V/ VI:

BANKING AND BUSINESS CORRESPONDENCE

Objective:

To develop communication skills related to Banking, Insurance and Personality Development of the students.

Unit I: Introduction to Business Communication

Business Communication – Meaning – Definition – Objectives – Process of Communication – Types of Communication – Directions of Communication – Barriers to Effective Communication. 7*C*s for Effective Business Communication – Layout of Business Letter – Features in Layout.

Unit II: Bank Correspondence

Bank Correspondence – Essential Features of Bank Correspondence – Letters from Customers to Bank – Letters from Bank to Customers – Correspondence within the Bank – proposal to Bank and reply to Authorities Letter.

Unit III: Insurance Correspondence

Insurance Correspondence – Specific terms used in Insurance Correspondence – Specimen letters related to Life Insurance, General Insurance and Marine Insurance.

Unit IV: Interview

Interview – Types – Job Interview – Interview Process – Specialised Interview Formats – Mock Interview – Tips for Interviewee and Interviewer – Qualities of Good Interviewer – Do's and Don'ts in Interview – Common Interview Questions.

Unit V: Self Appraisal and Personality Development

Self Assessment – Market Assesstment – Resume – Covering Letter to Resume – Group Discussions.

Textbook:

Raghunathan N. S and Santhanam B – Business Communication - Margham Publications, Chennai- Reprint 2017.

SEMESTER V/ VI
UGBIA519 / UGBIA619 - NON- MAJOR ELECTIVE – I:

BANKING SYSTEMS IN INDIA

Objective:

To impart knowledge to the students about Traditional Banking and Digital Banking Systems.

Unit I: Introduction to Banking

Origin of Banking – Banker – Banking and Other Business – Customer – The relationship between a Banker and Customer – General relationship – Statutory Obligation to Honour Cheques – Banker's Lien – Duty to maintain secrecy of Customer's Account.

Unit II: Banking Structure

Indigenous Bankers – Commercial Banks – Cooperative Banks – Regional Rural Banks – Foreign Banks – Development Banks (DB) – Industrial Development Bank of India (IDBI) – Industrial Finance Corporation of India (IFCI) – Industrial Reconstruction Bank of India (IRBI) – National Bank for Agricultural and Rural Development (NABARD) – Export and Import Bank (EXIM) – National Housing Bank (NHB) – Small Banking – Non Banking Financial Company (NBFC).

Unit III: Reserve Bank of India

Reserve Bank of India – Functions- Credit Control – Methods of Credit Control.

Unit IV: Introduction to Digital Banking

Introduction to Digital Banking –Brief History - Need for Digital Channels – Customer preference for Digital Banking – Types of Cards – Features – Benefits – Magnetic Strip Card and Europay Master card Visa (EMV) Technology.

Unit V: Modes of Digital Payment

Automatic Teller Machine (ATM) - History – Product Features – Instant Money Transfer (IMT) – Cash Deposit Machine (CDM) – Mobile Banking – Product Features – Immediate Payment System (IMPS) – Online Banking – Product Features – Point-of-Sale (POS) – Features – Types – Aadhaar Enabled Payment System (AEPS) – Real Time Gross Settlement (RTGS) – National Electronic Funds Transfer (NEFT).

Textbook:

1. Digital Banking - Indian Institute of Banking and Finance, Taxmann Publications, Edition: April 2016.

2. Banking Theory Law and Practice – E. Gordon & K. Natarajan- Himalaya Publishing House, New Delhi, 26th Edition, 2017.

INTERNSHIP

Objective:

- The make the students to gain practical knowledge in the field of Banking and Insurance Company.
- To guide the students in updating their career opportunities in various Banking aspects and Insurance operations.

Internship Training in Banks and Insurance Companies is mandatory for the students. Both the First and Second Years have to undergo an Internship Training in both the Public/ Private/ Foreign Banks as well in the Public/ Private Sector Insurance Companies.

- Each student should attend the Internship Training Individually.

- Each student should find a reputed Bank/ Insurance Company for the Internship Training during the month of May after their Even Semester Examination.

- First Year have to undergo for the period of 15 Working Days and Second Year for the Period of 30 Working Days with the approval of the Department.

- After completing her Training, the student should get the signature from the Branch Manager of the Banks/ Insurance Companies in Attendance Card.

- Each Student of First and Second Year have to draft a report on the work being carried out during her Internship Training.

- The report has to be drafted by the student individually.

DEPARTMENT OF ECONOMICS

B.Com. – SEMESTER I
UCCOB19 - BUSINESS ECONOMICS – I

Unit I: Nature and Scope of Business Economics

Definition and Scope of Business Economics – Nature of Business Economics – Relationship with other disciplines – Concepts applied in Business Economics – Role and responsibilities of business economist.

Unit II: Consumer Behaviour and Indifference Curve Analysis

Meaning of Utility – Law of Diminishing Marginal Utility – Law of Equi-Marginal Utility – Indifference Curve Analysis – Properties of indifference Curve – Indifference Scheduled – Indifference Curve – Indifference Map

Unit III: Demand Analysis

Meaning of Demand – Law of Demand – Individual Demand and Market Demand – Why does demand curve slopes downwards? Elasticity of Demand – Types of Elasticity of Demand – Measurement of Elasticity of Demand - Demand forecasting

Unit IV: Factors of Production

Meaning of Different Factors of Production – Production Possibility Curve – Law of Returns to Scale - Diminishing Returns to Scale – Law of Variable Proportions – Internal and external economies and diseconomies

Unit V: Cost, Revenue and Supply

Concept of cost of Production – Different Cost concepts: Nominal and Real Cost, Implicit and Explicit Cost, Opportunity Cost, Short-run and long run cost, Variable and fixed cost, total cost, marginal cost, average cost – Theory of Cost and Break-Even Analysis Meaning of supply – Function of supply. and classifications – Cost output relationship – Cost Control and Cost reduction – Theory of Cost and Break-Even Analysis. Profit Maximisation and Sales Maximisation

Textbooks:

1. Sankaran. S. – Business Economics – Margham Publications Chennai, 2016.
2. H.L. Ahuja – Business Economics - S. Chand & Company Limited, New Delhi, 2016.

Books for Reference:

1. Varshney R. L & Maheswary K. L – Managerial Economics - S. Chand & Company Limited, New Delhi, 2008.
2. Sundaram K.P. M. & Sundaram E. N – Business Economics – S. Chand & Company Limited, New Delhi, 2016.
3. Jhingan M.L – Principles of Economics – Vrinda Publicatio (P) Ltd, 2017.
4. Basotia G. R. – Managerial Economics a Modern Approach – Shree Niwas Publications, Jaipur, 2004.

B.Com. – SEMESTER II

UCCOD19 - BUSINESS ECONOMICS – II

Unit I: Market Structure

Meaning and Types of Market Structure - Perfect Competition: Features – Price and output determination – Monopoly: Features – Price and output determination – Price Discrimination – Monopolistic Competition: Price and output determination – Oligopoly and Duopoly market.

Unit II: Pricing Policy

Meaning and objectives of Pricing Policies – Factors Determining Pricing Policy – Different Pricing Methods – Specific Pricing Problems – Export Prices – Public Pricing.

Unit III: Factor Pricing

Ricardian theory of Rent – Quasi Rent – Marginal productivity theory of Wage – Modern theory of wage – Liquidity theory of Interest – Modern theory of Interest – Innovation theory of Profity – Risk theory of Profit – Uncertainty theory of Profit.

Unit IV: National Income

Different concepts of National Income – Gross National Product (GNP) Net National Product (NNP) – National Income at Factor cost – Personal Income – Disposable Income – Measurement of National Income – Difficulties of National Income.

Unit V: Inflation and Trade Cycles

Meaning of inflation – Causes of inflation – Types of inflation – Inflationary Gap – Philips Curve – Meaning of Trade Cycles – Characteristic of Trade Cycles.

Textbooks:

1. Sankaran. S. – Business Economics – Margham Publications Chennai, 2016.
2. H.L. Ahuja – Business Economics - S. Chand & Company Limited, New Delhi, 2016.

Books for Reference:

1. Varshney R. L & Maheswary K. L – Managerial Economics - S. Chand & Company Limited, New Delhi, 2008.
2. Sundaram K.P.M. & Sundaram E. N – Business Economics – S. Chand & Company Limited, New Delhi, 2016.
3. Jhingan M.L – Principles of Economics – Vrinda Publication (P) Ltd., 2015.

B.Com. – SEMESTER III

UAIED19 - ALLIED III: INDIAN ECONOMIC DEVELOPMENT POLICY

Unit I: Growth and Development

Difference between Growth and Development – Characteristics of Under development economy – Factors determining Economic Development – Obstacles to economic development – Human Development Index – Gender Development Index.

Unit II: Planning in India

Origin and definition of planning – Types of Planning – Planning in India – History of Planning in India – Objectives of planning – Different planning periods – Achievements and failures of Planning – NITIAayog.

Unit III: Agriculture in India

Role of Agriculture in Indian Economy – Land Reforms – Green Revolution – Agricultural Credit – Causes of Low Productivity in Indian Agriculture - Agricultural Price Policy – Food Security Act

Unit IV: Industry in India

Role of Industry in Indian Economy – Industrial Policy Resolution 1948, 1956 and 1991- Industrial Sickness – Industrial Dispute – Trade Unions in India

Unit V: Economic Reforms in India

Liberalisation – Privatisation – Globalisation – Disinvestment Policy – Public Vs Private Sectors – Globalisation and its Impact on Indian Economy – Foreign Direct Investment in India (FDI).

Textbooks:

1. Sankaran. S. – Indian Economy – Margham Publications, Chennai, 2018.
2. R. Cauvery, N. Kruparani… - Monetary Economics – S. Chand & Company Limited, New Delhi, 2016.

Books for Reference:

1. Gaurav Datt and Ashwani Mahajan - Indian Economy - S. Chand Company, New Delhi, 2013
2. Indian Economy: For Civil Services Examinations, McGraw Hill Education
3. Economic Survey, Government of India.
4. Misra S.K and Puri V.K (2018): Indian Economy, Himalaya Publishing House, New Delhi.

B.Com. - SEMESTER IV

UAITA19 – ALLIED – IV: INTERNATIONAL TRADE

Unit I: Foreign Trade

Difference between Internal and External Trade (or Inter - regional Versus International Trade) – Importance of International Trade - Theories of International Trade: Adam smith – Ricardo - Haberler's - Heckscher-Ohlin

Unit II: Terms of Trade and Balance of Payments

Different concept of Terms of Trade: (Net Barter Terms of Trade-Gross Barter Trade - Income Terms of Trade) - Balance of Payment (BOP); Meaning – Structure – Balance of Payment and Balance of Trade – Disequilibrium in BOP and Balance Of Trade – Causes for disequilibrium in BOP – Measures for correcting disequilibrium.

Unit III: Free Trade and Protection

Free Trade: Meaning – Case for and against Free Trade, Gain of free trade, Protection: Meaning, Arguments for and against protection.

Unit IV: Tariff

Tariff: Meaning and types – Effects of Tariff - Quotas: Meaning and Types – Effects of quotas on Imports – Export Management – Non-Tariff: Quantitative Restriction – Voluntary Export Restraints – Export Procedure and Documents – Export Finance.

Unit V: International Organisation

IBRD (World Banks) – IMF – WTO

Textbooks:

1. Dr. Radha V. International Economics – Prasanna publishers, Chennai, 2016
2. S.Sankaran – Foreign Exchange and Financing of Foreign Trade – Margham Publications, 2007.

Books for Reference:

1. Charles W.L. Hill and Arun Kumar Jain – International Business: Competing in the Global Market Place – McGraw Hill, 2007.
2. Justin Paul – International Business, 2nd Edition – Prentice Hall of India, 2007.
3. Francis Cherunilam – International Business, 5th Edition – Prentice Hall, India, 2010.
4. C. Jeevanandam, M.Victor Louis Anthuvan … - International Economics – Sultan Chand and Sons, New Delhi, 2006

BACHELOR DEGREE OF BUSINESS ADMINISTRATION

(HOSPITAL ADMINISTRATION)

(With effect from the Academic Year 2019 – 2020)

Objective: To produce young executives to meet the global needs of the hospital industry.

Duration - 3 years (6 Semesters)

Structure of the Course and the Scheme of Examination:

Sem	Part	Code	Title	Hours/ Week	Exam Hours		Credits	Marks
					Th	Pr		
I	I	ULTAA18	Tamil Paper - I	6	3	-	3	40+60
	II	UENGA17	English Paper - I	6	3	-	3	40+60
	III	UCHAA19	Fundamentals of Management	5	3	-	4	40+60
	III	UCHAB19	Foundation in Hospital Administration	5	3	-	4	40+60
	III	UAMST19	Allied – I: Medical Statistics	5	3	-	5	40+60
	IV	USHAA119	Skill-Based Elective – I: Life Skills	2	2	-	2	40+60
	IV	-	Value Education	1	-	-	-	-
			Total	**30**			**21**	**600**
II	I	ULTAB18	Tamil Paper - II	6	3	-	3	40+60
	II	UENGB17	English Paper - II	6	3	-	3	40+60
	III	UCHAC19	Healthcare Ethics	5	3	-	4	40+60
	III	UCHAD19	Medical Terminology for Administration	5	3	-	4	40+60
	III	UAORA19	Allied – II: Operations Research	5	3	-	5	40+60
	IV	USHAB219	Skill-Based Elective – II: Communication Skills in English	2	2	-	2	40+60
	IV	-	Value Education	1	-	-	-	
			Total	**30**			**21**	**600**
III	III	UCHAE19	Health Care Laws	6	3	-	4	40+60
	III	UCHAF19	Hospital Operations Management – I	6	3	-	4	40+60
	III	UCHAG19	Accounting for Hospital Administrators - I	5	3	-	4	40+60
	III	UAHCE19	Allied - III: Health Care Economics	5	3	-	5	40+60
	III	UEHAA19	Elective I A: Business Environment	5	3	-	5	40+60
	III	UEHAB19	Elective I B: Logistics and Supply Chain Management					
	IV	USHAC319	Skill-Based Elective – III: Wellness Management	2	2	-	2	40+60
	IV	-	Value Education	1	-	-	-	-
			Total	**30**			**24**	**600**

Sem	Part	Code	Title	Hours/ Week	Exam Hours		Credits	Marks
					Th	Pr		
IV	III	UCHAH19	Human Resource Management and Development	5	3	-	4	40+60
	III	UCHAI19	Hospital Operations Management – II	5	3	-	4	40+60
	III	UCHAJ19	Introduction to Research Methodology	5	3	-	4	40+60
	III	UCHAK19	Health Services Marketing	5	3	-	4	40+60
	III	UAAHA19	Allied – IV: Accounting for Hospital Administrators - II	5	-	3	5	40+60
	IV	USHAD419	Skill-Based Elective – III: Communication Skills in Hindi	2	2	-	2	40+60
	IV	UNEVS17	Environmental Studies	2	3	-	2	40+60
	IV	-	Value Education	1	-	-	-	-
			Total	**30**			**25**	**700**
V	III	UCHAL19	Organizational Behaviour	5	3	-	4	40+60
	III	UCHAM19	Quality in Health Care	5	-	3	4	40+60
	III	UCHAN19	Management Information Systems	5	3	-	4	40+60
	III	UCHAO19	Global Health Care System	5	3	-	5	40+60
	III	UCHAP19	Project	2	-	3	4	100
	III	UEHAC19	Elective II A: Health Care Insurance	5	3	-	5	40+60
	III	UEHAD19	Elective II B: E-Banking					
	IV	USHAE519	Skill-Based Elective – V: Accounting Packages	2	2	-	2	40+60
	IV	-	Value Education	1	-	-	-	-
Total							**28**	**700**
VI	III	UCHAQ19	Public Health and Community	8	3	-	4	40+60
	III	UCHAR19	Materials and Equipment Management	8	3	-	4	40+60
	III	UCHAS19	Internship	-	-	-	8	100
	IV	USHAF619	Skill-Based Elective – VI: Social Entrepreneurship	5	3	-	2	40+60
	IV	UVEDA15	Value Education	1	3	-	2	40+60
			Total				**20**	**500**
	V	UXTEN15	Extension Activities (90 Hours)				1	
			Grand Total				**140**	**3700**

SEMESTER I
UCHAA19 – FUNDAMENTALS OF MANAGEMENT

Unit I: Introduction

Introduction – Definition – Nature - Scope of Management - Functions of Management – Contributions of F W Taylor, Henry Fayol and Peter Drucker - Difference between Administration and Management.

Unit II: Planning

Planning – characteristics - types of planning – process – importance - SWOT Analysis to formulate strategy- Decision Making - types of decision – process – barriers to decision and steps to overcome

Unit III: Organizing and Staffing

Organizing - types of organization - organization charts - formal and informal organization – Authority – sources – types of authority – pros and cons – delegation – principles of delegation – distinction between centralization and decentralization - Staffing – meaning – nature- importance- Recruitment- Selection – Training

Unit IV: Direction, Coordination and Controlling

Directing – nature- meaning – significance - Co-ordination and control – principles of co-ordination – distinction between co-ordination and co-operation – need for coordination – types and techniques – principles of control process – pros and cons – control techniques

Unit V: **Reporting and Budgeting**
Reporting - Meaning - Nature - Types of Reports - Budgeting - Principles - Objective - Types and Procedures.

Case Study for all chapters

Textbooks

1. L.M. Prasad - Principles of Management - Sultan Chand and Sons, Latest Edition

2. C.B. Gupta - Business Management - Sultan Chand and Sons, Latest Edition

Reference Books

1. Stephens R.Robbins and David A Decenzo - Fundamentals of Management - Pearson Education 3rd Edition, 2001.

2. H.Koontz and Weihrich - Essentails of Management- Tata McGraw Hill, Latest Edition

3.SamuelC.Certo - Modern Management - Pearson Education, 9th Edition

SEMESTER I
UCHAB19 – FUNDAMENTALS IN HOSPITAL ADMINISTRATION

Unit I: Over view of health services

Medicine – Alternative Medicine - Hospitals - Types of Hospitals - Types of Patient - Hospital Departments - Diseases, treatment and technology - Medical Vocabulary - Current Trends in Healthcare.

Unit II: Communication skills

Communication - Compelling Communication - Enhancing group activity – Interpersonal - Listening - Teamwork - Verbal Communication - Written Communication– Audio-Visual Presentations – Etiquette.

Unit III: Analytical Skills

Creativity - Problem-solving - Critical Thinking - Critical thinking-solve problems - Decision making - Logical thinking - Understanding and analyzing issues and problems- Diagramming- Numerical techniques and analysis- Study and research skills - SWOT Analysis.

Unit IV: Computer skills

Microsoft Office - Spreadsheets – PowerPoint - Access – Excel - Email - Web and Social Skills - Graphic and Writing Skills.

Unit V: Personal Development

Time management- Thinking Skills - Determination and Persistence - Presentation Skills - Developing Leadership Skills - Interpersonal Skills – Positive attitude – Integrity – Treat people with respect.

Text Books

1. Asha Kaul - Effective Communication Methods –, PHI Learning, 2000.
2. Peter Norton, Tata Mc.GrawHill – Introduction to Computers.

Reference Books

1. V.K.Mahajan – Health Education.
2. John Adair – Effective Communication (Revised Edition): The most important management skill of all (Most Important Management Tool of All) Paperback– Unabridged, 4 Sep 2009.
3. B.S. Sijwalii and Indu Sijwali – A New Approach to REASONING Verbal & Non-Verbal, 1 January 2014.

SEMESTER I
UAMST19 – ALLIED – I: MEDICAL STATISTICS

Unit I: Matrices

Definition - Types of matrices - Matrix operations - Determinant of a matrix - Singular and non-singular matrices - Inverse of a matrix by co-factor method - Rank of a matrix –Solution of system of linear simultaneous equations using Cramer's rule (finding x, y, z)

Unit II: Differentiation

Differentiation-Derivatives of standard functions x^n, e^x, log x, constant (without proof) – Rules of differentiation (Addition, difference, product, quotient), chain rule, Successive differentiation (up to second derivative) – uses: Marginal Concepts, Elasticity of demand, Increasing and decreasing functions-maxima and minima - break-even point

Unit III : Classification and Graphical Representation

Introduction – meaning of classification – chief characteristics of classification – objects of classification – rules of classification – frequency distribution – individual observations – discrete frequency distributions – continuous frequency distribution – cumulative frequency distribution – bivariate frequency distributions – graph of frequency distribution – histogram – frequency polygon – frequency curve

Unit IV : Measures of Central Tendency

Arithmetic mean – Median – Mode – Empirical formulae – Combined and Weighted arithmetic mean -Geometric mean – Harmonic mean

Unit V : Measures of Dispersion and Skewness

Range – quartile deviation – mean deviation – standard deviation – Karl Pearson's and Bowley's coefficient of Skewness - Correlation and Regression.

Note: 20 % theory and 80 % problems

Text Books

1. P.A.Navnitham – Business Mathematics and Statistics – Jai Publishers, Trichy, 2007
2. R.S.N.Pillai and Bagavathi – Statistics – S.Chand and Company – New Delhi, 17th Edition, 1984

Reference Books

1. R.S.N.Pillai and Bagavathi – Statistics – S.Chand and Company – New Delhi, 17th Edition, 1984
2. Statistical Methods – S.P.GUPTA, Sultan Chand,2012
3. Levin and Rubin - Statistics for Management - Pearson Publication - 8th Edition.

SEMESTER I

USHAA119 - SKILL BASED ELECTIVE - I: LIFE SKILLS

Unit I: Basic Life Support (BLS)

Immediate Life Support (ILS) - Sequence of Actions – Procedure - Choking

Unit II: Chemical Safety and Radiation Safety

Chemical Safety - Physical, health and Environment Hazards - Safety Data Sheet - Personal Protective Equipment - Radiation Safety - Radiation and Radioactivity - Biological Effects – ALARA - General Radiation safety

Unit III: Hand Hygiene

Hand hygiene techniques - Stages of effective hand hygiene - General rules of hand hygiene at work

Unit IV: Occupational Health

Introduction to OHSA - OHSA standards - Safe and Healthful workplace - Employer Responsibilities

Unit V: Fire Safety and Disaster Management

Fire - Classes of fire - Types of Fire extinguisher - Dos and Don'ts during fire - Disaster Management - Preparedness – Response – Recovery – Mitigation
Types of disaster – Natural and Man-made disaster - Characteristics and phases of disaster - Disaster impact

Text Books

1. K.V.Ramani – Hospital Management – Text and Cases –, 1st edition, Pearson Education India, 2013.
2. D.C.Joshi, Mamta Joshi - Hospital Administration – Jaypee Brothers Medical Publishers, 2009.

Reference Books

1. National Disaster Management Guidelines—Hospital Safety A publication of: National Disaster Management Authority Government of India NDMA February, 2016.
2. OSHA Field Safety and Health Manual - Occupational Safety and Health Administration (OSHA).
3. Patient safety assessment manual – WHO – 2016 Second edition.

SEMESTER II
UCHAC19 – HEALTH CARE ETHICS

Unit I: Corporate Ethics

Role and importance of Business Ethics and Values in Business – Definition of Business Ethics – Impact on Business Policy and Business Strategy – Types of Ethical Issues – Bribes – Coercion – Deception – Theft – Unfair Discrimination

Unit II: Corporate Social Responsibility and Distributive Justice

Social Responsibilities towards Shareholders – Employees – Customers, Dealers, Vendors and Government – Social Audit - Distributive Justice

Unit III: Codes of Conduct

Principles of Medical Ethics- International Code of Ethics - Duties of a Doctor - Patient –Paramedical - Health Resources - Malpractice and Negligence - Medical Negligence

Unit IV: Professional and Personal

Confidentiality: (Professional Secrecy) - Rights of Patients - Consent -Informed Consent - Privileged Communication - Irrational Drug Therapy- Human Experimentation - Clinical Trials

Unit V: Emerging Issues

Sex Pre-selection and Female Feticide - Reproductive Medicine Ethical Issues in Transplantation - Assisted Reproductive Technologies - Surrogacy – Abortion - Euthanasia - Organ Donation

Textbooks

1. CM Francis, Medical Ethics, Jaypee, 2nd edition, 2007
2. Shaw William, Business Ethics, Cenage Publishers, 2016

Reference Book

1. Sankaran S, Business Ethics, Margham Publications, 2005

SEMESTER II
UCHAD19 - MEDICAL TERMINOLOGY FOR ADMINISTRATION

Unit I: Anatomy and Physiology

Definition of the terms Anatomy and Physiology - Types of Anatomy - Definition of terms used to describe the parts of the body - Definition of various regions of the body - The body as a whole-organization of the body: Cells, tissues, organs, membranes and glands.

Unit II: Anatomic and Physiological Description

i. Musculo-Skeletal System - Bone types, structure, functions - Joints, structure and functions - Ligaments, and tendons - Muscles, types, structure and functions of muscles – Related Diseases, types of fractures.
ii. Nervous System - functions of neurons – Central, Peripheral nervous and
iii. Autonomous nerves systems - Related Diseases
iv. Cardiovascular System- Heart-position, structure, conduction system, functions and cardiac cycle - Blood vessels, Circulation of blood; Systemic, pulmonary and portal - Blood pressure and pulse – Related Diseases
v. Lymphatic system-Lymph vessels, glands, ducts and lymph circulation - Lymph nodes in the body, spleen – Related Diseases
vi. Respiratory System - Structure and function of respiratory organs - Physiology of respiration –Related Diseases.
vii. Sensory organs: Structure and function of the Eye [vision], the Ear [hearing], Taste [tongue].

Uni t III: Anatomic an Physiological Description

i. Digestive System - Structure and functions of organs of digestion and accessory organs - Process of digestion and absorption – Related Diseases
ii. Excretory Systems- Structure and function of the organs of the Urinary system - Structure and functions of Skin [Integumentary System] - Regulation of body temperature – Related Diseases
iii. Endocrine System - Structure and functions of endocrine glands- (Pituitary Pancreas, thyroid, parathyroid, thymus, adrenal) – Related Diseases
iv. Sense Organs - Structure and functions of Eye, Ear, Nose and tongue - Physiology of vision, hearing and equilibrium – Related Diseases
v. Genito Urinary System - Female reproductive system: Structure and functions of female reproductive organs [Uterus,fallopian tube, oary] menstrual cycle, menopause and process of reproduction - Male reproductive system: Structure and functions of organs - Diseases related to reproductive system, antenatal, maternal and neonatal conditions
vi. Psychiatry conditions – Anxiety, depression, mental retardation, personality disorder, psychosis, psycho-physiologic disorder

Unit IV: Basic Medical Terminology

Basic concepts, - Definition and purpose of learning Medical Terminology - Origin of Medical Terms - Derivations from other languages, living creatures, colours, weapons - Phobias

Unit V: Components of Medical Terms

Roots - Prefixes - Suffixes – Systems wise Symptomatic, Diagnostic and Operative Terms related to whole body, Analysis of medical terms, Standard Medical Abbreviations

Text Books

1. Mr. Immanuel Ratinaraj Asher – Introduction to Medical Terminology.
2. Mr. Immanuel Ratinaraj Asher – Handbook of Medical Record Policies and procedures – for Medical Record professionals.

Reference Books

1. An Illustrated Guide by Barbara J. Cohen and Ann De Petris - Medical Terminology, 1 February 2016.
2. Medical Review – Medical Abbreviations For Medical Students And Healthcare Professionals Kindle Edition.
3. Dorland – Dorland's Pocket Medical Dictionary, 29e Paperback – 10 Nov 2013.

SEMESTER II
UAORA19 - ALLIED – II: OPERATIONS RESEARCH

Unit I: Introduction and Linear Programming

Operations research: Definition – Scope – Characteristics – Linear programming – Formulation –Graphical method – Regular simplex method (Simple Problems)

Unit II: Transportation Model

Transportation Problem – Initial basic feasible solution (North West Corner Least Cost VAM) – Unbalanced Transportation problem - Maximization problem - Test of Optimality using MODI method (excluding Degeneracy)

Unit III: Assignment Model

Assignment problem – Minimal assignment problem – Unbalanced Assignment problem – Restricted Assignment problem – Maximization problem in Assignment

Unit IV: Network Analysis: CPM and PERT Computations

Construction – The Network – Numbering the events – Different time calculations – representation in tabular form – Total, Independent and Free float – Calculation of critical path and project duration - Basic steps in PERT – Difference between CPM and PERT – Calculation of critical path and project duration.

Unit V: Game and Queuing Theory

Game theory – Meaning – Saddle point – Mixed Strategy - Dominance property – Solving 2* M and N*2 game using graphical method (excluding L.P.P)- Queuing theory –Meaning – Elements of Queuing system- Single channel model only.

Note: 80% problems and 20% theory

Text Books

1. Premkumar Gupta and Hira D.S. - Introduction to Operations Research, 1st Edition – S.Chand Company Ltd., 1998.
2. Vittal P.R - Introduction to Operations Research, 1st Edition - Margham Publishers – 1999.

Reference Books

1. Kalavathy. S - Operations Research, 2nd Edition - Vikas Publishing Ltd., 2002
2. K. Pandian, C.Kayalvizhi - Applied Operations Research for Management, 2nd Edition, Thirumalaa Publications, 2004
3. R.Paneerselvam - Operation Research - PHI Learning Pvt. Ltd 2006 - 2nd Edition

SEMESTER II

USHAB219 – SKILL BASED ELECTIVE II: COMMUNICATION SKILLS IN ENGLISH

Unit I: Introduction to Communication

Definition of Communication – Elements – Types and Media's of communication – Process of communication-Barriers in communication.

Unit II: Letter writing skills

Structure of letter – Leave letter – Complaint letter – Letter of Application - Enquiry – Sales Letter – Banking Correspondence

Unit III: Vocabulary and Phrases

Every day words - General statements – Past – Present – Future

Unit IV: Professional Skills

Aptitude Test – Logical and Reasoning – Basic Interview Questions - Preparation of Resume - Writing discharge summary - Consent for admission

Unit V: Practical Sessions

Group discussions **–** Role-play – Email – Browsing for assignments - Presentation skills - Use of Google scholars,

Note: 20 % Theory & 80% Practical

Textbooks

1. P. D. Chaturvedi and MukeshChaturvedi, Communication Skills, Pearson Education, 1st Edition, 2012.
2. B. S. Verma and R. T. S. Pundir, Professional Communication, Vayu Education of India, 1st Edition, 2011.

Reference Books

1. B. S. Sijwali and InduSijwali, You & the Interview Board, Arihant Publications 1st Edition, 2009
2. Hari Mohan Prasad and Rajnish Mohan, How to prepare for Group discussion & Interview, Tata Macgraw Hill Education Private Limited, 1st Edition 2012.

SEMESTER III
UCHAE19 – HEALTH CARE LAWS

Unit I: Promotion
Forming Society - The Companies Act - Law of Partnership - A Sample Constitution for the Hospital - The Tamil Nadu Clinical Establishment (Regulation) Rules,2018- Clinical Trial-Y-Schedule of DAC Act 1940 – I.C.M.R.Guidelines.

Unit II: Labour Relations
Factories Act - Shops and Establishment Act - The Workmen's Compensation Act - The Employee's State Insurance Act - The Employees" Provident Funds Act - The Payment of Gratuity Act - The Maternity Benefit Act - The Payment of Wages Act - The Minimum Wages Act - The Industrial Disputes Act - The Industrial Employment (Standing Orders) Act - The Trade Union Act - The Apprentices Act - The Employment Exchanges (Compulsory Notification of Vacancies) Act - The Collection of Statistics Act

Unit III: Medical Care
Medical Council of India - Medical Licensure Law - Doctors Patient Relationship - Medical Malpractice - Quality and Standard of Medical Care - Negligence - Medical Consent - Emergency Care - The Consumer Protection Act - Patient's Rights and Responsibilities - Medical Ethics

Unit IV: Medico Legal Commitments
Mental Illness – Tuberculosis - Drugs Addicts and Alcoholics - Legal Issue in Death Cases - Legal Testimony in Medico-legal cases - Narcotic Laws - The Drugs and Cosmetic Act - Drug Control Policy - Clinical Investigation - Blood Transfusion - The Medical Termination of Pregnancy Act - The Prenatal Diagnostic Techniques Act - Dying Declaration - Medical Jurisprudence - The Human Organ Transplantation Act – Toxicology – Mental Health Care Act 2017 – Abandon Children in Hospital and Procedure mandated in the Juvenile Justice (CARE AND PROTECTION OF CHILDREN) Act, 2015

Unit V: Hospital Administration
The Biomedical Waste (Management and Handling) Rules - Radiation Safety System - Law of Insurance - Export Import Policy - Exemption of Income Tax for Donations - Tax Obligations: Filling Returns and Deductions at Source

Textbooks

1. Raj Kumar, Acts Applicable to Hospitals in India (The Christian Medical Association of India, New Delhi).
2. Samuel Abraham, Human Resource Management in Hospital (Jefflin Rimon Publications, Vellore)

Reference Books

1 Ram Krishna Chaube, Consumer Protection and The Medical Profession with Legal Remedies (Jaypee Brothers, New Delhi).
2 Sameul Abraham, Laws on Hospital Administration (CMAI, Delhi)
3. Dr Sairam Bhat - Healthcare in India: An Introduction to Law and Legal System Hardcover, 3 Oct 2016.

SEMESTER III
UCHAF19 - HOSPITAL OPERATIONS MANAGEMENT – I

Unit I: Organization of the Hospital

Over view of health services - Types of Patient - Healthcare Models and Emerging Models - Types of Hospitals - Management Structure of Hospitals - Hospital Committees - Relationship with other Organization - Essential Hospital Operations Indicator - Current trends in healthcare

Unit II: Outpatient and Inpatient Service

Outpatient Service - Inpatient Service & Admitting Department - Surgical Services and Operating Theatre – ICU - Specialty Services - Accident and Emergency - Surgical Specialties and Anesthesiology - Medical Specialties - Community Medicine and Family Medicine - Paramedical Services - Alternative Health Care System

Unit III: Nursing Service

Objectives, Responsibilities and Organization of Nursing Services - Nursing Process and Patient Care - Ward Management

Unit IV: Hospital Infection Control

Surveillance and Reporting of Infection - Employee Health - Preventing Transmission of Infection - Biomedical Waste Disposal

Unit V: Clinical Support Services

Chaplain and Counseling – Pharmacy – Laboratories - Blood Bank - Occupational therapy – Physiotherapy - Speech therapy – Radiology - Diagnostics service - Nuclear Medicine - Catheterization Lab - Radiation therapy - ALC

Textbooks

1. Harris M G & Assoc - Managing Health Service: Concept & Practices. Maclennan & Petty: Sydney, 2003.
2. Kunders G.D Facilities Planning and Arrangement in Healthcare, Prison Books Pvt. LTD, 2004.

Reference Books

1. Sakharkar B.M Prinicples of Hospital Administration and Planning, 2nd edition, Jaypee, New Delhi, 2009.
2. Syed Amin Tablish - Hospital and Nursing Homes Planning, Organisations and Management, 1st edition, Jaypee, New Delhi, 2005.
3. Sharma - Step By Step Hospital Designing and Planning With Photo Cd Rom (Dr.Malhotra'S Series), 1 January 2010.

SEMESTER III
UCHAG19 - ACCOUNTING FOR HOSPITAL ADMINISTRATORS - I

Unit I: Introduction to Concepts

Definition of Accounting – Financial Accounting – Functions – Limitations – Meaning of Accounting Principles - Accounting Concepts and Conventions – Features

Unit II: Double Entry System

System of Book keeping – Single Entry System – Double Entry System – Meaning of Debit and Credit – Advantages of Double Entry System – Distinction between Double Entry and Single Entry – Accounting Equation – Rules for Accounting Equation – Uses of Computer in Accounting

Unit III: Journal and Ledger

Accounting Cycle – Introduction – Journal and Journalizing – Classification of Accounts – Ledger – Meaning of Ledger – Method of preparing an Account – Posting in the Ledger – Balancing of Ledger – Distinction between Journal and Ledger

Unit IV: Books of Accounts

Subsidiary Books – Preparation of different Subsidiary Books – Sales Book – Purchases Book – Sales Return Book – Purchase Return Book – Cash Book – Types - Petty Cash Book – Bill Receivable Book – Bills Payable Book – General Journal or Journal Proper.

Unit V: Final Accounts

Trial Balance – Meaning – Definition – Objectives - Preparation of Manufacturing Account - Final Accounts – Trading Account – Profit and Loss Account – Balance Sheet with adjustments (Simple problems)

Textbooks

1. Jain S.P. and Narang K.L. - Advanced Accounting - Kalyani Publishers, New Delhi 2005.
2. S.N.Maheswari and Sharad K Maheswari – Principles of Financial Accounting – Vikas Publishing House Pvt Ltd – 2013.

Reference Books

1. Reddy T.S. and Murthy A- Financial Accounting- Margham Publications, Chennai, 2007
2. Nagarajan K.L., Vinayagam N. and Mani P.L. - *Principles of Accountancy* - Eurasia Publishing House, New Delhi, 2006
3. Grewal T.S - Double Entry Book- S. Chand and Co, New Delhi, 2005

SEMESTER III
UAHCE19 –ALLIED -III: HEALTHCARE ECONOMICS

Unit I: Introduction to Health Economics

Introduction to Economics – Basic Problems of Economy – Types of Economy – Microeconomics and Macroeconomics – Circular Flow and Interdependence of Economic Activity – Scarcity and Efficiency– Basic Economic Concepts – What is Managerial Economics– What Is Health Economics? – The Relevance of Health Economics– The Size and Scope of The Health Economy.

Unit II: Basic Microeconomics Concepts in Health Economics

Market – Basic Elements of Demand and Supply – Market equilibrium – Elasticity of demand and supply – Consumer behaviour – Approaches to consumer behaviour – Demand for Health.

Unit III: Production and Cost of Healthcare

Production Function – Isoquants – Marginal Products – Substitution – Elasticity of Substitution – Costs – Cost Function – Cost Minimization – Economies of Scale – Technological Change.

Unit IV: Economic Evaluation and Markets in Healthcare

What is Economic Evaluation? – Cost benefit analysis – Cost effectiveness analysis – Cost-Utility Analysis (CUA) – Market – Monopoly – Perfect and Imperfect Competition – Markets in Healthcare – Market Failures – Government Interventions in Healthcare – Health Financing from Various Sources – Public & Private – Health Insurance - TPA

Unit V: Economics of Health Programmes

Environmental Influences on Health and its Economic Impact – Healthcare System in Different Countries – Economics Impact of Tobacco & Alcohol Use – Models of Addition – Aging of Population.

Textbooks

1. ShermanFolland, Allen C. Goodman and MironStano - The Economics of Health and Health Care (Prentice-Hall Inc, New Jersey).
2. Michael Drummond and et al, Methods for Economics Evaluation of Healthcare Programme (Oxford University Press, Second Edition).

Reference Books

1. Shuvendu Bikash Dutta – Health Economics for Hospital Management.
2. Government of India, Five Year Plans.
3. Charles E. Phelps - Health Economics: International Edition Paperback – Import, 20 Feb 2009.

SEMESTER III
UEHAA19 - ELECTIVE I A: BUSINESS ENVIRONMENT

Unit I: Introduction

The Concept of Business Environment –meaning and definition - nature and significance – Brief overview of political, cultural, legal, economic and social environment and their impact on business and strategic decisions – cultural heritage

Unit II: Environment

Political environment – Rights according to Indian Constitution – economic roles of Government in business - Legal environment

Unit III: Business Cycle

Economic Systems and their impact of business- business cycle – inflation and deflation – meaning – causes – effects - control – measures to be adopted by business firms to reduce the evil effects of business cycle - Financial Environment – financial system - Commercial Banks.

Unit IV: Governing Acts

Consumer Protection Act – Environment Protection Act - social responsibility towards customers and community – Business Giving – Social Audit

Unit V: Privatization and Liberalization

Privatization – meaning – ways of privatization – privatization in India – liberalization – meaning – Globalization – meaning – merits and demerits.

Textbooks

1. Sankaran S - Business Environment - Margham Publications, Latest Edition.
2. Shaw William - Business Ethics - Delmar Thomas Learning, Latest Edition.

Reference Books

1. Franics Cherunilam - Business Environment Text and Cases - Latest Edition.
2. Jayaprakash Reddy - Business Environment - APH Publishing Corporation, 2004.
3. Velasquez - Business Ethics – Prentice Hall of India, 5th edition, 2004.

SEMESTER III
UEHAB19 - ELECTIVE I B: LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Unit I: Understanding Supply Chain

Introduction – Definition - Importance of supply chain - Objective - Process of Supply chain - Decision Phases - Competitive and Supply Chain Strategies - Value Chain - Efficiency and Responsiveness Achieving Strategic Fit - Scope

Unit II: Drivers of Supply Chain and Distribution Network

Framework - Facilities - Inventory - Transportation - Information - Sourcing - Pricing - Obstacles - Factors influencing distribution network - Types of Distribution Network.

Unit III: Demand and Planning in Supply Chain

Forecasting: Role- Methods- Aggregate planning in supply chain management – Pricing in supply chain management - Multiple Customer Segment - Perishable Products - Seasonal Demand - Bulk and Spot Contracts

Unit IV: IT and Coordination in Supply Chain Management

Role of IT in supply chain management- Customer Relationship Management - Internal Supply Chain Management- Supplier Relationship Management – Coordination in supply chain management - Bullwhip Effect - Obstacles and Levers in coordination

Unit V: Logistics Management in Healthcare Sector

Flow of Logistics - Features - Models- Analysis in the logistics system.

Textbooks

1. Chopra S and P Mendil – Supply Chain Management: Strategy, Planning and Operations, 2nd Edition – Pearson Education, 2006.
2. Ronald H Ballou and Samir K. Srivastava – Business Logistics/ Supply Chain Management, 5th Edition, 2012

Reference Books

1. Donald J. Bowersox and David J. Closs – Logistical Management, 2nd Edition – Tata McGraw Hill, 2013.
2. David Simchi, Levi – Designing and Managing Supply Chain, 3rd Edition – Tata McGraw Hill, New Delhi, 2008.

SEMESTER III

USHAC319 - SKILL BASED ELECTIVE III: WELLNESS MANAGEMENT

Unit I: Self-Management

Meaning – Self-awareness – Dimensions of Personality Development – Interpersonal Relations – Types of complexes – Emotional Intelligence – Components of Emotional Intelligence – SWOT

Unit II: Stress Management

Meaning – Definition – Sources of Stress – Life Style stressors – Symptoms of stress – Guidelines to reduce stress – Workplace humor – Anger Management

Unit III: Time Management

Definition – Tips for Time Management – Advantages – Common mistakes student make in time management – Goals of Time Management

Unit IV: Situations Management

Conflict Management – Crisis Management – Event Management - Responsible use of technology

Unit V: Health and Nutrition Management

Need for a healthy diet – Balanced diet – Meditation – Simple exercises for a healthy living

Textbooks

1. Richard Regis - Stress Management, – National HRD Net Work Publication, 1st Edition.
2. Swati Y. Bhave- Anger Management, - SAGE publication- 3rd Edition, 2010

Reference Book

Carol A. Beatty- Building Smart Teams, SAGE publication- 1st Edition, 2004

SEMESTER IV

UCHAH19 - HUMAN RESOURCE MANAGEMENT AND DEVELOPMENT

Unit I: **Introduction**

Introduction to HRM – Scope and objectives – HRM planning – need – advantages – HRIS- HR manager – qualities, duties and functions – difference between HRM and personnel management.

Unit II: **HR Functions I**

Recruitment – Meaning – Factors – Process – Selection – Meaning - Process – Induction and orientation – Meaning – Strategic Choices – Problems- Performance appraisal –Meaning – Objectives – Problems – Methods -Training – process – methods

Unit III: HR Functions II

Talent acquisition and retention – career planning – QWL- Factors - Measures– Job Analysis- definition – Process - Methods – Job Design – Meaning - Techniques– Participative Management- Meaning - Methods

Unit IV: Welfare Measures and Disputes

Employee welfare – Meaning – Merits and demerits – types – approaches - Safety and health- meaning – need – safety programme- Health – Meaning- Job Stress– Coping strategies– Trade Unions- Meaning – reasons – strategic choices – Causes and Settlement of Disputes

Unit V: Ethics and Challenges

Separations - meaning - methods - HR audit- meaning – benefits – scope - approaches - Values and Ethics in HRM- meaning – sources – importance – issues- managing ethics – Challenges in HR.

Textbooks

1. Aswatappa – Human Resource Management and Personnel Management – Tata McGraw Hill Publications, Latest Edition.
2. V.S.P.Rao - Human Resource Management: Text and Cases - Excel Books, Latest Edition.

Reference Books

1. P L Rao — Human Resource Management- Excel Books, 2004.
2. P C Tripati — Human Resource Development - Sultan Chand & Sons, 1999.
3. R.C. Goyal and D. K. Sharma - Hospital Administration and Human Resource Management.

SEMESTER IV
UCHAI19 - HOSPITAL OPERATIONS MANAGEMENT – II

Unit I: Public Relations and Marketing

PRO – Objectives, Functions and Methods - Dealing With the Press and the Public - Reception and Front Office.

Unit II: Material Management

Purchase – Procurement, Quote - CRS – Quality and Quantity - Stores – Warehouse & Distribution.

Unit III: Medical Records & Billing and Insurance

Function & Importance of MRD - Registration and Appointment System - Storage and Organization of Medical Records - Planning and Managing the MR Department - Billing system (OP and IP) & Cash Collection - Patient Deposit and Prepayment Systems, Smartcards - Company and Credit Patients - Health Insurance

Unit IV: Engineering Services

Hospital Planning and Design - Civil Engineering and Buildings Maintenance - Electrical Engineering - Mechanical Engineering - Biomedical Engineering - Water Supply and Sewage - Central Medical Gas - Environment Engineering - Bio-Engineering - Management information System- Air Condition Engineering

Unit V: Support Services

Central Sterile Supply Department - Human Resource - Finance Department – Laundry – Housekeeping - Estate Management – Transport - Nutrition & Dietary – Mortuary – Telemedicine – Audit - Security – Fire and Disaster

Textbooks

1. Kunders G.D - Facilities Planning and Arrangement in Healthcare, Prison Books Pvt. LTD, 2004.
2. Sakharkar B.M - Prinicples of Hospital Administration and Planning, 2nd edition, Jaypee, New Delhi 2009.

Reference Books

1. Syed Amin Tablish Hospital and Nursing Homes Planning, Organizations and Management, 1st edition, Jaypee, New Delhi, 2005.
2. Sharma - Step By Step Hospital Designing and Planning with Photo Cd Rom (Dr.Malhotra'S Series) Paperback, 2010.
3. Gupta Shakti - Modern Trends in Planning and Designing Of Hospitals: Principles And Practice With Cd Rom Hardcover, 2007

SEMESTER IV
UCHAJ19 - INTRODUCTION TO RESEARCH METHODOLOGY

Unit I: Introduction

Definition of research – meaning – objectives - types of research - research process - qualities of a researcher – criteria of good research – Problems encountered in research.

Unit II: Research Design

Defining research problem - Research design - features of good research design – types of research design – factors affecting research design –Hypothesis - meaning – definition – need for hypothesis – formulation of hypothesis – types of hypothesis – test of hypothesis – Type I and Type II error.

Unit III: Sampling and scaling

Sampling techniques – types of sampling – merits and demerits – Scaling – Types – Measurements.

Unit IV: Data Collection

Collection of primary and secondary data - Interview techniques – survey and interview method – merits and demerits – Questionnaire – pre requisites of using questionnaire – structured and unstructured questionnaire – types of secondary data.

Unit V: Data analysis and Report writing

Steps in report writing - Introduction to Statistical Packages – Descriptive : Percentage Analysis – Charts - Inferential Analysis: Mean - Median - Mode – Range - Variance - Standard Deviation – Correlation – Regression - Chisquare – ANOVA (Only Theory)

Textbooks

1. C.R. Kothari – Research Methodology Methods and Techniques – New Age International Publishers, , Latest Edition
2. P. Ravilochanan – Research Methodology – Margham Publication, Latest Edition.

Reference Books

1. B.N. Ghosh - Scientific Methods and Social Research– Sterling Publishers Pvt. Ltd., Delhi.
2. Dipak Kumar Bhattacharyya - Research Methodology – Excel Books, 2nd Edition 2006.
3. Ajai Gaur – Statistical Methods for practice and Research.

SEMESTER IV
UCHAK19 – HEALTH SERVICES MARKETING

Unit I: Introduction to Marketing and Service Marketing

Definition of marketing – Types of entities – Core marketing concept – Evolution of marketing ideas - Marketing mix - 4 Ps to 7 Ps - Concept of service – Characteristics of services – Classification – Challenges and issues in services marketing.

Unit II: Building Service Model

Growth of service - Career opportunities in service sector - Planning and creating services – Flower of service – Development of new services – Distribution of services – Pricing Service – Approaches – Strategies.

Unit III: Competition Analysis and Strategies

Competitive Threats –Competition analysis – Strategies – Competitive Advantage – Service failures and Recovery – Complaint handling process - Service branding - Promotion.

Unit IV: Customer Behaviour

Consumer behavior in services – Customer expectations and perceptions of service - Improving service quality - SERQAL – Determinants of service quality – CRM - Drives – Frame work.

Unit V: Delivering and Performing of Services

Managing demand – Managing capacity – Inventory Demand – A Service encounter – Moment of truth - Service Interaction Process.

Textbooks

1. Rama Mohana Rao. K, Services Marketing, 2nd Edition, 2011
2. Philip Kotler et al – Marketing, 14th Edition, 2013

Reference Books

1. K.Douglas Hoffman et al – Essentials of Service Marketing: Concepts, Strategies and Cases, 2nd Edition, Thomsor Learning, 2010.
2. Kenneth E Clow, et al – Services Marketing Operation Management and Strategy, 2nd Edition – Biztantra, New Delhi, 2011
3. Lovelock – Services Marketing : People, Technology and Strategy, 7th Edition, 2011

SEMESTER IV
UAMAC19 – ALLIED – IV: ACCOUNTING FOR HOSPITAL ADMINISTRATORS – II

Unit I: Introduction

Introduction to Management and Cost Accounting – Meaning of Management and Cost Accounting – Characteristics – Principles – Scope – Objectives – Functions – Purpose – Role – Advantages – Limitations - Need for Cost Accounting - Difference between Cost and Management Accounting – Tools and Techniques of Management Accounting.

Unit II: Ratio Analysis

Ratio Analysis - Calculation of various ratios –Profitability ratios – Liquidity ratios – Solvency Ratios- Turnover ratios –Capital Structure Ratios.

Unit III: Funds Flow and Cash Flow

Funds Flow Analysis – Working Capital – Current Assets – Current Liabilities – Preparation of Funds Flow Statement (Simple problems with sale of Fixed Assets under Indirect Method)
Cash Flow Analysis – Meaning – Importance – Difference between Funds Flow and Cash Flow – Preparation of Cash Flow Statement (Simple problems with sale of Fixed Assets under Indirect Method).

Unit IV: Cost Accounting

Classification of costs – Cost sheet – Materials FIFO – LIFO – Process Costing.

Unit V: Marginal Costing & Budgetary Control

Marginal Costing – Meaning – Introduction to all concepts – Cost Volume Profit Analysis excluding managerial decision making - Budget and Budgetary Control – Meaning – Explanation – Advantages – Disadvantages – Types of Budgets – Cash Budget, Flexible Budget, Production Budget and Sales Budget.

Note: 80% Problems and 20% Theory

Textbook

1. Khan and Jain - Management Accounting – Tata McGraw Hill, New Delhi, 2007.

Reference Books

1. Prasanna Chandra - Fundamentals of Financial Management – Tata McGraw Hill, New Delhi, 2007.
2. Sahaf M.A - Management Accounting – Vikas Publishing House, New Delhi, 2006
3. Subir Kumar Banarjee - Financial Management - S.Chand and Co., New Delhi, 2006.

SEMESTER IV
USHAD419 - SKILL BASED ELECTIVE IV: COMMUNICATION SKILL IN HINDI

Unit I

Basic Hindi Words and its meaning and Translating Sentences.

Unit II

Numbers/Weeks/Days/Years/Months

Unit III

Proper Pronunciation.

Unit IV

Avoiding Rude Language/ Using Polite Language Phrases.

Unit V

Commonly used Statements and how to guide patients using spoken Hindi

Evaluation

CA - Written Exam
Semester - Oral Examination

Text Books

1. Spoken Hindi – N. Sreedharan – Sura Books, 2012
2. Rupert Snell - Get Started in Hindi Absolute Beginner Course: (Book and audio support) (Teach Yourself Language) Paperback, 25 Apr 2014.

Reference Books

1. Suresh Kumar, Ramanath Sahai - English-English-Hindi Dictionary Hardcover, 12 Jan 2015.
2. Krishna Gopal Vikal - Learn Hindi in 30 Days Through English Paperback, 1 Jun 2005.
3. Ajay Kumar Bhalla - Learn Hindi Through English (Multilingual) Paperback, 1 Nov 2013.

SEMESTER V

UCHAL19 - ORGANIZATIONAL BEHAVIOUR

Unit I: **Introduction**

Introduction - nature – definition - concept of OB – challenges of OB – role of OB – OB Models - Hawthorne Experiments

Unit II: Perception and Learning

Nature of human behavior – concept – process – models of man - Perception – concept – process – interpersonal perception – managerial applications developing perceptual skills - Learning – concept – nature – components of learning process – factors affecting learning

Unit III: Personality and Group Dynamics

Personality – concept – theories – determinants – measurement – Attitude – concept – factors in attitude formation – attitudes relevant for OB – Group Dynamics – concept – types – formal and informal- meaning – characteristics – difference

Unit IV: Conflict

Organization Conflict – concept – stages – positive and negative aspects – role conflict – interpersonal conflict – group level conflict – conflict resolution – Stress – Meaning – causes – effects - coping strategies – MBO – concept – process – benefits – problems - perquisites for installing MBO Programme.

Unit V: **Motivation and Leadership Theories**

Motivation Theories – Maslow's, Herzberg, Vroom's, McClelland's , X and Y- Leadership – functions – importance - theories – styles.

Case study for all chapters.

Textbooks

1. Keith Davis and John W. Newstorm - Organizational Behavior: Human Behavior at Work - Tata McGraw Hill, Delhi, Latest Edition.
2. L.M.Prasad – Organizational Behavior – Sultan Chand & Sons, Latest Edition.

Reference Books

1. Stephen. P. Robbins and Timothy A. Judge - Organizational Behavior - Prentice Hall India, Latest Edition.
2. Udai Pareek - Understanding Organizational Behavior - Oxford University Press.
3. Stephen P. Robbins and Seema Sanghi - Organizational Behaviour - Pearsons Education, 2005.

SEMESTER V
UCHAM19 – QUALITY IN HEALTHCARE

Unit I: Introduction to Quality

Concept and definitions - Dimensions of service quality - History of quality - Quality principles - Customer and types of customer - Continuous quality improvement - Seven tools of quality - Check Sheet, Control chart, Stratification, Pareto chart, Histogram and Scatter Diagram - 5s - Six Sigma- Kaisen - Lean Management and Reengineering.

Unit II: Healthcare Quality

Healthcare Quality and the patients – Basic concepts of Healthcare quality – Variation in medical practice and implication for quality - Quality improvement system - Need for healthcare quality management in hospitals – Measure and improving patient care experience.

Unit III: Patient Safety and Medical Errors

Scope and Use of Patient Safety Considerations in Healthcare - Clinical and Operational Issues – Improve patient safety – Adverse event - Using Technology to Improve Patient Safety

Unit IV: Audit & Accreditation in Healthcare

Clinical quality- - Auditing – types, steps and benefits- Accreditation- ISO, NABH, JCI and other standards- Benefits of accreditation

Unit V: Organization and Roles in Quality

Quality Policy- Quality Steering committee- Quality Council- Quality team- Healthcare performance indicator- Importance and concept of patient safety: implementing strategies

Textbooks

1. Bagad, V.S. Total Quality Management, Technical Publications, Pune.
2. Scott B. Ransom, the healthcare quality book, Health Administration Press, Chicago, Illinois AUPHA Press, Washington, D.C.

Reference Books

1. Raj Kumar, Acts Applicable to Hospitals in India (The Christian Medical Association of India, New Delhi).
2. Jayakumar - Total Quality Management- Lakshmi publication, Latest Edition.

SEMESTER V
UCHAN19 - MANAGEMENT INFORMATION SYSTEMS

Unit I: Introduction to Information Systems and application in Functional Business Areas

A Manager's view of Information Systems – An Introduction to concepts of system and Organizations – Strategic Uses of Information Technology – Business Process in Engineering and Information Technology.

Unit II: Applications of Information Systems

Applications to Operational Information systems to Business – operation marketing information system – operational accounting information system – operational human resource information system - Tactical and Strategic Information systems to Business – tactical accounting and financial information system - tactical marketing information system – tactical human resource information system.

Unit III: Planning and Development of Information Systems

Information systems Planning – System analysis and Design

Unit IV: Organization of Information systems

Introduction: Centralized/ De-Centralized/ Distributed Data Processing – Allocation of Responsibilities in Distributed Data Processing – Effective Organization of Information Processing Activities – Roles & Responsibilities of Information Systems Professionals – Career paths and Management of Data Processing – The Organization and Management of End-User Computing – Users and User Developed Applications – Management and Control Issues – Departmental Computing – Future of Information Systems.

Unit V: Hospital Information systems (HIS)

Introduction to HIS- definition, need of HIS, functional areas of HIS, utilization of HIS, Structure of HIS - Importance of HIS - Managing information in hospitals, Functional areas in a hospital, structuring of HIS, users and access control - Development and implementation- Hospital Management Software (HMS) - Application of MIS - Hospital Information Systems (HIS) or Hospital Information Technology (HIT) – Telemedicine - Laboratory Information System (LIS) – PACS – Health information management - Logistic and Supply chain – Data analytics - Electronic Health - E-governance.

Textbooks

1. Robert Schulthesis, Mary Sumner – Management Information Systems: The Manager's view- Tata McGraw Hill, 2006.
2. Haag, Cummings and McCubbrey – Management Information Systems for the Information Age, 6th Edition – Tata McGraw Hill, 2005.
3. Hospital Information Systems: A Concise Study by S.A Kelkar.

Reference Books

1. Gordon Davis – Management Information Systems: Conceptual Foundations, Structure and Development – Tata McGraw Hill, 2000.
2. James A, O'Brien - Management Information Systems, 6th Edition – Tata McGraw Hill, 2004

SEMESTER V

UEHAC19 - ELECTIVE II A: HEALTHCARE INSURANCE

Unit I: Introduction

Introduction to Insurance – Concept of Health insurance –Health care — Determinants – Levels of Healthcare – Types – Factors affecting Health system in India - Evolution of Health Insurance in India – Health insurance market

Unit II: Products of Health Insurance I

Health Insurance Products: Classification of Health Insurance products- IRDA guidelines on Standardization in health insurance – Hospitalization indemnity product - High Deductible plans – Senior citizen policy – Fixed benefit covers – Long term care Insurance

Unit III: Products of Health Insurance II

Combi products –Package policies –Health insurance for poorer sections –Government schemes –Personal accident -Overseas Travel Insurance –Group Health Cover –Special Products –Key terms in Health policies – Diagnostic Related Groups(DRG) – Determination of DRGs – Benefits of DRGs.

Unit IV: Underwriting

Health Insurance Underwriting: Need for underwriting—Principles and tools of underwriting Health insurance —The underwriting process – Group health insurance – Underwriting of Overseas Travel Insurance - Underwriting of Personal Accident insurance.

Unit V: Health Insurance Claims

Claims Management- Management of Health Insurance Claims - Claim process- Role of Third Party Administrators (TPA)

Text Books

1. Insurance Institute of India – IC 32- Health Insurance, 2015
2. Insurance Institute of India - IC 27 - Healthcare Insurance, 2016

Reference Books

1. Edwin Jerome Faulkner, Health insurance, McGraw-Hill insurance series
2. Benjamin S. Warren, Health Insurance: Its Relation to the Public Health, Biblio Bazaar, 2009
3. AmmerNarainAgarwala, Health insurance in India, East End

SEMESTER V
UEHAD19 – ELECTIVE II B: E- BANKING

Unit I: Introduction
Electronic Banking: Traditional Banking Vs E-Banking- Facets of E-Banking - E-Banking transactions truncated cheque and Electronic cheque - Models for E-banking-complete centralized solution- features -CCS-Cluster approach-Hi tech. Bank with in Bank Advances of E-Banking-Constraints in E-Banking.

Unit II: Online Banking
Online Banking: Introduction –concept and meaning-the electronic delivery channels-need for computerization-Automatic Teller Machine(ATM) at home –Electronic Fund Transfer(EFT)-uses –computerization in clearing houses- Tele banking- Banking on home computers –Electronic Money Transfer -uses of EMT.

Unit III: E- Banking in India
Updating Bank saving accounts –Computer bank branches-Financial Transaction Terminals- (FTT)-E Cheque-Magnetic Ink Character Recognition (MICR) and Cheques- E-Banking in India-Procedure- Programmes-Components- How to go on net for Online Banking-advantages-Limitations.

Unit IV: Security I
E-Banking Security- Introduction need for security –Security concepts-Privacy – Survey. Findings on security-Attack-Cybercrimes-Reasons for Privacy- Tampering-Encryption –Meaning-The encryption process-may appear as follows - Cryptogram-Cryptanalyst-cryptography-Types of Cipher systems – Code systems-Cryptography - Cipher-Decipher-Jumbling-Asymmetric - Crypto system - Data Encryption Standard (DES).

Unit V: Security II
E-Builder solutions-Digital certificate-Digital Signature &Electronic Signature-E-Security solutions — solutions providers-E-locking technique- E-locking services-Netscape security solutions- Pry Zone – E software security Internet-Transactions-Transaction security-PKI-Sierras Internet solutions –security devices-Public Key Infrastructure-(PKI)-Firewalls Secure Ledger- (FSL) - Secure Electronic Transaction (SET).

Text Books

1. C.S. Rayudu, E-Business, Himalaya Publishing House. 22
2. IIBF - Bank Financial Management Paperback, 2018.

Reference Books

1. Roger Hunt& John Shelly, Computers and Commonsense.
2. Peter Rose, Sylvia Hudgins- Bank Management and Financial Services Paperback , 1 Jul 2017.
3. N S TOOR, ARUNDEEP TOOR - Skylark Publication's Bank Financial Management - Guide for CAIIB Q&A by N. S.Toor & Arundeep Toor (9TH EDITION) Paperback, 2018.
4. Bhushan Dewan, E-Commerce.

PRACTICAL II - E-BANKING

1. Commenting on the correctness of documents like Cheque.
2. Responding to stimulated exercises on Customer/ Bank Employee Complaints.
3. Format of Letter of Credit.
4. Examining the working Mechanisms of ATMs and ETAs.
5. Working Knowledge of Telebanking
6. Knowledge of working Mechanisms of Encryption and E-Security.
7. Learning Internet Transactions Firewalls.

SEMESTER V
UCHAO19 – GLOBAL HEALTHCARE SYSTEM

Unit I: Introduction and Medical Tourism

Global healthcare - Meaning - History - Evaluation - Medical Tourism - Global Economy in Healthcare - Medical Tourism Destination - Challenges and Opportunities

Unit II: National Health Service

Leadership and Governance - Health information system - Health Financing - Medical products and technologies - Human resource for health - Service Delivery

Unit III: Canadian Healthcare

Leadership and Governance - Health information system - Health Financing - Medical products and technologies - Human resource for health - Service Delivery

Unit IV: Japan Healthcare

Leadership and Governance - Health information system - Health Financing- Medical products and technologies - Human resource for health - Service Delivery

Unit V: Malaysia Healthcare

Leadership and Governance - Health information system - Health Financing - Medical products and technologies - Human resource for health - Service Delivery

Text Books

1. International Management: Managing Across Borders and Cultures, Text and Cases (8th Edition) 8th Edition.
2. Health Care in Japan: Volume 9 (Routledge Library Editions: Japan)Hardcover – Import, 9 Sep 2010.

Reference Books

1. Bhardwaj Pradeep - Latest In Healthcare Management Paperback, 2015.
2. NHS - The Handbook to the NHS Constitution – 2019.pdf.
3. Richard Nadeau , Éric Bélanger , et al - Health Care Policy and Opinion in the United States and Canada (Routledge Studies in Governance and Public Policy), 2 September 2014.

SEMESTER V
UCHAP19 - PROJECT

Each student shall belong to a team of 5 and are required to prepare the report on the basis of investigation carried out in a particular problem area identified by them in a hospital. The report should demonstrate the capability of the students for some creative potential and original approach to solve the practical problems in day today activities in a hospital.

The report should include surveys, interpretation, planning and design of improved integrated management systems in a hospital, presented in a comprehensive manner and viva voce examination will be conducted on the basis of the report.

Evaluation Pattern

- The mode of evaluating the project will consist of two parts. One on the basis of report writing and the other will be through Viva Voce Examination will be conducted.
- The valuation of the report writing and Viva Voce Examination will be done by the internal and external examiner.
- 60 marks will be awarded for report writing and 20 marks for overall review and 20 marks for oral examination.
- Project will be for a period of 1 month which will be during the II year in the month of May.
- Each team should find a reputed hospital to carry out her investigation with the approval of the department.
- After completing the Project, the students should get an Attendance Certificate from the hospital.

The following are the components for report writing

Content	40 Marks
Methodology	10 Marks
Layout	10 Marks
Overall Performance Review	20 Marks (CA – 80 Marks)
Viva Voce	(Semester 20 Marks)
Oral Presentation	10 Marks
Question and Answer	10 Marks

SEMESTER V
USHAE519 – SKILL BASED ELECTIVE - V: ACCOUNTING PACKAGES

Unit I: Introduction

Introduction to Accounting Software Packages : Marg – Zipbooks – ProfitBooks – Money Manager Ex – Quick Books – Zoho Books – Vyapar – MProfit – Marg ERP – Tally

Unit II: Profit & Loss and Balance Sheet

Journal, ledger accounts – Trial Balance – Trading and Profit and Loss account – Profit and Loss account – Balance Sheet - Display Balance Sheet – Profit and Loss Account – Display trial balance

Unit III: Inventory and Stock

Fundamentals of Inventory – Stock Groups – Stock categories – Godowns /Locations – Units of Measure - Stock items

Unit IV: Cost Categories

Cost Categories – Cost Centers – Inventory Master Creation: Stock groups – Entering Vouchers; Voucher types – How to enter Voucher – Different Types of Accounting Vouchers (Payments / Receipt, Journal, Sales and Purchase).

Unit V: Introduction to Ratio Analysis

Ratio Analysis

Lab Exercises

1. Trading and profit and loss account of a company
2. Balance Sheet of the Company
3. Cost category and cost center
4. Inventory and stock

Textbooks

1. Namrata Agarwal, Tally 9, 2nd Edition – Dreamtech Press,2013.
2. A.K.Nadhani, K.K.Nadhani, Implementing Tally 9, BPB Publications – 2ndEdition, 2007.
3. www.tally9book.com

SEMESTER VI
UCHAQ19 - PUBLIC HEALTH AND COMMUNITY

Unit I: History of Medicine Overview

Medicine in antiquity - Scientific approach and modern medicine - Healthcare revolution

Unit II: Concepts of Health and Disease

Definition on health - Determinants of Health - Dimensions of Health - Concept of Disease - Concepts of Prevention - Health Management and Planning - Principles of Health Management and Planning cycle - Healthcare of the community – Health Delivery System

Unit III: Principles of Epidemiology

Definitions and basic measurement - Epidemiologic methods - Descriptive epidemiology - Uses of epidemiology - Screening for Disease

Unit IV: Disease: Concept, Cause and Control

Communicable diseases - Non-communicable diseases - Control of non-communicable diseases - National health planning in India, NHP - Health programmes in India - Reproductive and child health programme – Immunization - Leprosy & TB - HIV/AIDS programmes

Unit V: Health Status and Statistics in India and its Determinants

Nutrition and health - Social science and medicine - Environment and health - Health information and statistics

Textbooks

1. Park, K. Park’s Textbook of Preventive and Social Medicine,BanarsidasBhanot, Jabalpur, India, 24th Edition.
2. Virginia Berridge - Public Health: A Very Short Introduction (Very Short Introductions) Paperback, 28 Jul 2016.

Reference Books

1. Rajendra Pratap GuptaHealth Care Reforms in India: Making up for the Lost Decades Hardcover, 10 Jan 2016.
2. Sharma Suresh - Nursing Research and Statistics Paperback, 10 Aug 2018.
3. Mary Jane Schneider - Introduction to Public Health, 5/e Paperback, 2017.

SEMESTER VI
UCHAR19 - MATERIALS AND EQUIPMENT MANAGEMENT

Unit I: Materials Management

Introduction - Definition and Function - Goals and Objectives of Materials Management - Materials Cycle - Functions of Materials Manager - Problems and Issues in Hospitals - Information Systems for Materials Management

Unit II: Purchasing

Objectives and Elements of Purchasing - Purchasing System - Purchasing Cycle - Purchase Procedures - Legal and Ethical Aspects - Conditions of Contract - Financial Rules - Arbitration

Unit III: Equipment Purchase and Maintenance

Planning and Selection of Equipment - Import of Equipment - Equipment Utilization and Operation - Equipment Repair and Maintenance - Equipment Audit

Unit IV: Inspection, Storage and Distribution of Materials

Planning Consideration of Stores - Inspection and Verification of Materials - Storage of Materials - Distribution of Materials - Condemnation and Disposal

Unit V: Scientific Inventory Management

Codification and Standardization - Value Analysis - Inventory Control - Lead Time, Safety Stock and Reorder level - Economic Order Quantity (EOQ) - Selective Controls - Case Studies on Inventory Control

Textbooks

1. Shaki Gupta and Sunil Kant, Hospital Stores Management: An Integrated Approach (Jaypee Publications, New Delhi, India).

2. WHO, Maintenance and Repair of Laboratory, Diagnostic, Imaging and Hospital Equipment (WHO, Geneva).

Reference Books

1. Donald J. Bowersox and David J. Closs – Logistical Management, 2nd Edition – Tata McGraw Hill, 2013.
2. David Simchi, Levi – Designing and Managing Supply Chain, 3rd Edition – Tata McGraw Hill, New Delhi, 2008.
3. Ajay Kaul - Hospitality Logistics Management Hardcover, Sep 2012.

SEMESTER VI

UCHAS19 - INTERNSHIP FOR 2 MONTHS

Each student shall be required to prepare the report on the basis of training undergone by her in a hospital. The report should demonstrate the capability of the students in studying the hospital and its services and activities in totality.

Evaluation Pattern

- Each student should undergo the training separately.
- The mode of evaluating the student will consist of two parts. One on the basis of report writing and the other will be through Viva Voce.
- The valuation of the report writing will be by the internal examiner while for the oral examination an external examiner will be called for.
- 60 marks will be awarded for report writing and 20 marks for over-all review and 20 marks for oral examination.
- Training will be for a period of 3 months which will be during the last semester of the course.
- Each student should find a reputed hospital to carry out her investigation with the approval of the department.
- After completing her training, the student should get an Attendance Certificate from the hospital.

The following are the components for report writing

Content	50 Marks
Layout	10 Marks
Overall Performance Review	CA – 60 Marks
Viva Voce	Semester 40 Marks
Oral Presentation	20 Marks
Question and Answer	20 Marks

SEMESTER VI
USHAF619 - SKILL BASED ELECTIVE VI : SOCIAL ENTREPRENEURSHIP

Unit I: Social Entrepreneurship

Social entrepreneur – factors impacting transformation into social entrepreneur-The characteristics of social entrepreneurs - The four distinctions of social entrepreneurship

Unit II: Forms of Social Enterprises

Profit and non-profit Proprietorships – partnership - company - Non-Governmental organization - Society – Trust and Company (Sec. 25) registration - Factors determining selection of forms of registration

Unit III: Sustainable Development

Concept of Sustainable Development and its importance -Factors affecting sustainable development - Environmental costs and its economic value - The Political Challenge and development Issues in India - The Millennium Ecosystem Assessment - International Influences

Unit IV: Opportunities for Social Entrepreneurs

Methods of sensing opportunities and fields of opportunities - Assessing and prioritizing opportunities - Enterprise launching and its procedures – start-ups – incubation – accessing venture capital – CSR funds - PPP

Unit V: Successful Social Entrepreneurship Initiatives

Study of successful models Aravind Eye Care System, etc

Exposure visit to Hope House, MBKG

Textbooks

1. Jayshree Suresh – Entrepreneurial Development, 1st Edition – Margham Publication, Latest Edition.
2. Robert, Michael, Dean A. Shepherd – Entrepreneurship, 6th Edition – Tata McGraw Hill, 2006.

Reference Books

1. S. S. Khanka – Entrepreneurial Development, 1st Edition – Sultan Chand & Sons, Latest Edition.
2. Dinanath Kaushik - Studies in Indian Entrepreneurship, New Delhi, Cyber Tech Publications, 2013
3. Gopalkrishnan - The Entrepreneur's Choice: Cases on Family Business in India, New Delh, Routledge taylor& Francis Group, 2014

M. A. ENGLISH

(With effect from the Academic Year 2019 - 2020)

SEMESTER I

PIENA19 – INDEPENDENT ELECTIVE I A: CHILDREN'S LITERATURE

Objectives:

- To enable the students to evaluate the literary qualities and the popular appeal of Children's Literature
- To help the students to explore the category of Children's Literature and its impact on children

Unit I: Poetry

William Wordsworth	: To the Cuckoo
Edward Lear	: The Owl and the Pussy Cat
Theodore Roethke	: My Papa's Waltz
Coventry Patmore	: Toys

Unit II: Prose

Jawaharlal Nehru	Letters from a Father to his Daughter: 1. The Book of Nature 2. How Early History was written 3. The Making of the Earth
Shoba De 1. Circle of Love 2. Growing up is hard to do	Speed Post

Unit III: Drama

Rabindranth Tagore:	The Post Office

Unit IV: Short Story

Panchatantra Stories	1. The Greedy Cobra and the King of Frogs 2. The Story of the Potter 3. The Carpenter's Wife
Hans Anderson	The Little Mermaid
Richard Burton	Alibaba and the Forty Thieves
Ruskin Bond	The Tiger in the Tunnel

Unit V: Fiction

C.S. Lewis	The Tale of Narnia: The Lion, The Witch and The Wardrobe
Rudyard Kipling	The Jungle Book
Roald Dahl	Matilda

Innovative Component:

Read and analyse fairy tales, fables, cartoons, graphic novels, comics and other works of Children's Literature

Books for Study and Reference

1. Tiwari, Shubha – Children and Literature – New Delhi: Atlantic Publishers and Distributors, 2006
2. Winbott S.E. – English Poetry for the Young – Blackie and Sons.
3. Hans Anderson – Hans Anderson Fairy Tales: India: Wilco Publishing House, 2005.
4. Nehru, Jawaharlal. Letter from a Father to His Daughter. India: Puffin Books, 2004.

SEMESTER I

PIENB19 – INDEPENDENT ELECTIVE I B: TECHNICAL AND BUSINESS WRITING

Objectives:

- To participate actively in writing activities (individually and in collaboration) that model effective scientific and technical communication in the workplace.
- To develop professional work habits, including those necessary for effective collaboration and cooperation with other students, instructors, and Service.
- To communicate effectively as professionals and understand technical writing needs.

Unit I: Technical Writing

Business letters – E-Mails – Memos – Notices – Agenda – Minutes of meeting – Technical abstracts Writing summaries and paraphrases.

Unit II: Technical Writing:

Job applications – Resumes – Project Proposals – Technical reports – News reports – Data Commentary

Unit III: Linguistic Ability and Style:

ABC of Technical writing – Accuracy, Brevity and Clarity – Note making techniques.

Unit IV: Editing

Editing for coherence - Editing for clarity - Editing for economy - Editing for readability

Unit V: Technical Article Writing

Journal articles – conference papers – Reviews – Research articles – paragraph writing – paragraph length, unity, coherence – Developing paragraph – presentation skills.

Innovative Component

Preparation of Business reports, proposals, memorandums and emails,User manuals; software installation guides; Standard Operating Procedures (SOP); Service Level Agreements (SLA); Request for Proposal (RFP); legal disclaimers; company documents; annual reports; and Help files.

Books for Reference:

1. Kapoor, A.N. *Bussiness Letter for Different Occasions*, New Delhi: S. Chard and Company Pvt. Ltd. 1987.
2. Pal, Rajendra, J.S. Korlahalli*Essentials of Business Communication*. New Delhi: Sultan Chard a sons, 1998.
3. Ramesh, M.S. C.C. Pattarshetti, *Business Communications*, New Delhi: R. Chard & Co Publishers, 1997.
4. Rizvi, M. Ashraf.*Effective Technical communication*.
5. Chennai: Mc Graw Hill Education Pvt. Ltd. 2018.

SEMESTER II

PIENC19 – INDEPENDENT ELECTIVE II A: LITERATURE FOR ACADEMIC AND PROFESSIONAL PURPOSES

Objectives:

- To develop in the students the knowledge of literary history for professional and academic purpose.
- To enhance the interpretative ability to critically analyse and appreciate literary texts

Unit I: Characteristics of British Literary Movements-Renaissance to Postmodernism

Old English (or Anglo-Saxon) Period: Middle English Period: The Renaissance: Elizabethan Age: Jacobean Age: Caroline Age: Commonwealth Period (or Puritan Interregnum): The Neoclassical Period: The Restoration: The Augustan Age (or Age of Pope): The Age of Sensibility (or Age of Johnson): The Romantic Period: The Victorian Period: The Pre-Raphaelites: Aestheticism and Decadence: The Edwardian Period: The Georgian Period: The Modern Period1945-present : Postmodern Period

Unit II: American History of Literature

The Colonial Period 1607-1765
The Revolutionary Period 1765-1815
The Era of National Expansion 1815-1837
The Concord Writers 1837-1861
The Cambridge Scholars 1837-1861
Literature in the Cities 1837-1861
Literature Since 1861

Unit III: History of Indian English Literature

1. The Literary Landscape: The Nature And Scope Of Indian English Literature
2. From The Beginnings to 1857
   Early Prose - Early Poetry
3. The Winds Of Change: 1857 To 1920
   Poetry – Prose- Biography And Autobiography - Travel Books – Essays - Literary And Art Criticism – Drama – Fiction - The Short Story
4. The Gandhian Whirlwind: 1920-1947
   Prose
   Political Prose--Mahatma Gandhi - Jawaharlal Nehru - Other associates of Gandhi Critics of Gandhism Hindu Mahasabha ideology - Muslim Political thought - Communist thought - Socialist thought Moderate thought – Journalism - History - Religious and Philosophical Prose - Radhakrishnan Biography and Autobiography - Travel Books – Essays - Literary and Art Criticism Poetry
   The School of Sri Aurobindo - Religious and Philosophical verse - Romantic verse
   Minor verse writers Drama – Fiction - Novel - Short Story

5. Independence And After
   Poetry
   The Romantic School - Women Poets: Kamala Das - Other modern Poets
   fiction - The Novel - Women Novelists - THE SHORT STORY - Women Writers
   Drama - Poetic Drama - Prose Drama
   Prose – Autobiography – Biography - Politics and History - Religion and Philosophy
   Travel Books - Essays and Belles-Letters - Literary and Art Criticism
   Reference: M K Naik. *A History of Indian English Literature.* Sahitya Akademi.1999

Unit IV:

Basic Tenets of various Schools of Criticism – Classical to Contemporary

Unit V:

Literary Forms: Poetry, Essay, Short Story, Novel, Drama, Biography, Autobiography

Rhetoric
Figures of speech – words – sentences – paragraph – composition

Prosody
Accent - rhythm and meter
Scansion

Innovative Component

Review of literary texts
Preparing a paper (Analysis, study and Research)

Primary Texts:

1. R.J. Rees, *English Literature*: *An Introduction for Foreign Readers.* London: Macmillan, 1978.
2. M. H. Abrams. *A Glossary of Literary Terms*, Seventh Edition. Singapore: Thomson Heinle, 2008.
3. Gray, Martin. *A Dictionary of Literary Terms*. New Delhi: Pearson, 2008.
4. Jaydip Sarkar and Anindya Bhattacharya**.** A Handbook of Rhetoric and Prosody Paperback. Chennai. Orient Blackswan.2018

Secondary Texts:

1. Leech, Geoffrey., Margaret Deuchar and Robert Hoogenraad. *English Grammar for Today.* New York: Palgrave Macmillan, 2011.
2. Day, Gary. *Literary Criticism: A New History.* Hyderabad: Orient Black Swan, 2008.
3. Freeman, Sarah - *Written Communication in English*. Chennai: Orient Longman, 2005.
4. Gerson, Sharon. J. and Steven M. Gerson. *Technical Writing: Process and Product* 3rd edition. New Delhi: Pearson Education Inc., 2005.
5. Pauley, Steven E. and Daniel, G.Riordan. *Technical Report Writing*. New Delhi: A.I.T.B.S. Publishers and Distributors, 2006.

6. Rackham, Jeff. *From Sight to Insight: Steps in the Writing Process*, 2nd Edition. New York: Holt, Rinehart and Winston, 1984.
7. Prasad, B. *Background to the Study of English Literature*. India: Macmillan, 2008.
8. Schwartz, Helen J. *Interactive Writing; Composing with a Word Processor*. New York: Saunders College Publishing, 1985.
9. Turk, Christopher and John Kirkman. *Effective Writing*. London: Spon Press, 1982.
10. Neal M. James and Suzanne S.Brown. *Newswriting and Reporting*. USA: Iowa State University Press, 1982.
11. Harry Blamire. *A History of Literary Criticism*. Macmillan History of Literature (Laxmi Publications)2008.

Innovative Component

Critical analysis of Poetry, Prose, Drama, Short story and Novels

SEMESTER II

PIEND19 – INDEPENDENT ELECTIVE II B: CREATIVE WRITING

Objective:

- To develop the reading and writing skills for personal and academic purpose.
- To enhance the interpretative ability to critically analyse and appreciate literary texts

Unit I: **Introducing Creative Writing**

Analyze Purpose of writing
Learning to Write
Publishing and Editing

Unit II: Challenges of Creative Writing

Challenges to Writer
Challenges of Translation
Challenges of Experiment
The Challenge of Design
The Challenge of Quality

Unit III: Process of Creative Writing

Seven Processes (Preparing, Planning, Incubation, Beginning, Flowing, Breakthroughs and finish lines, On titles)
The writer post- performance
Precisions of Process
Confidence and Practise

Unit IV: Composition and Creative Writing

Habits of mind, Principles of practice
Discipline
Notebooks and rituals
Compositions and action
Language's Mercury
Influence and Imitation

Unit V: Practice of Poetry, Fiction and Nonfiction

Writing literary fiction (Flash fiction- Short story- Novel- Character- Story making)
Writing creative nonfiction (writing about yourself- writing about people and the world)
Writing poetry (listening to language- finding language- awakening language- shaping language- playing with language- poetry's reason)

Innovative Component

Creative writing of Poems, short stories, plays and essays.

Primary Text:

1. Morley, David. *The Cambridge Introduction to Creative Writing*. Cambridge: CUP, 2007.

Secondary Texts:

1. Best, Wilfred D. *The Students Companion*. London: Rupa Paperback, 1984.
2. Dawson S.W. *Drama and Dramatic: The Critical Idiom Series*. London: Methuen & Co, 1984.
3. Doubtfire, Dianne. *Creative Writing.* Britain: The Chaucer Press Ltd, 1983.
4. Evans, Ifor B. *The Use of English.* London and New York: Staples Press, 1949.
5. Hall Donald and Sven Birkerts. *Writing Well*. New York: Harper Collins Publishers, 1991.
6. Kahn John Ellison (Ed.) *Reader's Digest: How to Write and Speak Better.* New York: Reader's Digest, 1993.
7. Millward Celia. *Handbook for Writers, 2nd Edition.* New York: Holt, Rinehart & Winston, 1980.
8. Reid Ian. *The Short Story: The Critical Idiom Series.* London: Methuen & Co, 1986.
9. Saxena Sunil. *Headline Writing.* New Delhi: Sage Publications, 2006.
10. Schwartz Helen J. *Interactive Writing: Composing with a Word Processor.* New York: Saunders College Publishing, 1985.
11. Scott Bill. *The Skills of Communicating.* Mumbai: Jaico Publishing House, 1995.

SEMESTER III

PIENE19 – INDEPENDENT ELECTIVE III A: LITERATURE AND ENVIRONMENT

Objectives:

- To analyse the strategies through which poets, dramatists, and fiction and nonfiction writers have addressed environmental questions through both the form and content of their works.
- To investigate the extent to which literary and cultural forms shape the ways that people see and relate to nature and the environment, that is to the places where they live, work, travel, and form their identities.

Unit I: Detailed Poems

Admiration of Nature and Deforestation

William Wordsworth	The Education of Nature
Coleridge	To the Nightingale
G.M. Hopkins	Spring
Gieve Patel	On Killing a Tree
Robert Frost	Tree at my window

Unit II: Non Detailed Poems

Global Warming and Climate Change

Nissim Ezekiel	After Rain
Eunice De Souza	Landscape
Hilda Doolittle	Heat
Wilfred Campbell	The Winter Lakes
H.W. Longfellow	Nature

Unit III: Prose

Conservation of Water and Protection Of Animals

ThakazhiSivasankara Pillai	In the Flood
Rabindranath Tagore	The Horse
Sir J. Arthur Thomson	The Donkey (Detailed)
C.Rajagopalachari	The Tree Speaks (Detailed)
C.V.Raman	Water: The Elixir of Life (Detailed)

Unit IV: Short Stories

Nature And Its History

Rudyard Kipling	How the Leopard got his spots
Jim Corbett	The Kanda Man – Eater
Sufi Saints	When the Waters were changed
Ruskin Bond	The Cherry Tree
	Dust on the Mountains

Unit V: Fiction

Ecological Study

Timothy Morton	Without Nature
Barbara Kingsolver	Prodigal Summer
Mamang Dai	The Black Hill
Upton Sinclair	The Jungle
Patrick White	The Tree of Man

Innovative Component

Ecocritical analysis of Poetry, Prose, Drama, Short story and Novels

Books for Study and Reference

1. C.D.Narasimhaiah. ed. *An Anthology of Commonwealth Poetry*. Macmillan India Limited, Chennai. 1990.
2. C.N. Ramachandran. Ed. *Five Centuries of Poetry*. Radha Achar Macmillan Publishers India Ltd, NewDelhi, 1991.
3. De Souza, Eunice. Ed. *Nine Indian Women Poets: An Anthology*. Oxford University Press, New Delhi, 1997.
4. Dickinson, Emily. *Selected Poems*. Dover Publications. Newyork.1990.
5. Dr. S. Sen. *Robert Frost : Selected Poems (A Critical Evaluation)* . Unique Publishers, New Delhi, 1984.
6. Dr. A. Shanmugakani. Ed. *A Bouquet of Poems : An Anthology of Poems*. Manimegalai publishing house, Madurai. 2012.
7. Holloway, John. Ed. *Selected Poems of Percy Bysshe Shelley*. Heinemann Educational Books, London. 1960.
8. M.Khatri. *Great Short Stories of Sufi Saints*. The Book Paradise, New Delhi, 2006.
9. M.W.Gardsen. ed. *Life and Literature (Prose Selections).* Macmillan Co.of India Ltd, Madras, 1971.
10. R. Parthasarathy. *Twentieth Century Indian Poets*. Oxford University Press, New Delhi, 1976.
11. Satpathy, Sumanyu. Ed. *Early Modern Poetry*. Macmillan India Limited, Chennai, 1999.

SEMESTER III

PIENF19 – INDEPENDENT ELECTIVE III B: ACADEMIC WRITING

Objectives:

- To develop the reading and writing skills for personal and academic purpose.
- To enhance the interpretative ability to critically analyse and appreciate literary texts

Unit I: Writing a Summary and Response

Writing Practice: Identifying arguments – Summarizing - Forming and expressing a point of view
Editing focus: Paraphrasing - Subject-verb agreement

Unit II: Writing a Descriptive Essay and a Classification Essay

Reading: *Cherries for My Grandma* by Geoffery Canada
Writing practice: Analyzing essay organization - Writing detailed examples as support - Using a summary as an introduction
Editing focus: Adjective clauses - Habitual past: *would* vs. *used to*
Writing a Classification Essay
Reading: *Some Reflections on the Technology of Eating* (from *The New York Time*)
Writing practice: Determining an organizing principle for categorization - Categorizing and avoiding overlapping - Developing conclusions for classification essays
Editing focus: Pronoun referents

Unit III: Writing an Advantages–and–Disadvantages Essay

Reading: *You've Got Inappropriate Mail* (from *The New York Time*)
Writing practice: Summarizing and incorporating academic research as support
Responding to a quote- More on using a summary as an introduction
Using the conclusion to unit an essay
Editing focus: Bibliographies or "Works Cited" lists - Citations for online references - Citations within a text

Unit IV: Writing a Cause –and-Effect Essay and Writing a Comparison–and-Contrast Essay

Reading: Excerpt from *The Face of Beauty* by Diane Ackerman
Writing practice: Developing different types of support - Writing up research studies
Showing cause and effect - Outlining an essay
Editing focus: Adverbial clauses - Causal connectors - Reported speech
Writing a Comparison–and-Contrast Essay
Reading: "A Holistic Approach to Personality Analysis. The Myers-Briggs Type Indicator"
Writing practice: Developing introductions - Assessing the value of a theory
Editing focus**:** Clauses for comparison, contrast and concession - Transitional expressions between sentences

Unit V: Writing a Literary Analysis Essay and Writing an Argumentative Essay

Reading: Excerpt from *The Kite Runner*, by Khaled Hosseini
Writing practice: Analyzing mood - Summarizing a story - Understanding plot devices - Writing about symbols - Organizing an introduction for a literary analysis essay
Integrating quotes with text - Integrating simile, metaphor, and personification
Editing focus**:** Present and past unreal conditions
Writing an Argumentative Essay
Reading: *Students Shall Not Download. Yeah, Sure.* (from *The New York Time*)
Writing practice: Identifying arguments and counterarguments -Refuting an argument - Organizing an argumentative essay - Synthesizing information to form arguments
Editing focus: Unstated conditionals - Noun clauses

Prescribed Text
Colonna, Mary and Gilbert, Judith. Reason to Write**.** Oxford: Oxford University Press, 2006. Print.

Books for Study and Reference

1. Bailey, Stephen. Academic Writing:A Handbook for International Students. USA and Canada: Routledge Third edition.2011
2. Savage, Alice., Effective Academic Writing: Developing Ideas Oxford: Oxford University Press, 2012. Print.
3. Savage, Alice and Shafiei, Masoud. Effective Academic Writing: The Paragraph. Oxford: Oxford University Press, 2012. Print.

SEMESTER IV

PIENG19 – INDEPENDENT ELECTIVE IVA: CULTURAL THEORY AND POPULAR CULTURE

Objectives

- To educate students on the indispensability of culture in the production, dissemination and representation of knowledge and meaning
- To edify students on the nuances of the idea of culture in its contemporary relevance and the critical aspects of popular culture

Unit I: Cultural Studies and Culturalism

Cultural Studies: An Introduction
Mathew Arnold
Leavisism
Amitava Kumar, "Poetry for the People" (from Poetry and Cultural Studies: A Reader)

e-content

Stuart Hall. "The Foundation of Cultural Studies". *Cinema on the Brain*. YouTube, 2014
Prof.Avishk Parui, Dept. of Humanities and Social Sciences, IIT Madras. "Introduction to Cultural Studies". NPTEL – NOC IITM, YouTube, 2018

Unit II: History, Theory and Practice: I

Richard Hoggart: *The Uses of Literacy*
Raymond Williams: 'The analysis of culture'
E.P.Thompson: *The Making of the English Working Class*
Stuart Hall and Paddy Whannel: *The Popular Arts*
The Centre for Contemporary Reading

e-content

"British Cultural Studies: Raymond Williams and Culture and Society". University Quick Course, 2018
John Hall, F R Leavis and Raymond Williams – "Two Very Different Positions on 'Culture'". BBC., 2017

Unit III: Culture, Communication and Media

Culture and Communication: towards an ethnographic critique of media consumption in the transnational media system

e-content

Stuart Hall. "Representation and Media", Media Education Foundation, YouTube, 1997

Unit IV: Culture and Hegemony

Post-Marxist cultural studies: hegemony revisited
The idea of mass culture
Race, culture, and communications: looking backward and forward at cultural studies

e-content

Prof.Anju Narayan, Delhi University. "Culture and Class Struggle in Literature: Antonio Gramsci, Raymond Williams". Vidya-Mitra. YouTube, 2017

Unit V: Popular Culture

The Cultural Field
The Economic Field

e-content

Prof.Rutger de Graff, University of Amsterdam. "Popular Culture: Reflection or Illusion", *Introduction to Communication Science*. Courseera. YouTube, 2013.

Innovative Component

Cultural analysis of Poetry, Prose, Drama, Short story and Novels

Books for Study

1. Storey, John. Cultural Theory and Popular Culture, VI Edition, New Delhi: Pearson, 2014
2. Storey, John. Ed.*What is Cultural Studies? A Reader.* London: Hodder Headline Group, 1997

SEMESTER IV

PIENH19 – INDEPENDENT ELECTIVE IV B: LITERARY SENSIBILITY AND APPRECIATION

Objective:

- To apply critical thinking, independent judgment, intercultural sensitivity
- To enhance the capacity for reflection and appreciation of beauty and truth

Unit I

Introduction : Literary Sensibility in the Enlightenment Era, Romantic Period and contemporary Age.

Unit II

David Hume, "Of the Standard of Taste" (1757)
Johan Huizinga. "The Passionate Intensity of Life,"
The Autumn of the Middle Ages. (Originally published in Dutch in 1919 and translated into English as *The Waning of the Middle Ages)*

Unit III

John Locke's *An Essay Concerning Human Understanding*
T.S.Eliot "dissociation of sensibility"

Unit IV

Northrop Frye Towards Defining an Age of Sensibility
Williams, Raymond. "Structures of Feeling"
Marxism and Literature. Oxford: Oxford University Press, 1977. Print

Unit V

Susan Sontag "One Culture and the New Sensibility."
Clifford "Found in Translation: On the Social History of the Moral Imagination" (1977) and "Art as a Cultural System"

Recommended reading for critical appreciation: Sensibility in Practice

Henry Mackenzie Edmund Burke, Samuel Johnson, Samuel Richardson, Samuel Coleridge, The Della Cruscan Poets, Thomas Gray, Friedrich Schiller, Adam Smith, Lawrence Sterne, Jane Austen, William Wordsworth

Innovative Component

Appreciation of Poetry, Prose, Drama, Short story and Novels with particular attention to emotional response

Books for Reference

1. Harold Bloom (ed.), *Poets of Sensibility and the Sublime* (New York, New Haven, Philadelphia: Chelsea House Publishers, 1986) – esp. N. Frye, 'Towards Defining an Age of Sensibility'

DEPARTMENT OF COMMERCE
M.Com. Course

(Effective for the Students admitted from the Academic Year 2019-2020)

Objectives of the Course

1. To introduce the students to the advance studies in Accounting, Tax, Statistics and other business practices
2. To introduce the students to career oriented courses like Internship Training Programme, Enterprise Resource Planning and Tally
3. To inculcate Research aptitude in the students
4. To create social consciousness and promote social responsibility among the students through extension programmes

Distribution of Hours/ Credits and Scheme of Examination:

Sem	Code	Title of Paper	Hours/ Week	Exam Hours		Credits	Marks
				Th	Pr		
I	PCCOA19	Advanced Corporate Accounting	6	3	-	4	40+60
	PCCOB19	Direct Taxation I	6	3	-	4	40+60
	PCCOC19	Organisational Behaviour	6	3	-	4	40+60
	PCCOD19	Financial Services and Markets	6	3	-	4	40+60
	PECOA19	Elective – I A: Entrepreneurial Development	5	3	-	4	40+60
	PECOB19	Elective – I B: Customer Relationship Mnagement					
		Total				**20**	**500**
II	PCCOE19	Indirect Taxation: Law and Practice	5	3	-	4	40+60
	PCCOF19	Direct Taxation I	6	3	-	4	40+60
	PCCOG19	Research Methodology	5	3	-	4	40+60
	PCCOH19	Bank Financial Management	6	3	-	4	40+60
	PECOC19	Elective – II A: International Marketing Management	5	3	-	4	40+60
	PECOD19	Elective – II B: Management of Financial Derivatives					
	PNHRA16	Human Rights	2	3	-	2	40+60
		Total				**22**	**600**

Sem	Code	Title of Paper	Hours/ Week	Exam Hours	Credits	Marks	Sem
III	PCCOI19	Advanced Cost and Management Accounting	6	3	-	4	40+60
	PCCOJ19	Services Marketing	6	3	-	4	40+60
	PCCOK19	Advanced Business Statistics	6	3	-	4	40+60
	PCCOL19	Human Resource Management	6	3	-	4	40+60
	PCCOM19	Principles of Insurance	5	3	-	4	40+60
	PCCON19	Internship Training Programme	-	-	3	2	100
	PGTRA16	Teaching and Research Aptitude	-	3	-	3	40+60
		Total				**25**	**700**
IV	PCCOO19	Financial Management	6	3	-	4	40+60
	PCCOP19	Industrial Relations and Labour Laws	5	3	-	4	40+60
	PCCOQ19	Enterprise Resource Planning and Tally (Theory)	4	3	-	3	40+60
	PCCOR19	Tally (Practical)	2	-	3	2	40+60
	PCCOS19	Total Quality Management	6	3	-	4	40+60
	PCCOS19	Business Environment	6	3	-	4	40+60
	PCCOT19	Project	-	-	3	2	100
		Total				**23**	**700**
		Grand Total				**90**	**2500**

SEMESTER I

PCCOA19 – ADVANCED CORPORATE ACCOUNTING

Objective:

To provide knowledge to the students about a few advanced aspects in company accounts

Unit I: Accounts of Holding Companies

Holding Company and Subsidiary Company - Consolidated Balance Sheet and Profit and Loss Account - Treatment of Dividend - Bonus Shares

Unit II: Accounts of Electricity Companies

Accounts of Electricity Companies - Nature – Features of Double Accounting System – Receipts and Expenditures on Capital Accounts – General Balance Sheet - Replacement of Assets - Final Accounts of Electricity Companies – Disposal of Surplus

Unit III: Accounts of Life Insurance Companies

Accounts of Life Insurance Companies – Final Accounts

Unit IV: Generally Accepted Accounting Practices (GAAP), Accounting Standards (AS) and Liquidation of Companies

Generally Accepted Accounting Practices (GAAP) – Accounting Standards (AS)
Liquidation of Companies – Contributory - Preferential Payments - Statement of Affairs – Deficiency Account – Surplus Account – Liquidator's Final Statement of Account

Unit V: Human Resource Accounting and Inflation Accounting

Human Resources Accounting – Approaches to Human Resource Accounting – Assumptions – Methods - Financial Reporting Practices.
Inflation Accounting (Current Purchasing Power Method only)

Textbooks:

1. Reddy T. S. & Murthy A. – Corporate Accounting – Margham Publications, Chennai, 2016
2. GAAP Papers issued by The Institute of Chartered Accountants of India

Books for Reference:

1. Jain S.P. and Narang K. L. – Advanced Accounts – Vol II – Kalyani Publishers, New Delhi, Reprint 2018
2. Gupta R.L. and Radhaswamy M. – Advanced Accounts – Vol II – S. Chand & Sons., New Delhi, Reprint 2017
3. Dr. Maheswari S.N. – Corporate Accounting – Vikas Publishing House, New Delhi, Reprint 2017
4. Shukla M.C. and Grewal T. S. – Advanced Accounts – Vol II - S.Chand & Sons., New Delhi, Reprint 2019
5. Dr. Arulanandam M. A. and Raman K.S. – Advanced Accountancy – Himalaya Publishing House, Revised Edition 2015

SEMESTER I

PCCOB19 - DIRECT TAXATION – I

Objective:

To provide knowledge about calculation of income under different Heads of Income through the application of the provisions of the Income Tax Act, 1961

Unit I: Residential Status

Basic Concepts – Residence and Tax Liability – Incomes Exempt from Tax – Income from Salaries

Unit II: Income from Salary and House Property

Income from Salaries (only problems on Retirement Benefits are included) – Income from House Property

Unit III: Profits and Gains of Business or Profession

Profits and Gains of Business or Profession – Basis of Charge – Principles governing assessment of business income – Method of Accounting – Deductions expressly allowed – General deductions – Expenses disallowed – Depreciation.

Unit IV: Income from Capital Gains

Capital Gains – Basis of charge – Capital Assets – Computation of Capital Gains – Exemptions

Unit V: Income from Other Sources

Income from Other Sources – Basis of charge – Chargeable Incomes – Deductions.

Textbook:

Dr. Mehrotra H.C and Dr. Goyal S. P. – Income Tax including Tax Planning and Management – Sahithya Bhawan Publications, New Delhi (Relevant Edition).

Books for reference:

1. Dr. Vinod. K. Singhania – Direct Taxes, Law and Practice – Taxmann Publications, New Delhi, (Relelvant Edition)
2. Gaur V.P., Narang D.B.,, Puja Gaur, Rajeev Puri - Income Tax Laws and Practice – Kalyani publications, New Delhi (Relevant Edition)
3. N. Hariharan – Income Tax Law and Practice – Vijay Nicole Imprints Pvt. Ltd., Chennai (Relevant Edition)
4. Reddy T.S. – Income Tax Law and Practice – MarghamPublications, Chennai (Relevant Edition)

SEMESTER I

PCCOC19 - ORGANISATIONAL BEHAVIOUR

Objective:

To provide the students a basic knowledge on the dynamics of individual and group behaviour for efficient and effective utilization of human resources in organisations

Unit I: Introduction to Organizational Behaviour

Organisational Behaviour – Definition – Nature and Scope – Challenges faced by Management – Process – Foundations of Individual Behaviour – Personality, Perception, Values, Attitudes and Beliefs.

Unit II: Group Behaviour

Foundation of Group Behaviour – Theories (All) – Types – Stages – Decision Making – Quality Circles – Organisational Conflict – Definition – Sources - Types – Aspect of Conflict – Process and Conflict Management.
Communication – Need - Process – Channels – Communication networks and Barriers to Communication

Unit III: Organisational Change and Development

Forces of Change – Managerial responses to pressures for change – Models of Change Process – Resistance to Change – Approaches to planned Change – Organizational Effectiveness

Unit IV: Dynamics of Organisation

Dynamics - Meaning – Types – Organisational Structure – Elements – Typology. Organizational Theory – Types – Organizational Climate

Unit V: Job Stress

Job Stress: Meaning - Measurement – Causes – Consequences – Typical symptoms of Stress – Dealing with Stress – Methods to overcome Stress

Textbook:

Dr. Khanka S.S. – Organisational Behaviour – S.Chand & Company Pvt. Ltd., New Delhi, Reprint 2017

Books for Reference:

1. Aswathappa – Organisational Behaviour – Himalaya Publishing House, New Delhi, Revised Edition 2016
2. Shuchi Sharma – Organisational Behaviour – Tata McGraw Hill Publication Pvt. Ltd., New Delhi, Revised Edition 2016
3. Arun Kumar N. Meenakshi – Organisation Behavioural – Vikas Publishing House Pvt. Ltd., New Delhi, Revised Edition 2015
4. Yogendra Singh, Mamta Pandey – Principles of Organisational Behavioural – AITBS Publishers, New Delhi, Revised Edition 2016

SEMESTER I

PCCOD19 - FINANCIAL SERVICES AND MARKETS

Objective:

To enable the students to understand commonly used financial instruments and the services provided by financial institutions and markets

Unit I: Financial Services

Financial Services – Features – Functions – Types – Constituents – Financial Markets – Factors Affecting the Financial Markets and Services
Lease Financing – Features – Process – Constituents of Leasing Industry – Advantages and Disadvantages of Leasing – Factoring – Process – Functions – Benefits – Types of Factoring
Forfeiting – Features – Process – Securitization – Parties to Securitization – Process – Types – Benefits

Unit II: Venture Capital

Venture Capital – Types – Benefits – Venture Capital Financing – Investment Nurturing – Methods – Techniques – Status of Venture Capital in India – SEBI – Venture Capital Funds (Amendment) Regulations, 2000 – Foreign Venture capital investors.
Credit rating – Classification – Advantages and Limitations – Rating process – Rating framework – Credit Rating Agencies – CRISIL – ICRA – ONICRA – Credit Rating Agencies and SEBI – CIBIL Score - Importance – Foreign Direct Investment

Unit III: Mutual Funds

Mutual Funds – Concept – Growth of Mutual Funds in India – Structure – Types – Schemes on the basis of investment objectives – Regulation of Mutual Funds – Lacunae in Regulations

Unit IV: Financial Markets

Call Money Market – Participants – Functioning of Call Money Market – Transactions – Advantages – Call Money Rates – Reasons for fluctuations – CBLO Market – Features – Advantages – Repo market – Concept – History – Mechanism - Types of Repo arrangements – Risk and Advantages – Development in Commercial Paper Market – Certificates of Deposit

Textbook:

Punithavathy Pandian – Financial Services and Markets – Vikas Publishing House Pvt. Ltd., Noida, Reprint 2017

Book for Reference:

1. Agarwal O.P. – Management of Financial Services – Himalaya Publishing House Pvt. Ltd., New Delhi Edition 2015
2. Guruswamy A. – Financial Services – Margham Publications Ltd., Chennai, Reprint 2017
3. Rajesh Kothari – Financial Services in India – Concept and Application – SAGE Publication India Private Ltd., New Delhi, Reprint 2012
4. Sandeep Goel - Financial Services – PHI Learning Ltd., New Delhi, Edition 2014

SEMESTER I

PECOA19 – ELECTVE – I A: ENTREPRENEURIAL DEVELOPMENT

Objective:

To introduce and inculcate the knowledge of Entrepreneurship among the students

Unit I: Introduction

Entrepreneur – Meaning - Entrepreneurship – Meaning – Definition – Characteristics – Qualities of an Entrepreneur – Theories on Entrepreneurs (All) – Functions – Classification of Entrepreneurs – Factors influencing Entrepreneurship – Role of Entrepreneurs in the Economic development

Unit II: Supporting Services to Entrepreneurs

Entrepreneurial Development – Agencies: Commercial Banks – District Industries centre – National Small Scale Industries Corporation - Small Industries Development Organisation – Small Industries Services Institutes – The Khadi and Village Industries Commission.

Unit III: Idea Generation

Micro and Macro Enterprises - Project Identification and Selection – Project Formulation – Project Appraisal – Financing of Enterprises - Ownership Structures – Small Scale Entrepreneurs – Role of Small Scale Industries in the Indian Economy – Incentives and Subsidies for small scale industries – Policy measures to strength small, tiny and village enterprises

Unit IV: Entrepreneurial Development Programme

Entrepreneurial Development Programmes – Need – Objectives – Curriculum – Phases – Critical Evaluation – Problems of EDPs – Role of Government in organizing EDP

Unit V: Women Entrepreneurship and Micro Finance

Concept, Functions and Problems – Recent trends in the development of Women entrepreneurship – Self Help Groups – Objectives, Features and Achievements of SHGs – Growth in SHG – Concept and Features of Micro Finance – Distribution channels of Micro Finance – Bank Linkage through Micro credit – Subsidies and Incentives to Women Entrepreneurs

Textbook:

Khanka S. S – Entrepreneurial Development – Sultan Chand & Sons, New Delhi, Reprint 2014

Books for Reference:

1. Sangeeta Sharma- Entrepreneurial development –Asoke K.Ghosh Publishers, Reprint 2016.
2. David H. Holt – Entrepreneurship: New Venture Creation – Prentice Hall of India, New Delhi, Reprint 2017
3. Dr. Sanjay R. Ajmeri- Entrepreneurship Development- Pearson Education, Delhi, Reprint 2017
4. Poornima M. – Entrepreneurship Development, Small Business Enterprise – Pearson Education, Delhi, Revised Edition 2012

SEMESTER I

PECOB15 - ELECTIVE I B: CUSTOMER RELATIONSHIP MANAGEMENT

Unit I:

Introduction to customer Relationship Management – Emergence of Relationship Marketin – Distinction between Traditional Marketing and Relationship – Six Market Model – Three Cornerstones of CRM – CRM Survey Design – Advances of CRM – Types of Customer Relationship Programmes – Scope for CRM.

Unit II:

Customer Relationship – Categorising Relationship – The Relationship Life Cycle – Customer Acquisition – Customer Retention – Relationship Stages – Relationship Longevity – Know Your Customer (KYC) – CRM Business Transformation Process – Integration of CRM with ERP – Data Warehousing.

Unit III:

The analysing Phase of Relationship Marketing – Target Planning – Customer Segmentation in Relationship Marketing – Customer Loyalty – Relationship Marketing – Customer Satisfaction Process – Customer Partnership.

Unit IV:

Implementing Relationship Marketing Programmes – Strategy, Structure and Systems – The Mckinsey 7 'S' Framework – Ending Relationships – Total Quality Management (TQM) – Shared Values, Staff, Skills and Styles of Implementing RM Programmes.

Unit V:

Monitoring and Controlling relationships – Approaches – Measures of Relationship success – Satisfaction – Relationship Returns measuring financial performance – Complaints analysis and handling – Service Recovery – Service quality – The GAPS Model for managing service quality – Technology for Relationship Marketing – Criteria for creating value for customers.

Textbook:

Customer Relationship Management – Dr.S.Sheela Rani, Margham Publications, Chennai, Edition 2016

Books for Reference:

1. Kaushik Mukerjee – Customer Relationship Management: A Strategic Approach to Marketing – PHI Learning Pvt. Ltd, New Delhi 2008
2. Kumar V. and Werner J. – Customer Relationship Management: A Databased Approach – John Wiley & Sons, Mumbai
3. Shanmugasundaram S. – Customer Relationship Management – Prentice Hall of India Pvt.Ltd., New Delhi, 2008
4. Alok Kumar Rai – Customer Relationship Management – Concepts and Cases - Prentice Hall of India Pvt. Ltd., New Delhi, 2011

SEMESTER II

PCCOE17 – INDIRECT TAXATION: LAW AND PRACTICE

Objective:

To introduce the students to Indirect Taxes, provisions of the Goods and Services Tax Act, 2017 and The Customs Act, 1964.

Unit I: Introduction

History of Taxation – Definition of Tax – Features - Elements of Tax – Objectives of Taxation – Canons of Taxation – Characteristics of a Good Tax System in India – Features and Problems of Indian Tax System – Reform of Tax System in India – Classification of Taxes – Direct and Indirect Taxes – Merits and Demerits of Direct and Indirect taxes – Direct Taxes in India – Direct taxes at State Level – Indirect Taxes in India – Indirect Taxes levied by Central Government – Indirect Taxes levied by State Governments – Indirect Taxes at local Government – Specific Duties and Advalorem Duties – Proportional, Progressive, Regressive and Degressive Taxes – Single and Multiple Tax Systems – Multiple Tax Systems

Unit II: Introduction to GST

GST - Introduction – History – Constitutional Amendment – Meaning – Worldwide GST – Enactment of GST Bills – Dimensions – Effects of GST on Indian Economic Growth – Action Plan – Scope – Administration – GST Bills – Differences between Present Tax Structure and GST – Existing Indirect Taxes Structure – Indirect Taxes to be Integrated with GST – Impact on Small Enterprises – Strengths of Goods and Services Tax in India – Objectives – Challenges – Opportunities – Justification – Salient Features of GST Model – Types – CGST, SGST, IGST and UTGST – GST impact on Central Government – GST impact on State Government – Exemptions under GST – Advantages and Disadvantages – Major benefits – Impact of GST on the Indian Economy and its implications – Other Effects – GST Rates

Unit III: Supply and Goods in GST

Definition of various terms – Goods exempted from Goods and Services Tax – Services exempt from Tax – Meaning of Original Works – Meaning of Legal Service – Meaning of Recognised Sports Body – Introduction to Supply – Meaning of Supply – Scope of Supply – Meaning of Related Persons – Import of `services Job Work – Time of Supply – Value of Supply – Inter-State Supplies – Intra-State Supplies

Unit IV: Calculation of GST

Taxable event under GST – Provisions relating to Levy and Collection of CGST – Payment of GST - The Liability of Composite Supply and Mixed Supply – Meaning of Mixed Supply – Composition Levy – Aggregate Turnover – Input Tax Credit – Exempt Supplies – Apportionment of Credit and Blocked Credits – Transfer of Relating to Import of Goods – Import of Services – Zero Rated Supply – Refund of Taxes in case of Zero Rated Supplies – Registration – Person liable for Registration – Aggregate Turnover – Persons Exempt from Registration – Notified Category of Persons – Compulsory Registration under section 24 – Procedure for Registration – Permanent Account Number – Procedure for Issuance of Registration Certificate – Separate Registration of Multiple

Business – Suo-Moto Registration – Cancellation of Registration – Unregistered person – Reverse Charge – Meaning of Reverse Charge – Liability to Pay Under Reverse Charge Basis – Supply of Goods or Services by Unregistered supplier to Registered Supplier – Goods and Services Notified under Reverse Charge – Services on which Tax is Payable under Reverse Charge Mechanism –Assessment and Audit – provisional Assessment – Assessment of Unregistered Persons – Revoking of Assessment Order – Furnishing of Returns – Administration – Meaning of Adjudicating Authority – meaning of Proper Officer and Commissioner – Powers of CGST Officers – Audit by GST Tax Authorities – Provisions of Special Audit – Offences and Penalties – Provisions Relating to Seizure and Release and Conveyance in Transit – Offences and Prosecution – Provisions Relating to Refund of Tax –Interest on Delayed Refunds

Unit V: Customs Act

Introduction – Appointment of Customs Officers – Levy and Collection Customs Duty – Valuation of Goods Under Customs Act – Import and Export Procedures – Exemptions from Customs Duty – Demand and Recovery of Customs Duty – Clearance of Exported Goods Baggage – Import and Export through Courier – Post parcel – Customs Duty Drawback

Theory: Problem - 60:40

Textbook:

Reddy T.S. and Hariprasad Reddy Y. – Business Taxation with introduction to GST, Margham Publications, Chennai, 10th Revised Edition, 2018

Books for Reference:

1. Dinkar Pagar – Business Taxation – Sultan Chand & Sons, New Delhi, (Relevant Edition)
2. Balachandran V. – Business Taxation – Sultan Chand & Sons, New Delhi, (Relevant Edition)
3. Govindan V. S – Indirect Taxes Made Easy – Sitaraman & Co., Chennai, (Relevant Edition)
4. Datey V.S – Indirect Taxation, Law and Practice – Taxmann Publication, New Delhi, (Relevant Edition)
5. Notification by Govt. of India - GST Act, 2016

SEMESTER II

PCCOF19 – DIRECT TAXATION – II

Objective:

To provide knowledge to the students on calculation of incomes under different Heads of Income, Gross Income Total, Total Income and Tax liability of various assesses through the application of the provisions of Income Tax Act, 1961

Unit I: Clubbing and Set off

Clubbing of Incomes and Aggregation of Incomes – Set off and Carry forward of losses – Deductions to be made in computing Total Income.

Unit II: Rebate and Relief of Tax

Rebate and Relief of Tax – Computation of Total Income and Tax Liability of Individuals

Unit III: Assessment of Firms

Assessment of Firms

Unit IV: Assessment of Companies and Co-operative Societies

Assessment of Companies – Assessment of Co-operative Societies

Unit V: Tax Planning

Tax planning in relation to Concepts, Residential Status, Employees remuneration, other Heads of Incomes and Persons

Textbook:

Dr. Mehrotra H.C. and Dr. Goyal S.P. – Income Tax including Tax Planning and Management – Sahithya Bhawan Publications, New Delhi (Relevant Edition).

Books for Reference:

1. Dr. Vinod. K. Singhania – Direct Taxes, Law and Practice – Taxmann Publications, New Delhi, (Relelvant Edition)
2. Gaur V.P., Narang D.B.,, Puja Gaur, Rajeev Puri - Income Tax Laws and Practice – Kalyani publications, New Delhi (Relevant Edition)
3. N. Hariharan – Income Tax Law and Practice – Vijay Nicole Imprints Pvt. Ltd., Chennai (Relevant Edition)
4. Reddy T.S. – Income Tax Law and Practice – Margham Publications, Chennai (Relevant Edition)

SEMESTER II

PCCOG19 – REASEARCH METHODOLOGY

Objective:

To introduce to the students the concept of research, process of conducting research, methods and techniques of presenting research report

Unit I: Introduction to Research

Research – Definition – Characteristics – Nature and scope – Types of Research – Major Steps in Research – Formulation of Research Problem – Review of Literature – Research Design – Hypothesis – Uses of Social Research

Unit II: Nature and Collection of Data

Data collection – Sources of Data – Primary and Secondary Data – Procedure for Data Collection – Tools of Data Collection – Observation – Questionnaires – Schedule – Interview

Unit III: Sampling

Sampling – Types of Sampling – Errors in Sampling – Sample Size – Factors influencing Sample Size – Processing of Data – Editing – Coding – Classification and Tabulation

Unit IV: Statistical Techniques and Research Presentation

Statistical Analysis – Measures of location and dispersion – Skewness – Kurtosis – Karl Pearson's Coefficient of Correlation – spearman's Rank Correlation Coefficient – Linear Regression– Diagrammatic and Graphical Representation – Interpretation of results – Percentages – Bar Diagrams – Pie charts

Unit V: Research Reports

Research Reports – Structure and Components of Reports – Types of Reports – Features of good Research Reports – Foot Notes and Citation – Plagiarism and consequences of Plagiarism

Textbook:

Kothari C. R – Research Methodology Methods and Techniques – New Age International Publishers, New Delhi, 2019

Book for Reference:

1. Ravilochanan P. – Research methodology – Margham Publications, Chennai, Revised Edition 2017.
2. Ranjith Kumar – Research Methodology – Sage Publications, New Delhi, Reprint 2015
3. Gupta S.L and Hitesh Gupta – Business Research Methods – Tata McGraw Hill Publications, New Delhi, Reprint 2012
4. David Dooly – Social Research Methods – Prentice Hall India Pvt, Ltd., New Delhi, Revised Edition 2016

SEMESTER II

PCCOH19 – BANK FINANCIAL MANAGEMENT

Objective:

To impart knowledge to the students on the Financial Management techniques applied by banks

Unit I: Correspondent Banking System

Correspondent Banking – Functions – Electronic Modes of Transmission / Payment Gateways – (SWIFT, CHIPS, CHAPPS and RTGS) – Definition of NRI – NRI Accounts - Facilities to NRIs – Facilities to Exporters and Importers

Unit II: Letter of Credit

Documentary Letters of Credit – Meaning – Definition – Types – Important changes in UCP 600 – Parties to Letter of Credit – Rights, Responsibilities and Liabilities – Uniform Rules for Bank to Bank Reimbursements (URR-525) – External Commercial Borrowings

Unit III: Foreign Exchange and its Operation

Foreign Bank – Meaning – Foreign Branch – Meaning – Foreign Exchange Rate and Foreign Exchange Business – Definition – Foreign Exchange Markets – Factors determining exchange rates – Exchange Rate mechanism Foreign exchange Dealing Room Operations – Management and Control of a Dealing Room –RBI / FEDAI Guidelines – Basis of Forex Derivatives – Definition of Risk and Risk in Foreign Exchange Operations – Management of risk and Guidelines of Risk Management

Unit IV: Risk Management

Risk Management in Foreign Trade – Role of ECGC – Introduction – Definition of Risk and Risks in International Trade – Country Risk – Export Credit in International Trade – ECGC of India – Role, Products and Policies – Financial Guarantees – other aspects relating to ECGC Policies and guarantees – Role of EXIM Bank, Reserve Bank of India, Exchange Control in India – FEMA and FEDAI

Unit V: Balance Sheet Management

Balance Sheet Management – Components of Assets and Liabilities in Bank's Balance Sheet and their management – Banking Regulation and Capital – Capital Adequacy – Supervisory Review Process – Market Discipline

Textbook:

Bank Financial Management – Indian Institute of Banking and Finance – MacMillan Publishers India Ltd., 2016

Books for Reference:

1. Sankaran S. - International Trade - Margham Publications Ltd., Chennai, Reprint 2017
2. Raj Agrawal - Indian Foreign Trade - Excel Books – New Delhi, Reprint 2012
3. Foreign Exchange Facilities for individuals - Indian Institute of Banking and Finance - MacMillan Publishers India Ltd. Mumbai, Reprinted 2016
4. Jeevanandan C. – Foreign Exchange and Risk Management – Sultan. Chand and Sons – Educational Publisher, New Delhi, Reprint 2015

SEMESTER II

PECOC19 – ELECTIVE – I A: INTERNATIONAL MARKETING MANAGEMENT

Objective:

To enable the students to learn the procedures and strategies in International Marketing, Foreign Exchange regulations and Documentation for exporting

Unit I: Introduction

International Marketing Management – Meaning – Definition – Scope – International Marketing Vs Domestic Marketing – Need and Importance – Problems and Challenges – Reasons for rapid Internationalization – Global Marketing of Services

Unit II: Product Planning

Product planning for Export – Need for product planning – Product Life Cycle in International Marketing – Packaging – Role of IIP in Export packaging – pricing for Export – factors determining prices – Role of price and non-price factors in International marketing – Marginal cost pricing – Elements of costs for export price quotations – Impact – Quotations – Export price strategy

Unit III: Promotion

Promoting product internationally – Nature of International Advertising – Unified or Diversified Advertising Strategy – Promotional Methods – Campaign Design – Generic promotion in International Marketing – Market entry and Overseas Distribution System - Methods of entry in the foreign market – Channels of Distribution – Elements of Distribution Policy – Factors affecting channels of decisions – Exporting through agents or distributors – Role of Export Trading Houses

Unit IV: Market Research

Overseas Market Research – Need – Designing and testing of a Questionnaire – Conduct of Overseas Market Research – Marketing plan for exports

Unit V: Risks

Management of Risks in International Marketing – Export Documentation – Role of Export Documentation – Significance of some export documents – Common defects in export documents – Processing of an Export Order

Textbook:

Bhattacharya R. L. and Varshney –International Marketing Management – Sultan Chand, New Delhi, (Latest Edition)

Books for Reference:

1. V. Kumar – International Marketing Research – PHI Learning Private Limited, New Delhi, Revised Edition 2012
2. Philip R. Cateora, John L. Graham, Prashant Salwan – International Marketing, Tata McGraw–Hill Publishing Company Ltd. New Delhi, Reprint 2014
3. Philip Kotler - Marketing Management - Prentice Hall, New Delhi, Revised Edition 2015
4. Sak. Onkvist and John J. Shaw - International Marketing - Prentice Hall, New Delhi, Edition 2012

SEMESTER II

PECOD15 - ELECTIVE II B: MANAGEMENT OF FINANCIAL DERIVATIVES

Objective:

To provide adequate knowledge about wide range of financial derivatives having pivotal role in enhancing shareholders' value by ensuring access to the cheapest source of funds.

Unit I:

Introduction Derivative – Definition, Objectives, Types of Derivatives, Instruments, Roles in Financial Risk

Unit II:

Forward Contract Structure and Features, Forward Spread Agreement, Exchange Rate Agreement, Foreign Exchange Agreement, Forward Exchange Rates in India, Value of Forward contract, Forward Rates Computation, Forward Contract - Delivery, Cancellation, Extension, Terms and Conditions.

Unit III:

Forward Contract Structure and Features, Specification, Mechanism of trading, Type of trading, Determining gains and lsses and Daily Settlement, Stock exchange of Future contracts (CBOT and CME), Principle of Forward and Future contract, Options on Futute, Hedging in Future, Regulations of future contract, Difference between Forward and Future contract.

Unit IV:

Options Structure and Features, Option terminology, Market Margin requirement, Taxation of Option Transaction, Principle of Option Pricing, Option Pricing Model – Binomial Model, Black Schole Model, Stock Option, Determining Option Premium, Option Strategies.

Unit V:

Heading - Heading of Foreign Exchange Exposure, Heading with the Money Market, Currency Options, Currency Future, Internal Heading Stratey, Speculation in Foreign Exchange and Money Market.

Textbook:

Apte P G – International Financial Management – Tata McGraw Hill Publication, New Delhi, 2012

Books for Reference:

1. Robert W.Kolb – Financial Derivatives: Pricing and Risk Management, John Wiley & Sons, Mumbai, 2008
2. Dom M Chance – Introduction to Derivatives and Risk Managemnt – South Western Cengage Learning, Mumbai, 2012
3. Satyajit Deas – Derivatives Products and Pricing – John Wiley and Sons, Mumbai, 2011
4. Satyajit Das – Risk Management and Financial Derivative – McGraw Hill, New Delhi, 2012

SEMESTER III

PCCOI19 - ADVANCED COST AND MANAGEMENT ACCOUNTING

Objective:

To teach the students the advanced techniques in Cost and Management Accounting

Unit I: Costing Concepts, Process and Contract Costing

Uniform Costing- Inter-firm Comparison - Cost Reduction and Cost Control - Activity Based Costing
Process Costing - Ascertainment of Equivalent Production Units – Inter Process Profits
Contract Costing - Cost Plus Contract - Escalation Clause with prudent basis

Unit II: Managerial Decision Making

Decision Making – Marginal Costing – Limiting or Key Factor – Selling Price Decision – Pricing of Export Sales – Sales Mix Decision - Plant shut down Decision - Differential Cost Analysis - Practical Applications of Differential Cost Analysis

Unit III: Standard Costing and Variance Analysis

Standard Costing and Variance Analysis- Material, Labour and Overhead Variances – Sales and Profit Variance (Advanced Problems)

Unit IV: Funds Flow Analysis

Preparation of Funds Flow Statement (Advanced Problems)

Unit V: Cash Flow Analysis

Preparation of Cash Flow Statement (As per AS 3)

Theory: problems – 20: 80

Textbook:

Arora M. N. – A Textbook of Cost and Management Accounting – Vikas Publishing House, Chennai, 10th Edition, 2017

Books for Reference:

1. Maheswari S.N. – Cost and Management Accounting – Sultan Chand & Sons, New Delhi, Reprint 2017
2. Pillai R.S.N and Bhagavathi – Management Accounting – S. Chand & Company Pvt. Ltd., New Delhi, Reprint 2017
3. Ravi M. Kishore – Cost and Management Accounting – Taxmann Publications, New Delhi, Reprint 2018
4. Tulsian P.C. – Cost Accounting – S.Chand & Company Pvt. Ltd., New Delhi, Reprint 2016
5. Jain S.P and Narang K.L – Advanced Cost Accounting – Kalyani Publications, New Delhi, Reprint 2015

SEMESTER III

PCCOJ19 – SERVICES MARKETING

Objective:

To make the students aware of the basic concepts of various Services and their Marketing aspects

Unit I: Introduction

Services – Meaning – Definition – Difference between Goods and Services – Characteristics of services – Growth of service sector – Services sector in the Indian Economy

Unit II: Product Mix

The Services Product – Development of new service - Positioning of Services – Pricing of Services – Distribution of Services – Managing Services demand – Demand situations and patterns – Forecasting methods

Unit III: Market Segmentation

Market Segmentation – Meaning – Criteria – Basis of Market Segmentation – Competition - Analysis and Strategies – Competitive threats – Competition Analysis – Service Quality Management – Meaning – Perception of Service Quality – Determinants of Service Quality – Process for Service Quality Management – GAP Model of Service Quality – SERVQUAL

Unit IV: Consumer Behaviour

Consumer Behaviour towards services – Factors influencing Consumer Behaviour – Service Perception – Consumer Purchase Decision Process – Services Marketing Strategy – Steps in Strategic Planning – Market Oriented Service Strategy – Strategic Management Trap – Service Oriented Approach – Service Oriented Organisation Structure – Service Triangle – Marketing Mix

Unit V: Customer Relationship Management

Customer Relationship Management – Benefits – Factors for successful CRM – CRM Framework – Consumer Protection in Services – Services Marketing in India – Marketing of Banking, Transport, Hospital, Education Services, Tourism services in India with relevant case studies

Textbook:

Rama Mohana Rao K. – Services Marketing – Pearson Education, Chennai, Second Edition 2017

Books for Reference:

1. Srinivasan R. – Services Marketing – PHI Learning Pvt. Ltd., New Delhi, Reprint 2015
2. Rajendra Nargondkar – Services Marketing – Tata McGraw Hill, Chennai, Reprint 2015
3. Govind Apte – Services Marketing – Tata McGraw Hill, Chennai, Reprint 2012.
4. Balaji B. – Services Marketing and Management – Sage Publications, Chennai, Reprint 2012

SEMESTER III

PCCOK19 – ADVANCED BUSINESS STATISTICS

Objective:

To teach the students the application of statistical techniques for interpreting and drawing conclusion for business problems

Unit I: Partial and Multiple Correlations - Partial and Multiple Regressions

Partial Correlation – Partial Correlation Coefficient – Partial Correlation in case of four variables – Multiple Correlation – Multiple Regression

Unit II: Non – Parametric Tests

Non–Parametric Tests – Sign Test for Paired Data – One Sample Sign Test – Sign test in case of Large samples – Rank Sum test – Mann-Whitney U-Test – One Sample Run Test – Kruskal-Wallis test (H Test) – Spearman's Rank Correlation

Unit III: Testing of Hypotheses (Z and T- Test)

Testing hypothesis – Testing of Means and Proportions – Large and Small samples – Z test and t test

Unit IV: Chi-square Distribution

Chi-square Distribution – Characteristics and application – Test of goodness of fit and Test of independence – Test of Homogeneity

Unit V: F-Distribution and Analysis of Variance

F-distribution – Testing Equality of population variances – Analysis of variance – One-way and Two-way Classifications

Theory: Problems – 20: 80

Textbook:

Gupta S.P. - Statistical Methods - Sultan Chand & Sons, New Delhi, Revised Edition 2013

Books for Reference:

1. Sancheti D.C. and Kapoor V. K., Business Statistics, Sultan Chand and Sons, New Delhi, 7th Edition, 2015
2. Sharma J.K – Business Statistics – Pearson Education, New Delhi, 2nd Edition 2016
3. Richard I Levin and David S. Rubit, Statistics for Management – Pearson education, New Delhi, Edition 2015
4. Dr. Joseph Anbarasu D. - Business Statistics and Operations Research – Learntech Press, Trichy, 2015

SEMESTER III

PCCOL19 – HUMAN RESOURCE MANAGEMENT

Objective:

To provide knowledge to the students regarding the management of Human Resources in organizations

Unit I: Introduction to Human Resource Management

Human Resource Management – Evolution – Objectives – Responsibilities – Man Power Planning – Objectives and Elements – Process of Man Power Planning

Unit II: Job Analysis and Design

Job Satisfaction – Concept – Determinants and measurements – Job Analysis – Methods of Job Analysis- Job Design – Job Description – Job Specification – Job Evaluation – Job Enrichment – Recruitment and Selection – Sources of Recruiting Human Resource – Selection process – Testing and Interviewing

Unit III: Career Planning Development and Evaluation

Career Planning and Development – Stages and Process of Career Development – Training, Placement and Development – Training Needs – Training Programmes – Executive Development – Importance – Evaluation Process – Internal Mobility and Separation – Promotion, Transfer, Lay-off and Discharge

Unit IV: Performance Appraisal of Employee

Appraising Employee Performance – Basic Considerations – Methods of Performance – Basic Considerations – Methods of Performance Appraisal – Requisites of a Sound Performance Appraisal System – Employee Incentives and Benefits – Effective Measures of Incentives and Benefits

Unit V: Grievances and Work Life Balance

Employee Grievances – Causes – Essentials of Sound Grievance Procedure - Redressal of Grievances – Employee Discipline – Objectives – Types – Enforcement of Discipline – Causes of Indiscipline – Procedure – Disciplinary actions – Quality of Work Life – Concept and Determinants of Quality of Work Life – Recent Trends in HRM – Talent Management

Textbook:

Khanka S.S – Human Resource Management – S. Chand and Co., New Delhi, Reprint 2015

Books for Reference:

1. Shashi K. Gupta and Rosi Joshi – Human Resource Management – Kalyani, New Delhi, Edition 2014
2. Jaya Sankar J. – Human Resource Management – Kalyani Publishers, New Delhi, Edition ,2018
3. Lalitha Balakrishnan and Srividhya S. – Human Resource Development – Himalaya Publishing House, Chennai, Edition 2016
4. Aquains P. G. – Human Resource Management – Vikas Publishing House Pvt. Ltd., New Delhi, Revised Edition 2012

SEMESTER III

PCCOM19 - PRINCIPLES OF INSURANCE

Objective:

To provide students the basic knowledge of the Principles of Insurance and the methods of risk management

Unit I: Introduction

Introduction to Insurance - Characteristics of Insurance - Purpose and Needs - Benefits of Insurance - Functions of Insurance – Importance of Insurance - Principles of Insurance – Nature of Insurance Contract - Types of Insurance Contracts - Fundamentals of Insurability – Insurance Contract Vs. Wagering Agreement - Assurance Vs Insurance - Gambling Vs Insurance – Classification of Insurance

Unit II: Life Insurance

Life Insurance – Essential features of Life Assurance – Advantages of Life Assurance – Types of life Insurance Plans - Reinsurance – Channels of Distribution – Surrender Value and Paid-up Value - Issue of Duplicate Policy - Lost polices – Settlement of Claims in Life Insurance

Unit III: Fire and Marine Insurances

Fire Insurance – Scope of Fire insurance – Fire Insurance Principles - Types of Fire policies – Assignment of Fire policies- Settlement of Claims
Marine Insurance- Scope of Marine Insurance – Marine Insurance Contracts – Fundamental Principles – Marine Insurance Policy

Unit IV: Motor Vehicle and Health Insurances

Motor Vehicle Insurance – Taxonomy of Motor vehicle – Kinds of Motor Vehicle Insurance Policies- Procedure for Motor Vehicle Insurance - Claims settlement under Motor Vehicle Insurance
Health Insurance – Types of Health Insurance Polices- Health Insurance Schemes in India

Unit V: Miscellaneous Insurances

Fidelity Guarantee Insurance- Property Insurance- Building Insurance – Earthquake Insurance – Flood Insurance - Burglary Insurance - Cattle Insurance – Engineering Insurance - Liability Insurance – Crop Insurance - Insurance Pricing – Underwriting

Textbook:

Jyotsna Sethi and Niswan Bhatia – Principles of Insurance - PHL Learning Pvt. Ltd. New Delhi, Revised Edition 2015

Books for Reference:

1. Dr. Periasamy P. – Fundamentals of Insurance – Vijay Nicole Imprints Pvt. Ltd., Chennai, Edition 2016
2. Gupta P. K. – Legal Aspects of Insurance – Himalaya Publishing House Pvt. Ltd., Mumbai Revised Edition 2015
3. Inderpal Singh – Insurance: Principles and Practice – Kalyani Publishers, New Delhi, Edition 2017
4. Mishra M.N.– Modern Concepts of Insurance – S. Chand & Co. New Delhi, 2010
5. Premavathy S. - Principles of Insurance – S. Chand & Co., New Delhi, Edition 2016

SEMESTER II & III

PCCON19 - INTERNSHIP TRAINING PROGRAMME

Design of Internship Training Programme (ITP)

- **Period:** The Internship Training Programme (ITP) is for a period of 45 working days only, from December of the previous year to June of the next year (5 days in December, 4 days in April and balance days in May and June), with a minimum of 5 hours and a maximum of 8 hours per day. The ITP shall be during the day only (8 a.m. to 6 p.m.)

- **Attendance:** The attendance of the trainee shall be strictly monitored by the Supervisor. If the trainee does not commence the training in December 2018 or if the trainee is irregular during the programme, the same shall be immediately intimated to the Coordinator

- **Assignment:** The trainee shall be assigned work related to Audit / Finance and Accounts / H.R. / Stores or any other Commerce related areas.

- **Fortnightly Report:** To ensure proper utilisation of time by the trainee, a fortnightly report duly attested by the Supervisor after checking its authenticity shall be maintained and this report shall be finally submitted by the trainee to the Coordinator at the end of the training period.

- **Final Report by the trainee:** The trainee shall write a detailed report of the Training Programme, get it authenticated by the Supervisor and submit the same to the Coordinator of the Programme, based on which a *Viva voce* Examination shall be conducted.

- **Supervisor's Final Report:** After the completion of the programme the Supervisor shall fill up the 'Supervisor's Final Report' in the given format and send the same to the Coordinator within a week of completion of the Programme.

- **Supervisor's Marks:** The marks awarded by the Supervisor shall be a part of the internal valuation and hence the Supervisor should be honest and not to be too liberal in awarding marks.

- ***Viva voce* Examination:** The trainee shall undergo a *Viva voce* Examination based on the Final report submitted by her. The *Viva voce* shall be conducted by an External Examiner.

- The allotment of marks for the Internship Training Programme is as follows:

Criteria	Marks
Supervisor's marks (based on performance during the Programme)	40
Internal Examiner (ITP Report)	20
External Examiner (ITP Report)	20
Viva voce	20

SEMESTER IV

PCCOO19 – FINANCIAL MANAGEMENT

Objective:

To provide knowledge to students about the tools and techniques applicable for efficient management of finance in an organisation

Unit I: Introduction to Financial Management and Financial Planning

Financial Management – Meaning – Definition – Nature of Financial Management – Objectives – Scope and Functions – Role of Financial Manager - Financial Planning – Meaning – Definition – Scope – Characteristics – Essentials of Sound Financial Planning – Theories of Capitalisation - Sources of Long Term Finance: Equity, Preference, Debentures, Term Loans, Public Deposits. Short Term Finance: Trade Credit, Bank Credit, Customer Advances, Instalment Credit, Commercial Credit etc. - Fixed Capital – Working Capital

Unit II: Leverages

Leverage – Meaning - Types and Significance of Leverages – Calculation of Leverages – Degree of Leverages - Capital structure – Meaning - Features of appropriate Capital Structure – Factors affecting Capital structure – Theories of Capital structure – Net Income Approach, Net Operating Income Approach, Traditional Approach and Modigliani and Miller Approach (problems included)

Unit III: Cost of Capital

Cost of Capital – Meaning - Importance – Computation of Cost of Capital – Cost of Debt before and after tax – Cost of Preference Share Capital – Cost of Equity Share capital – Cost of Retained Earnings – Weighted Average Cost of Capital

Unit IV: Working Capital Management

Working Capital Management – Meaning – Definition – Types of Working Capital – Advantages – Factors Determining Working Capital - Need for Working Capital – Working Capital Cycle – Factors affecting Working Capital Requirements – Forecasting Working Capital Requirements – Funding of Working Capital Requirement

Unit V: Investment and Dividend Decision

Capital Budgeting – Meaning – Definition – Project Evaluation Techniques - Payback Period, Accounting Rate of Return, Net Present Value, Internal Rate of Return, Profitability Index, Decision Tree, PERT and CPM

Dividend Policy Consideration – Dividend Payout Methods – Dividend Theories – Walter and M.M. Theories

Theory: Problem – 60: 40

Textbook:

Dr Murthy A. – Financial Management – Margham Publications, Chennai, Reprint 2018

Books for Reference:

1. Khan M. Y, Jain P.K. – Financial Management – Tata McGraw Hill, New Delhi, 6th Edition 2019
2. Pandey I.M. – Financial Management – Vikas Publishing House Pvt. Ltd., New Delhi, Reprint 2018
3. Sudharsana Reddy G. – Financial Management: Principles and Practice – Himalaya Publishing House, Chennai, Edition 2018
4. Periasamy P. – Financial Management – Tata McGraw Hill, New Delhi, Edition 2018
5. Dr. Palanivelu V.R. – Financial Management – S. Chand and Co., New Delhi, 2018

SEMESTER IV

PCCOP19 – INDUSTRIAL RELATIONS AND LABOUR LAWS

Objective:

To teach the students the laws prevalent for the protection of the welfare of employees in industries

Unit I: Industrial Relations

Industrial Relations – Meaning - Nature of Industrial Relations – Significance - Factors pertaining to Good Industrial Relations – Causes and effects of poor Industrial Relations – Industrial Disputes – Forms and causes – Methods of Settlement of Industrial Disputes

Unit II: Industrial and Labour Laws

Industrial Laws and Labour Law – Need for Labour Legislation – Principles of Labour Legislation – History of Labour Legislation – Workmen's Compensation – Determination and Time for payment of Compensation

Unit III: Trade Union

Trade Union - Definition – Need – Objectives – Structure – Trade Union Theories – Functions of Trade Union – Trade Unions Act, 1926 – Concept and benefits of Collective bargaining – Workers' Participation in Management

Unit IV: Payment of Wages Act, 1936 and Factories Act, 1948

Payment of Wages, Act 1936 – Objectives – Scope – Rules for payment of wages – Authorised deductions from Wages
Factories Act, 1948 – Objectives – Provisions relating to Health, Safety and Welfare of Employees

Unit V: Employees State Insurance Act, 1948

Employees State Insurance Act, 1948 – Objectives – Employees State Insurance Corporation – Constitution, Powers, Duties of Standing Committee – Benefits to the Employees – Sickness, Maternity, Disablement, Dependants, Medical and Funeral Benefits

Textbook:

Saravanavel P. – Labour Legislations – Eswar Press, Chennai, Reprint 2015

Books for Reference:

1. Srivastava S. C. – Industrial Relations and Labour Laws – Vikas Publishing House Pvt. Ltd., New Delhi, Edition 2015
2. Tripathi P.C. and Gupta C.B. – Industrial Relations and Labour Laws – Sultan Chand & Sons, New Delhi, Edition 2018
3. Venkata Ratnam C. S. – Industrial Relations and Labour Laws – Oxford University Press, New Delhi, Reprint 2017
4. Nair N. G. and Latha Nair – Personnel Management and Industrial Relations – Sultan Chand & Sons, New Delhi, Reprint 2016

SEMESTER IV

PCCOQ19 – ENTERPRISE RESOURCE PLANNING AND TALLY

Objective:

To provide an introduction to the operation of Enterprise Resource Planning and the related technologies

Unit I: Introduction

Enterprise Resource Planning (ERP) – Introduction – History – Common Myths about ERP – Reasons for growth of ERP Market – Advantage of ERP – Roadmap for successful implementation of ERP packages – Importance of ERP to a company – Values created by ERP –Benefits of ERP system – Risks of ERP – Implementation of ERP – Challenges, Strategies and Process – Future directions and trends in ERP

Unit II: ERP and Related Technologies

ERP and Related Technologies – Business Process Reengineering – Data Warehousing – Data Mining – Online Analytical Processing (OLAP) – Supply Chain Management (SCM) – Customer Relationship Management (CRM) – Business Process Reengineering – Evolution – Phases – Success in BPR – Data Warehousing – Related Terms – Data Warehousing System – System – Structure of Data Warehouse – Advantages - Obstacles – Uses of Data Warehouse

Unit III: Data Mining

Data Mining – Meaning – Process – Advantages – Technologies used – OLAP – Meaning – Relationship with Data Warehousing – Uses – Features – Styles – Product Life Cycle Management – Meaning – Benefits – Phases of Product Life Cycle – Product Life Cycle Management's support to product Life Cycle

Unit IV: Supply Chain Management and Security in ERP

Supply chain Management – Evolution – Advantages – Business Benefits – Customer Relationship Management – Meaning – Function – Components – Uses – Features and Forms of CRM system – Benefits - Advanced Technology and ERP security – ERP Bolt – ons – Middleware – Computer crimes – Types – Security and ERP – Physical Access – Restrictions – Passwords – Firewalls – Backup – Emerging Security solutions – Human security concerns – Preventing employee crimes – Tips for defending hackers

Unit V: Tally Software

Tally Software – History – Features – General and Accounting – Group and Ledgers – Inventory in Tally – Stock Group and Items – Vouchers – Accounting and Inventory – Cost Centers and Categories – Budgets and Control – Bill wise details – Interest Calculation – Security control –GST in Tally – Additional Features in Tally 9 Release 13

Note: Study Material will be provided.

SEMESTER IV

PCCOR19 - PRACTICAL: TALLY

Objective:

To provide knowledge of the advanced operations of Tally ERP 9 and its practical application

Practical Exercises:

1. Profit and Loss Account and Balance Sheet
2. Inventory – Stock Summary and P&L Account
3. Cost Centres and Cost Categories
4. Bill-Wise Details
5. Interest Calculation – Simple and advanced mode
6. Application of GST

SEMESTER IV

PCCOS19 – TOTAL QUALITY MANAGEMENT

Objective:

To introduce to the students the concept of Quality and Total Quality Management in organisations

Unit I: Concept of Total Quality Management

Quality – Definition – Dimensions – Total Quality Management – Definition – Core Concepts of TQM - Basics – Principles – Quality Planning – Statements – Strategic Planning – Basic Concepts of TQM – Leadership – Role of Senior Manager – Quality Control – Quality Objective – Team Building – Barriers to Implementation of TQM – Factors Influencing Quality Cost – Cost of Quality – Analysis Techniques of Quality Cost – Economics of Quality – Quality Assurance

Unit II: Customer Satisfaction

Customer Focus – Customer Satisfaction – Customer Perception of Quality – Customer Relations Management – Customer Complaints – Service Quality – Customer Retention – Customer Feedback – Supplier Relationship – Partnering, Sourcing, Supplier Selection, Rating, Certification and Relationship Development

Unit III: Continuous Process Improvement

Continuous Process Improvement – PDSA cycle – Kaizen – Gemba Kaizen – 5s of Continuous Process Improvement – Quality Circles – Re-engineering – Employee Involvement – Motivation – Empowerment – Teams – Recognition and Reward – Performance Appraisal – Benefits of Employee Involvement – Performance Measures – Basic Concept - Balanced Score Card – Performance Measure Presentation

Unit IV: Seven tools of Quality and Bench Marking

Seven tools of quality – Check Sheet – Pareto Diagram – Histograms – Flow chart – Causes and Effect diagrams – Control Charts – Scatter Diagrams

Bench Marking – Types – Process – Shortcomings - Total Productive Maintenance – Concept –Improvement Needs

Unit V: Quality Function Deployment

Quality Function Deployment – Process – Benefits – House of Quality – Quality Management Systems – Need – Principles – Revision of Standards – Documentation – Implementation – Auditing – Certification – ISO 9000: 2000 Quality system – ISO 14000 - Concepts – Requirement and Benefits

Textbook:

Ramakrishnan R. – Total Quality Management – Eswar Press, Chennai, Reprint 2017

Books for Reference:

1. Srinivasa Gupta N. and Valarmathi B. – Total Quality Management – Vijay Nicole Imprints, Chennai, Reprint 2017
2. Shridhara Bhat K. – Total quality Management – Himalaya Publishing House, Mumbai, Edition 2018
3. Pike, John and Barnes, Richard – TQM in Action – London, Chapman & Hill, Edition, 2016
4. Spenley Paul – World Class Performance through TQ – Chapman & Hall, London, Revised Edition 2017
5. Senthil Arasu B. and Praveen Paul J. – Total Quality Management – Scitech Publications, (India) Pvt. Ltd., Hyderabad 2017

SEMESTER IV

PCCOW19 - BUSINESS ENVIRONMENT

Objective:

To teach the students about the various micro and macro environmental factors, forces and policies that influence business operations

Unit I: Overview of Business Environment and Financial System

Introduction to Business Environment – Nature and Scope – Characteristics – changing concepts of business – Demographic factors - Environmental Analysis – Ecological environment – Water, Air and Noise Pollution - Financial system - Financial Institutions – Importance - Role – Banking functions – Financial Markets.

Unit II: Economic and Non-Economic Environment

Economic - Basic aspects of Business – Economic Environment of business – Monetary Policy and business – Fiscal Policy – Physical Controls – Foreign Trade Policy – Economic system and Business – Economic planning – Resource Endowment

Non- Economic - Sociological Factors – Educational – Cultural Factors – Historical – Political – Legal – More classifications of Business Environment – Static and Dynamic Environment - Business Cycle – Inflation – Control of Business Cycle – Characteristics of Inflation – Degree of Inflation

Unit III: Constitutional and Legal Environment

Constitutional Environment in India – Preamble to the Constitution – Fundamental Rights – Directive Principles of State Policy – Directives shaping the policy of the States – Non-justifiable rights – Criticisms of the Directive Principles.

Legal environment - Introduction – History – Objectives of the Companies Act, 1956 – Definition, Meaning & Features of a Company - Kinds and classifications of Company - Holdings and Subsidiary Companies – Investment Company

Unit IV: Socio - Cultural Environment

Business and Culture – Family – Monistic Society – Social stratification in India – Social Transformation – Culture – Applied to Business – Culture – Applied to Business – Culture lag - Social responsibilities - Sole Proprietorship – Features – Merits – Demerits – Partnership –Features – Limits to Social Responsibility

Unit V: Technological and Global Environment

Technological Environment – Features – Impact of Technology – Business operations – Expenditure on Research and Development – Social Technology - Globalisation – Foreign Trade Direct Investment – Multinational Corporations - World Trade Organization

Textbook:

Dr. S. Sankaran – Business Environment- Margham Publications, Chennai, Reprint 2018

Books for Reference:

1. Gupta C.B.– Business Environment - Himalaya Publishing House, Mumbai, Reprint 2017
2. Francis Cherunilam R. – Business Environment – APH Publishing Corporation, New Delhi, Reprint 2013
3. Vivek Mittal – Business Environment - Excel Books, New Delhi Revised Edition 2012
4. Dr. Sankaran S. - International and Business Environment – Margham Publications, Chennai, Reprint 2018.

SEMESTER IV

PCCOU19 – PROJECT

Objective:

To develop an interest for research among students and expose them to the practical aspects in Business, Trade and Industry.

Period	Student's Activity	Staff Supervisor's Activity	Department's Activity
II Semester	The student selects a topic related to Business/ Finance/Trade/ Marketing for study.	The student is introduced to the Methodology and Techniques of research through the Paper Research Methodology	Each student is assigned to a staff supervisor with the help of who she is made to select a topic related to Business/ Finance/ Trade/ Marketing for Study.
Summer Holidays after II Semester	The student prepares the first draft of the Questionnaire.	The student is made to review and collect literature related to her topic. The first draft of the Questionnaire	
III Semester	The student finalises the Questionnaire The student selects the sample (Sample size is 50) and collect data. The Student prepares the rough draft of the Dissertation.	The first draft of the Questionnaire is checked.	A workshop is conducted on 'SPSS and its application in Research', with special reference to the topics selected.
IV Semester	The student prepare the final draft of the Dissertation after two reviews by the staff supervisor. The student submits the Dissertation in two copies.	The final draft of the Dissertation is reviewed.	A Viva Voce is conducted before the End-Semester Examination during late February/early March by an external Examiner.

SEMESTER I

PSCOD19 - SELF-STUDY PAPER I: CORPORATE ADMINISTRATION

Objective

The objective is to enable the students to get familiarized with the existing Company Law and Secretarial Procedure

Unit I: Introduction to Company

Meaning and Definition – Features – Steps in formation of Joint Stock Company - Highlights of Companies Act 2013 - Kinds of Companies – One Person Company - Private Company - Public Company - Company limited by Guarantee - Company limited by Shares - Holding Company - Subsidiary Company - Government Company - Associate Company - Small Company - Foreign Company - Global Company - Body Corporate - Listed Company

Unit II: Formation of a Company

Promotion Stage: Meaning of Promoter - Position of Promoter & Functions of Promoter - Incorporation Stage – Meaning and contents of Memorandum of Association and Articles of Association - Distinction between Memorandum of Association and Articles of Association - Certificate of Incorporation - Subscription Stage – Meaning and contents of Prospectus - Statement in lieu of Prospects and Book Building, Commencement Stage – Document to be filed - E-filing - Register of Companies - Certificate of Commencement of Business

Unit III: Company Administration

Key Managerial Personnel – Managing Director, Whole time Directors, the Companies Secretary, Chief Financial Officer, Resident Director, Independent Director, Auditors – Appointment – Powers – Duties and Responsibilities - Managing Director – Appointment – Powers – Duties and Responsibilities - Audit Committee - CSR Committee - Company Secretary - Meaning, Types, Qualification, Appointment, Position, Rights, Duties, Liabilities & Removal or dismissal

Unit IV: Corporate Meetings

Corporate Meetings - Types of Meetings – Annual General Meeting – Extraordinary General Meetings – Board Meetings and Resolutions - Requisites of a valid meeting

Unit V: Formation of Global Companies

Meaning – Types –Features – Legal Formalities– Administration

Textbook

Kapoor N.D. - Company Law and Secretarial Practice - Sultan Chand & Co. Pvt. Ltd., New Delhi, Edition 2019

Books for Reference:

1. Maheshwari S.N. - Elements of Corporate Law - Himalaya Publishing House Pvt. Ltd., Mumbai, 2015
2. Venkataramana K. - Corporate Administration - Seven Hills Book Publication, India, Edition 2010
3. Bhandari M.C. - Guide to Company Law Procedures - Wadhwa Publication, Edition 2010

SEMESTER I

PSCOE19 - SELF-STUDY PAPER II:

PUBLIC RELATIONS AND CORPORATE COMMUNICATION

Objective:

To create awareness among the students on the soft skills required to plan and pursue a career and empower them with employability skills

Unit I: Attitude and Emotional Intelligence

Importance of Attitude – Meaning of Positive Thinking and Positive Attitude – Ways to build positive attitude – Effects of negative attitude and measures to overcome - Significance of interpersonal relationships in personal and professional life - Tips to enhance interpersonal relationships - Emotional Intelligence

Unit II: Vision, Goal Setting and Time Management

Meaning of Vision – Doing things for the right purpose – Setting and achieving goals – Importance of Goal Setting – Periodicity in Goal Setting – Short, Medium, Long-term – Methods to achieve set goals - General principles of Stress Management and Time Management

Unit III: Creativity in facing challenges

The creative mind – Importance of Creativity – Elements of Creativity – Influence and Flexibility – Factors influencing creativity – Methods of enhancing creativity – Techniques of creativity – Brainstorming - Attributes listing

Unit IV: Communication Skills

Basics of Managerial Speaking Skills – Body Language – How to develop matter for a speech - Presentation aids and effective use of presentation aids - Preparation of Resume and preparation for Group Decision and Interview

Unit V: Public Relation Practice

Meaning – Scope – Planning for Public Relation – measuring PR

Textbook

Jaishri Jethwaney et al., - Corporate Communication – Oxford University Press India, Edition 2010

Books for Reference:

1. Paul A.Argenti – Corporate Communication – McGraw Hill Education, New Delhi, 2015
2. Joep Crelissen – Corporate Communication: Guide to Theory and Practice – Sage Publication, 2017
3. Klement Podnar – Corporate Communication: A Market View point, Routledge Publishers, Edition 2014

SEMESTER II

PSCOC19 - SELF-STUDY PAPER - III:

PRINCIPLES OF EVENT MANAGEMENT

Objective:

To provide students with a conceptual framework of Event Management, Event Services, Conducting Events and Managing Public Relations

Unit I: Introduction to Event Management

Event - Meaning – Need for Event Management - Analysis of Event - Scope of Event - Decision Makers - Event Manager and Technical Staff - Establishing of Policies and Procedures - Developing Record Keeping Systems

Unit II: Event Management Procedure

Principles for holding an Event - General Details - Policies - Permissions - Government and Local Authorities - Phonographic Performance License - Utilities - Five Bridge Ambulance, Catering, Electricity, Water Taxes Applicable

Unit III: Conduct of an Event

Preparing a Planning Schedule – Organizing Tables - Assigning Responsibility - Communication and Budget of Event – Checklist – Computer-Aided Event Management – Roles and Responsibilities of Event Managers for Different Events – Master of Ceremonies

Unit IV: Public Relations

Introduction to Public Relations – Concept – Nature – Importance – Limitations – Media - Types of Media - Media Management - Public Relation Strategy and Planning - Brain Storming Sessions - Writings for Public Relations

Unit V: Corporate Events

Planning of Corporate Events - Job Responsibility of Corporate Event Organizer - Arrangements - Budgeting - Safety of Guests and Participants - Creating Blue Print - Need for Entertainment in Corporate Events - Reporting of Corporate events

Case studies of Event Management Firms may be done

Textbook

Sita Ram Singh – Event Management - APH Publishing House Corporation New Delhi, Edition 2009

Book for Reference:

1. Wagen – Event Management – Pearson Education, New Delhi Edition 2005
2. Sharma D. – Event Planning and Management – Deep and Deep Publishing Pvt. Ltd., New Delhi, Edition 2005

SEMESTER II

PSCOB19 - SELF-STUDY PAPER - IV:

SOCIAL AND ETHICAL ISSUES IN BUSINESS

Objective:

To make the students learn the responsibilities of the Business towards society and the ethical issues related to businesses

Unit I: Introduction

Ethics – Nature – Objectives – Business Ethics – Nature of relationship between Ethics and Business – The Unitarian view of Ethics - The Separatist view of Ethics – The Integration view of Ethics – Ethical consciousness in business –Need for Business Ethics

Unit II: Ethical issues in Marketing

Ethical issues in Marketing – Marketing Management – An overview – Ethical issues in Marketing mix – Product – Price – Promotion – Place – Process – People – Physical evidence - Ethical issues and Consumerism – Consumer Rights – Consumer Welfare

Unit III: Ethical issues in Purchase Management

Ethical issues in Purchase Management – Purchasing Function – An overview – Role of Purchase manager – Ethical issues in purchasing – Code of Ethics for purchases – Ethical issues in Global buyer – Supplier relationships – Ethical issues in Human Resource Management

Unit IV: Ethical issues in Accounting

Ethical issues in Finance – Importance of Financial Statements – Fictitious Revenues – Concealed liabilities and expenses – Improper and fraudulent disclosure or omissions - Fraudulent Asset Valuation – Transparency in disclosures

Unit V: Corporate Social Responsibility

Corporate Social Responsibility – Meaning – Definition – Methods – Evaluation – Internal stakeholders - Shareholders, Employees, Management – External stakeholders – Consumers, Suppliers – Creditors – Competitors – Community
Environmental Ethics – Environmental issues in India – Greening and Green initiatives

Textbook:

Murthy C. S. V. – Business Ethics: Text and Cases – Himalaya Publishing House – New Delhi, Edition 2007

Books for Reference:

1. Mr. Fernando (LIBA) – Business Ethics – Dorling Kindersley (India) Pvt. Ltd., Licenses of Pearson Education in South Asia – New Delhi, Edition 2010

SEMESTER III

PSCOA19 - SELF-STUDY PAPER - V: RISK MANAGEMENT

Objective:

To give students the knowledge about risk and managing the risk

Unit I: Introduction to Risk Management

Introduction to Risk Management- Elements of uncertainty, peril, hazards – Types - Risk Management Process – Definition - Types and various means of Managing Risk – Limitations of Risk Management

Unit II: Sources of Risk and Exposure

Sources of Risk and exposure - Pure Risk and Speculative Risk - Acceptable and Non-acceptable risks - Static and dynamic risk - Various elements of cost of Risk

Unit III: Corporate Risk Management

Corporate Risk Management - Riskiness of returns - Approaches and processes of Corporate Risk Management, Management of Business risk, Currency and Interest rate risk, Assets and Liability Management, - Guidelines and tools of Risk Management

Unit IV: Derivatives as Risk Management Tools

Derivatives as Risk Management Tools - Features of Hedging, Forward, Future, Options and Swaps - Classification of Derivatives - Important features of Derivatives

Unit V: Hedging and Options

Hedging risks with currency and Interest rate futures - Index future and Commodity futures - Fundamental concepts of Options and Hedging - Risk Management with Options - Fundamentals of currency and Interest rate Swaps - Risk management with Swaps, Fundamental concepts of VAR Approach and Insurance

Textbook:

Indian Institute of Banking and Finance – Risk Management – Mac Millan Publishers India, New Delhi, Revised Edition 2018

Books for Reference:

1. Carl L. Pritchan – Risk Management: Concept and Guidance – Auebach Publications, UK, 2017
2. Risk Management Institute – Practice Standard for Project Risk Management – Risk Management Institute, Bangalore, 2009
3. Michel Crouhy, Dan Galai et., - Essentials of Risk Management – McGraw Hill Education, New Delhi, 2013

M.Sc. CHEMISTRY

(Effective for those admitted from the Academic Year 2019 - 2020)

Vision of the Department:

To inculcate a keen interest for learning chemistry, acquiring skills in carrying out tasks systematically with perseverance and precision, motivating towards research, inspiring to lead a life with scientific approach and promote the standard of personal and societal living.

Objectives

- To expose the students to the recent trends in Chemistry and related sciences.
- To acquire skill and competency in research.
- To inculcate a sense of responsibility towards self, others and the society.
- To train economically backward students to provide better job opportunities.
- To tap out the talents through extracurricular and co curricular activities.

Eligibility for Admission to M.Sc. Chemistry

- A pass in undergraduate course in Chemistry with a minimum of 55%

The Course of Study and Scheme of Examination:

Sem	Code	Title	Hours/ Week	Exam		Credits	Marks
				Th	Pr		
I	PCCHA19	Stereo Chemistry and Conformational Analysis	5	3	-	5	40+60
	PCCHB19	Structural Inorganic Chemistry	5	3	-	4	40+60
	PCCHC19	Kinetics and Photo Chemistry	5	3	-	4	40+60
	PECHA19	Elective I A: Polymer Chemistry	5	3	-	4	40+60
	PECHB19	Elective I B: Nano Chemistry					
	PCCHG19	Practical I: Organic Chemistry I	3	-	-	-	-
	PCCHH19	Practical II: Inorganic Chemistry I	4	-	-	-	-
	PCCHI19	Practical III: Physical Chemistry I	3	-	-	-	-
	PICHA19	IEP: Dairy Chemistry		-	-	2	40+60
	PICHB19	IEP: Quality Control and Chemical Analysis					
Total			**30**	**-**	**-**	**19**	**500**

Sem	Code	Title	Hours/ Week	Exam		Credits	Marks
				Th	Pr		
II	PCCHD19	Organic Reactions and Mechanisms	4	3	-	4	40+60
	PCCHE19	Advanced Coordination Chemistry	5	3	-	4	40+60
	PCCHF19	Group Theory and Quantum Chemistry	5	3	-	4	40+60
	PECHC19	Elective IIA: Pharmaceutical Chemistry	5	3	-	4	40+60
	PECHD19	Elective IIA: Medicinal Chem.					
	PCCHG19	Practical I: Organic Chemistry I	3	-	6	3	40+60
	PCCHH19	Practical II: Inorganic Chemistry I	3	-	6	3	40+60
	PCCHI19	Practical III: Physical Chemistry I	3		6	3	40+60
	PNHRA19	Human Rights	2	3	-	2	40+60
	PICHC19	IEP: CSIR-Net Preparatory Course in Inorganic Chemistry		-	-	2	40+60
	PICHD19	IEP: Water Chemistry					
Total			**30**	**-**	**-**	**29**	**900**
III	PCCHJ19	Synthetic Organic Chemistry	4	3	-	4	40+60
	PCCHK19	Molecular Spectroscopy	4	3	-	4	40+60
	PCCHL19	Electro Chemistry	4	3	-	4	40+60
	PECHE19	Elective III A: Analytical Chemistry	5	3	-	4	40+60
	PECHF19	Elective III B: Green Chemistry					
	PGTRA19	Teaching and Research Aptitude	-	3	-	3	40+60
	PCCHP19	Practical IV: Organic Chemistry II	3	-	-	-	-
	PCCHQ19	Practical V: Inorganic Chemistry II	3	-	-	-	-
	PCCHR19	Practical VI: Physical Chemistry II	3	-	-	-	-
	PICHE19	IEP: CSIR Net Preparatory Course In Organic Chemistry	-	-	-	2	40+60
	PICHF19	IEP: Forensic Chemistry					
	PICHG19	IEP: Research Methodology					
Total			**30**			**21**	**600**

Sem	Code	Title	Hours/ Week	Exam		Credits	Marks
IV	PCCHM19	Natural Products and Bioorganic Chemistry	5	3	-	4	40+60
	PCCHN19	Solid State Chemistry and Nuclear Chemistry	5	3	-	5	40+60
	PCCHO19	Thermodynamics	5	3	-	5	40+60
	PECHG19	Elective IV A: Organometallic and Bioinorganic chemistry	5	3	-	4	40+60
	PECHH19	Elective IV B: Organic Farming and Solid Waste Management					
	PCCHP19	Practical IV: Organic Chemistry II	3	-	-	3	40+60
	PCCHQ19	Practical V: Inorganic Chemistry II	4	-	-	3	40+60
	PCCHR19	Practical VI: Physical Chemistry II	3	-	-	3	40+60
	PICHH19	IEP: CSIR Net Preparatory Course In Physical Chemistry	-	-	-	2	40+60
	PICHI19	IEP: Advanced Instrumentation Techniques					
	PICHJ19	IEP: Leather Chemistry					
		Total	**30**	**-**	**-**	**29**	**800**
Grand Total						**98**	**2800**
	PSCHA19	Summer Research Project	-	-	3	2	100

SEMESTER I

PCCHA19- STEREOCHEMISTRY AND CONFORMATIONAL ANALYSIS

Objectives:

- To learn the concepts of stereochemistry, conformational analysis and their application in the determination of reaction mechanism.
- To understand the mechanism and stereo chemistry of substitution and elimination reactions.
- To gain knowledge about the optical rotatory dispersion and circular dichroism.

Unit I: (15 Hours)

1.1 Optical activity and chirality - classification of chiral molecules as asymmetric and dissymmetric, nomenclature-absolute configuration - R/S and D/L and relative configurations - threo/erythro and syn/anti.

1.2 A brief study of dissymmetry of allenes, biphenyls-atropisomerism, spiro compounds, transcyclooctene, cyclononene and molecules with helical structures.

1.3 Interconversion of Sawhorse, Newmann and Fischer projections. Asymmetric synthesis - Cram's rule.

1.4 Geometrical isomerism - E, Z -nomenclature of olefins. Geometrical and optical isomerism of disubstituted cyclopropane, cyclobutane and cyclopentanes. Stereo specific and stereo selective reactions - definition and examples.

Unit II: (15 Hours)

2.1 Conformational analysis of di-substituted cyclohexanes and their stereo chemical features - Geometric and optical isomerism of these derivatives.

2.2 Conformation and reactivity of cyclohexene - Allylic 1,2 and 1,3 strain and related compound alkyldiene cyclohexane.

2.3 Conformation of cyclohexanone-2-alkyl and 3-alkyl ketone effect and reactivity of cyclohexanone in comparison with cyclopentanones.

2.4 Conformations of six membered rings containing hetero atoms - Conformation and stereochemistry of cis and trans decalin and 9-methyl decalin - chemical consequence of conformational equilibrium - Curtin-Hammett principle.

Unit III: (15 Hours)

3.1 S_N1, S_N2 and S_Ni reactions - Mechanisms and evidences.

3.2 Factors influencing S_N1 and S_N2 reactions. Mixed S_N1 and S_N2 reactions.

3.3 Substitution by ambident nucleophiles, substitution at allylic, vinylic, benzylic and aryl halides, SET (single electron transfer).

3.4 Neighbouring group participation – introduction of an acyclic open chain system, Π systems of aromatic rings, cyclic system, double bond and σ bond.

Unit IV: (15 Hours)

4.1 E_1, E_2, E_1CB reaction and mechanism - E_1, E_2 and E_1CB variables- mechanistic spectrum, competition between elimination and substitution.

4.2 Stereochemistry of E_2 - syn and anti elimination reaction, orientation of the double bond – regiochemistry of the elimination reaction.

4.3 Pyrolytic eliminations - acyclic and alicyclic systems, Molecular rearrangements during elimination.

4.4 Grob's fragmentations - Incorporation of fragmentation - Mechanism of fragmentation - Mechanism allied to E_1 and E_2 elimination.

Unit V: (15 Hours)

5.1 Optical Rotatory Dispersion and Circular Dichroism- terminology- optical rotation, circular birefringence, circular dichroism and cotton effect.

5.2 Plain curves, rotatory dispersion of ketones - structure, configuration, conformation of unsaturated ketones and diketones,

5.3 Emperical and semiempirical rules- The Axial haloketone rule, the Octant rule (Configuration and Conformation)

5.4 Absolute configuration and ketal formation.

Reference:

1. R.O.C. Norman & Coxon, Principles of Organic Chemistry, NY, 3rd Edition, 1980.
2. S.M. Mukherji and S.P. Singh, Organic Reaction Mechanism, MacMillan India Ltd., Chennai, Reprint 2010.
3. Stanley H Pines, Organic Chemistry, McGraw Hill Publication, 5th Edition, Reprint 2007.
4. Francis A. Carey and Richard J. Sundberg, Part A and B, Advanced Organic Chemistry, Plenum Press, 4th Edition, Reprint 2001.
5. Jerry March, Advanced Organic Reaction Mechanism and Structure, A Wiley Interscience, 4th Edition, Reprint 2005.
6. D. Nasipuri, Stereochemistry of Organic Compounds, 2 nded,, New Age Publishers, Reprint 2011.
7. P.S. Kalsi, Stereochemistry, Conformation and Mechanism, New Age International Ltd, Reprint 2017.
8. Ernest L. Eliel, Stereochemistry of Carbon Compounds, Tata McGraw Hill Publishing, Reprint 2007.
9. C.K. Ingold, Structure and Mechanism in Organic Chemistry, CBS Publishers and Distributore pvt ltd, Second edition
10. P.S. Kalsi, Stereochemistry and Mechanism through Solved Problems, New Age International Publishers, and Reprint 2003.
11. R.K. Bansal, Organic Reaction Mechanism, Tata McGraw Hill Publishing, 9th Edition, Reprint 2005.
12. Bernard Miller Advanced Organic Chemistry Reaction & Mechanism, Pearson Education, 2nd Edition, Reprint 2005.
13. P.S. Kalsi, Organic Reactions and their Mechanism, New Age International Publishers, 2nd Edition, Reprint 2017.
14. Nimai Tewari, Advanced Organic Stereochemistry (Problems & Solutions), Books and Allied (P) 1st Edition, 2010.

SEMESTER I

PCCHB19 - STRUCTURAL INORGANIC CHEMISTRY

Objectives:

- To learn the concepts of Lewis acids and bases.
- To learn the structures of complex solids, metals and alloys.
- To gain knowledge about the structure and bonding in poly acids, boron hydrides and metal clusters.

Unit I: (15 Hours)

1.1 Acids and Bases, Proton transfer equilibria in water – Solvent leveling effects.
1.2 Aqua acids. Periodic trends in aqua acids – Simple oxo acids – Anhydrous oxides – Polyoxo compound formation.
1.3 Lewis acid - base concepts. Hard and soft acids and bases -group characteristics of Lewis acids.
1.4 Lux - Flood theory of acids and bases. Usanovich acids and bases, Super acids and superbases, Nonaqueous Solvents, Classification, protic and aprotic solvents. Molten salts as solvents and ionic liquids - Heterogeneous acids and bases - symbiosis and proton sponges.

Unit II: (15 Hours)

2.1 Structure of Complex Solids - layered structures- Conducting ionic solids – graphite - Solids held together by covalent bonding – Diamond – Madelung constants.
2.2 Imperfections in crystals - stoichiometric and non-stoichiometric defects – Schottky, controlled valency, F-Center and Frenkel defect.
2.3 Band theory of solids, Intrinsic and extrinsic semiconductors, piezoelectric crystals.
2.4 Superconductivity – Meissner effect, Critical Temperature and Critical Magnetic Field- Type I and Type II superconductor, Ternary Oxides – Structure of 123 Oxides (YBa-Cu- O) – Applications of High temperature super conducting Materials.

Unit III: (15 Hours)

3.1 Structure of simple solids – Unit cell and crystal structures - Close packing of Spheres – Holes in closed packed structures.
3.2 Structure of Metals and Alloys - Nonclosed packed structures- Atomic radii of metals- Polytypism – Polymorphism of metals.
3.3 Alloys- substitutional solid solutions, interstitial solid solutions of non metals – intermetallic compounds.
3.4 Characteristic structure of ionic solids – binary phases – ternary phases.

Unit IV: (15 Hours)

4.1 Structure and Bonding I - polyacids - isopolyacids and heteropolyacids of Molybdenum and Tungsten - Dawson and Keggins structure of poly acids, Heteropolyanions and Heteropoly Blues.
4.2 Inorganic polymers - Silicates, structures, properties, correlation and applications.
4.3 Molecular sieves, Feldspar, Zeolites and ultramarines and its application.
4.4 Polysulphur – nitrogen compounds. Structure and bonding in tetrasulphur tetranitride, polythiazyl and S_xS_y compounds- Poly organo phosphazenes.

Unit V: (15 Hours)

5.1 Structure and Bonding II - boron hydrides - introduction, classification of boranes- diborane, Tetra borane, Pentaborane, hexaborane and decaborane.

5.2 Polyhedral boranes - Wade's rule - Closo, Nido and arachno structures. Hydroboration.

5.3 Carboranes and metallo carboranes. Closo, Nido and arachno structures of carboranes and metallocarboranes.

5.4 Structure and Bonding of Boronitrides. Metal clusters- chemistry of low molecularity metal clusters (upto trinuclear metal clusters)

Reference:

1. J.E. Huheey - Inorganic Chemistry, Principles, Structure and Reactivity - Harper Collins, New York, 4th Edition, 1993.
2. F.A. Cotton and G. Wilkinson - Advanced Inorganic Chemistry: A Comprehensive Text - John Wiley and Sons, 5th Edition, 1988.
3. K.F. Purcell and J.C. Kotz - Inorganic Chemistry - WB Saunders Co., USA, 1977.
4. M.C. Day and J. Selbin - Theoretical Inorganic Chemistry – East West Press, 2nd Edition, 1974.
5. G.S. Manku – Theoretical Principles of Inorganic Chemistry - Tata McGraw Hill Publications, 2006.
6. D.F. Shrivers, P.W.Atkins and C.H. Langford - Inorganic Chemistry – 5th Edition, OUP, 1990.
7. NH Ray - Inorganic Polymers - Academic Press, 1978.
8. F. Basolo and R.G. Pearson - Mechanism of Inorganic Reaction - Wiley NY, 1967.

SEMESTER I

PCCHC19 - KINETICS AND PHOTOCHEMISTRY

Objectives:

- To get exposed to the kinetics of reactions in solutions, acid- base catalysis and surface reactions.
- To gain knowledge on photochemical and photophysical processes.
- To have an in depth knowledge on the kinetics of complex and fast reactions.

Unit I: (15 Hours)

1.1 Partition functions and activated complex-Eyring equation-Determination of free energy, enthalpy and entropy of activation and their significance.
1.2 Potential energy surfaces.
1.3 Applications of ACT to reactions in solution - effect of pressure, dielectric constant and ionic strength on reactions in solutions, cage effect.
1.4 Kinetic isotope effect, linear free energy relationships– Hammett and Taft equations.

Unit II: (15 Hours)

2.1 Catalysis- Homogeneous catalysis - Acid-Base catalysis – types of acid-base catalysis - specific and general acid-base catalysis. Mechanisms and kinetics of acid-base catalysed reactions- protolytic and prototropic mechanism – Bronsted catalysis law.
2.2 Enzyme catalysis – types of enzyme catalysis, rate of enzymes catalysed reaction by Michaelis-Menton mechanism – study of effect of substrate concentration, pH and temperature on enzyme catalysed reactions – inhibition in enzyme catalysed reactions
2.3 Heterogeneous catalysis - surface reactions, types - physisorption and chemisorptions, differences between physisorption and chemisorption, Lennard-Jones plots, Adsorption isotherms- Langmuir and BET isotherms – Postulates and derivations.
2.4 Kinetics of surface reactions – unimolecular and bimolecular reactions, catalysis by semiconductor oxides (n-type and p-type) - mechanism of heterogeneous catalytic reactions, Langmuir and Rideal-Eley mechanism-adsorption co-efficient and its significance.

Unit III: (15 Hours)

3.1 Complex reactions- definition with examples, kinetics of reversible, consecutive and parallel reaction.
3.2 Chain reactions - types of chain reaction (Stationary and non-stationary), general treatment of chain reactions – chain length – explosion limits.
3.3 Rice Herzfeld mechanism – order of reactions of unity, one-half and three-halves for photolysis of acetaldehyde.
3.4 Fast reactions - relaxation methods - pressure and temperature jump methods, stopped flow and flash photolysis methods.

Unit IV: (15 Hours)

4.1 Photochemistry - Introduction, Absorption and emission of radiation – intensity distribution in the electronic, vibrational species - Franck Condon Principle.
4.2 Jablonski diagram-radiative and non radiative processes-fluorescence and phosphorescence - E-type and P- type delayed fluorescence - spin forbidden radiative transition - internal conversion and intersystem crossing.
4.3 Electronically excited states - Excited state dipole moment and acidity constant – Decay of electronically excited states, Dissociation and predissociation of diatomic molecules - energy transfer process.
4.4 Photophysical processes - kinetics of unimolecular and bimolecular photophysical processes- kinetic treatment of excimer and exciplex formation – Quenching - static and dynamic quenching- Stern-Volmer equation.

Unit V: (15 Hours)

5.1 Photochemical reactions - Photo assisted mechanism, hydrogen and halogen reactions, kinetics of photochemical reaction, photoredox, photosubstitution, photoisomerization and photosensitized reactions.
5.2 Photovoltaic and photogalvanic cells, photo assisted electrolysis of water, application of solar energy conversion, photochemical reaction of vision.
5.3 Radiation chemistry – Interaction of high-energy radiation with matter -primary and secondary processes - G value - radialysis of water – hydrated electron, Ion pair yield.Photochemical reaction of vision.

Reference:

1. R.G.Frost and Pearson - Kinetics and Mechanism - Wiley, New York, First Reprint 1970.
2. Keith J.Laidler - Chemical Kinetics - Pearson Edition Company Pvt. Ltd., Third Edition, 2005.
3. N.J.Turro - Modern Molecular Photo Chemistry - Benjamin, Cumming, Menlo Park, California, 1978.
4. K.K. Rohatgi Mukherjee - Fundamentals of Photo Chemistry - Wiley Eastern Ltd., Second Edition, 1992.
5. Gurdeep Raj – Photochemistry - Goel Publishing House, 4th Edition, 2002.
6. A.Singh, R.Singh – Photochemistry - Campus Books International, 1st Edition, 2005.
7. P.W.Atkins - Physical Chemistry - Oxford University Press, 7th Edition, 2002.
8. G.W.Castellan - Physical Chemistry - Narosa Publishing House, Seventh Reprint, 2004.
9. Donald A. Mc Quarrie and John D. Simon - Physical Chemistry: A Molecular Approach - 1998, Viva Books Pvt., Ltd., New Delhi, Reprint 2004.
10. J.Rajaram J.C. Kuriacose - Kinetics and Mechanisms of Chemical Transformations: Applications of Femto Chemistry - Mc Millan Publishers India Ltd., Reprint 2009.
11. P.Atkins, Julio De Paula, James Keeler – Physical Chemistry Thermodynamics and Kinetics, 11th Edition, Oxford University Press, 2018.

SEMESTER I
PECHA19 - ELECTIVE I A: POLYMER CHEMISTRY

Objectives:

- To gain knowledge on polymerization techniques and characterization of polymers.
- To get acquainted with the recent applications of polymers.

Unit I: (15 Hours)

1.1 Introduction-Basic concepts of polymer science – definitions, degree of polymerization, molecular forces and chemical bonding in polymers.
1.2 Classification and Polymerization Techniques – Classification of polymers, suspension, bulk and emulsion techniques.
1.3 Mechanism and kinetics of addition polymerization- Cationic and anionic polymerization.
1.4 Mechanism and kinetics of free radical and condensation polymerization. Co-ordination polymerization – Mechanism using Ziegler Natta catalyst and biopolymers.

Unit II: (15 Hours)

2.1 Characterization Methods - Crystalline nature- degree of crystallinity, degree of crystallisability and X-ray diffraction studies.
2.2 Study of polymers – Differential Scanning Calorimetric (DSC) and Thermo gravimetric analysis of polymers (TGA)
2.3 Glass transition temperature – Definition, Factors affecting glass transition temperature.
2.4 Relationship between glass transition temperature and melting point.
2.5 Relation to structure- Principle and structural determination-SEM, TEM.

Unit III: (15 Hours)

3.1 Polymer Reactions and Degradation - Hydrolysis, Acidolysis, Hydrogenation, Addition and Substitution reaction.
3.2 Cyclisation, Cross-linking and Vulcanization
3.3 Graft and Block Copolymers- definition and reactions leading to the formation of graft and block copolymers.
3.4 Types of degradation – Definition and mechanisms of Thermal and Photo degradation 3.5 Definition and mechanisms of oxidative and mechanical degradation

Unit IV: (15 Hours)

4.1 Physical Properties and degradation- Mechanical Stress versus Strain measurements, biodegradation.
4.2 Polymer processing- Moulding - Compression, Blow moulding, Injection moulding and Extrusion moulding, Casting of films and Calendaring.
4.3 Molecular weight determination - number average, weight average and viscosity average molecular weight - Principle and method of determination- GPC and Osmometry -Membrane Osmometry and Vapour Phase Osmometry.
4.4 Principle and method of determination-Light scattering, Viscometry method.

4.5 Ultracentrifugation-Sedimentation velocity method and Sedimentation equilibrium method

Unit V: (15 Hours)

5.1 Applications of Polymers - industrially important polymers - Synthesis, properties and uses of natural and synthetic rubber and polyester.
5.2 Synthesis, properties and uses of Polytetra fluoro ethylene (TEFLON), Poly styrene , poly vinylchloride, poly acrylonitrile and Ion-exchange resins
5.3. Electrically conducting polymers – poly acetylene – poly aniline.
5.4 Biopolymers and their applications.
5.5 Synthetic fibres: synthesis, properties and applications of Rayon, Nylon, Polyacrylates.

Reference:

1. V.R. Gowarikar, Viswanathan J. Sridhar - Polymer Science – New Age International publishers, Reprint 2015.
2. F.W. Billmeyer - Textbook of Polymer Science - Wiley Inter Science, 3rd Edition. 2005.
3. Joel R. - Polymer Science and Technology - Fried Prentice Hall, India, Reprint 2000.
4. G.S. Mishra - Introduction to Polymer Chemistry - Wiley Eastern Ltd., Reprint 2005.
5. M.G.Arora and M.Singh - Polymer Chemistry - Anmol Publications, Reprint 1996.
6. M.S.Bhatnagar - Textbook of Polymers - S. Chand and Company, First Edition 2004.
7. R.J.Young and P.A.Lovell - Introduction to Polymers - Nelson Thornes Ltd., Reprint 2004.
8. Susheel Kalia and Luc Averous, Biopolymers: Biomedical and Environmental Applications, Wiley Publications, 2011.

SEMESTER – I

PICHA19 - INDEPENDENT ELECTIVE – I A - DAIRY CHEMISTRY

Objectives:

- To impart knowledge on the principles and practical applications of various dairy products.
- To help the students understand the analysis of dairy products by using physical, biochemical and instrumental methods of analysis.

Unit: I

1.1 Milk - Constituents of milk – Water, lipids, carbohydrates, proteins, salts and miscellaneous constituents.

1.2 Milk products and their composition – Fluid milks and creams, plain milk, skim milk, low fat milk, ultra-high temperature (UHT) sterile milk.

1.3 Flavoured fluid milk products, fermented and acidified milks, butter milk, yogurt, kumiss.

1.4 Concentrated fermented milks – Fluid cream, table cream, whipping cream.

1.5 Concentrated milk products- Evaporated milk, plain condensed milk, sweetened condensed milk, condensed skim milk, butter, ghee, cheese and its classification.

Unit: II

2.1 Sampling of milk.
2.2 Physical test – Creamline – Freezing point – Refractive index – Temperature.
2.3 Chemical test – Albumin, casein, lactic acid, lactose.
2.4 Total solids – Lactometer – Gravimetric analysis.
2.5 Bacteriological test.

Unit: III

3.1 Introduction – Fluid milk products – Cooling and agitation.
3.2 Clarification – Separation and standardisation – Pasteurization – Vacuum removal of off-flavours.
3.3 Homogenization – Packaging and distribution.
3.4 Ice cream – Ingredients and their functionality – Butter – Processing the cream.
3.5 Evaporated milk – Standardization –Cheese and curd processing.

Unit: IV

4.1 Market milk – Introduction and definition – Market milk industry in India and abroad.
4.2 Indian standards – food chemical codex
4.3 Milk and public health –milk adulteration – lactometer- Safeguarding milk supply – Clean milk production.
4.4 Buying and collection of milk - Cooling and transportation of milk.
4.5 Cleaning and sanitation of equipment – Judging and grading of milk.

Unit: V

5.1 Nutrition and muscles – Effect of various nutritional factors on muscle of agricultural animals – Effects of under nutrition on human muscle.

5.2 Nutrition and bone formation – Bone formation and remodelling – Calcification – Effects of nutrients on bone formation.

5.3 Nutrition, regeneration and repair – Regeneration in lower animals- Regeneration in man and other animals.

References:

1. N.P. Wong, R. Jenness, M. Keeney, E. H. Marth, Fundamentals of Dairy Chemistry, 3rd Edition, CBS publishers & Distributors, 1998.
2. J. G. Davis, Milk Testing – A laboratory control of milk, Agrobios(India), 2010.
3. V. K. Chhazllani, Dairy Chemistry and Animal Nutrition, Mangalam Publications, 2008.
4. Sukumar De, Outlines of Dairy Technology, Oxford University Press, 2003.
Clarence Henry Eckles, Willes Barnes Combs, Harold Macy, Milk and Milk Products, 4th Edition, Tata McGraw-Hill Publishing Company Limited, 2002.

SEMESTER –I

PICHB19 - INDEPENDENT ELECTIVE I B: QUALITY CONTROL AND CHEMICAL ANALYSIS

Objectives:

- To provide information on fundamental concepts of Quality Control, Quality Analysis and good laboratory practices and their application in chemical industries.
- To understand the various methods of analysis of water, soil and air
- To familiarize the standards and specifications involved in quality control

Unit I

1.1 Definition and dimension of Quality, Need for quality- Quality control - Objects of quality control-Advantages of Quality control-Relation to Quality Assurance. Statistical Quality Control - Merit, Difference between Quality control and Statistical Quality Control.
1.2 Total Quality Management- Six Sigma, Total Quality Control, Total Waste Elimination-Barrier to Total Quality Management implementation.

Unit II

2.1 Specifications and Standards: Role of Specifications, Data Sheets- MSDS, Typical specification of industrial chemicals, Specific specifications- colour, flash and fire points, Density of liquids and solids, particle size, viscosity, thixotropy.
2.2 Quality standards International and National : ISO 9001 series, ISI, MINAS, ASTM, FSSAI, BIS, AGMARK, FMTM, FDA, DIN and their specifications.

Unit III

3.1 Quality control and testing of Food additives in industries- Food preservatives- Class I and Class II preservatives- Qualitative analysis of Class II preservatives (sodium benzoate, Benzoic acid, Sulphur dioxide, Sorbic acid)- Food colours – Natural and Artificial food colours- Extraction of the colour from food – Identification of colours by chromatographic techniques.
3.2 Quality control and Testing in Textile industries- Importance of Quality control- Textile testing methods- Physical Methods- Dimension Stability Test, Fabric shrinkage Test, Tensile Strength, Bursting Strength-Chemical Methods- Solubility Test, Colour Fastness properties.

Unit IV

4.1 Methods of assessing water, soil and air quality: Water- Specifications for potable and industrial water, Major and minor components-DO, BOD, COD and their measurements-significance in waste water treatment- threshold odour number.
4.2 Soil – Analysis of moisture, pH, total nitrogen, phosphorous, silica, lime, magnesia, manganese, Sulphur and alkali salt, Air- Analysis of CO, CO_2, NO_2, SO_2, H_2S. National Ambient Air Quality Standards.

Unit V

5.1 Good Laboratory Practices (GLP)- Calibration and use of glass wares- storing and recycling reagents in laboratory, safety measures and first aid in the laboratory-protocols for handling chemicals and their disposal.

5.2 Quality control Laboratory: Responsibilities, .Routine control, Sampling plans, data generation and storage. Use of computers and sensors in quality control.

References:

1. Piot Konieczka, Jacek Namiesnik, Quality Assurance and Quality Control in the Analytical Chemical Laboratory: A Practical Approach, CRC Press, First Edition 2016.
2. G.R. Basotia, Total Quality Management, Mangal deep Publications, 2001.
3. Marton E. Bader, Practical Quality Management in the Chemical Process Industry,CRC Press, 1983.
4. S.N. Mahindru, Food Additives- Characteristics, Detection and Estimation, APH publishing, 2009.
5. Manual of methods of Analysis of Food: As Issued by FSSAI,ILBCO India, 2018.
6. Elliot B, Grover D, Hamby S, Handbook of Textile Testing and Quality Control, Textile Book Publishers, 1960.
7. K. Amutha, A Practical Guide to Textile Testing, CRC Press, 2016.
8. S.P. Maharajan, Pollution Control In Process Industries, Tata McGraw - Hill Education, 1985.
9. RJ Heinsoln and R L Kabel, Sources and Control of Air pollution, Prentice Hall,1999
10. Revised National Ambient Air Quality Standards, 2009.
11. B.S. Dhillon, Applied Reliability and Quality-Fundamentals, Methods and Procedures, Springer, 2007.
12. Allen F. Hirch, Good Laboratory Practice Regulation, 1989.

SEMESTER II

PCCHD19 - ORGANIC REACTIONS AND MECHANISMS

Objectives:

- To discuss the various oxidation and reduction reactions.
- To understand the mechanisms of rearrangements.
- To learn about photochemical and pericyclic reactions.

Unit I: (12 Hours)

1.1 Oxidation by quinones, selenium dioxide, osmium tetroxide, lead tetraacetate.
1.2 Formation of C-C bond in phenol coupling, acetylenic coupling.
1.3 Oxidation by chromic acid (Jones reagent), chromium trioxide - pyridine (Sarett's reagent), DMSO-DCC (Pfitzer-Moffatt reagent).
1.4 Oppenauer oxidation, Dakin reaction and Swern oxidation.

Unit II: (12 Hours)

2.1 Catalytic reduction – reduction by metals (Cu, Pd, Ni).
2.2 Wolf- Kishner reduction and its modification, Clemmensen, Birch and MPV reduction reactions.
2.3 Reduction of Carbonyl compounds (Aldehydes and Ketones) with $LiAlH_4$, $NaBH_4$, and tritertiary butoxyaluminium hydride and sodium cyanoborohydride.
2.4 Selectivity in reduction of 4-t-butylcyclohexanone using selected hydrides. (LAH and $NaBH_4$)

Unit III: (12 Hours)

3.1 A detailed study with suitable examples of the mechanism of the following rearrangements – Wagner-Meerwein, Demjanov, Dienone – Phenol rearrangement.
3.2 Favorski, Baeyer-Villiger, Wolf, Von-Richter rearrangements.
3.3 Curtius, Lossen and Schmidt rearrangements.
3.4 Nitrenes – Singlet and triplet nitrenes. Methods of generating nitrenes and their reactions.

Unit IV: (12 Hours)

4.1 Reaction mechanism and applications of Barton, Simmon-Smith and Mannich reactions.
4.2 Reaction mechanism and applications of Stobbe condensation, Darzen condensation and Chichibabin reactions.
4.3 Reaction mechanism and applications of Michael addition, Skraup and Ullmann reactions.
4.4 Reaction mechanism and applications of Hunsdicker, Nef and HVZ.

Unit V: (12 Hours)

5.1 Photochemical excitation - fate of the excited molecules - study of photo chemical reaction of ketone. Norrish type I and Norrish type II reaction.
5.2 Photocyclo addition – Paterno - Buchi reduction - photo cycloaddition of α-β unsaturated ketones- di-pi methane rearrangement.
5.3 Pericyclic reactions - classification, orbital symmetry - Woodward Hoffmann rules. Analysis of electrocyclic reaction -Types - 4n and 4n + 2 systems - Cyclo addition – Types – [2+2] and [4+2] cycloaddition reactions.Sigmatropic reactions-1, n Hydrogen shift, Cope rearrangement and Claisen rearrangement.
5.4 Correlation diagrams for butadiene - cyclobutene system.

Reference:

1. R.O.C. Norman & Coxon - Principles of Organic Chemistry – New York, 3rd Edition, Reprint 2012.
2. Francis A. Carey and Richard J, Sundberg - Part B , Advanced Organic Chemistry Kluwer Academic Publishers, 4th Edition, Reprint 2001.
3. S.M. Mukherji and S.P. Singh - Organic Reaction Mechanism - Mac Millan India Ltd., Chennai, 3rd Edition, Reprint 2010.
4. Sanyal S.N.Bharathi Bhawan - Reactions, Rearrangements and Reagents - Reprint 2005.
5. Jerry March - Advanced Organic Chemistry - Wiley Inter Science, 6th Edition, Reprint 2006.
6. P.S. Kalsi - Stereochemistry and Mechanism Through Solved Problems - Wiley Eastern Ltd., Reprint 2001.
7. W.Carruthers - Modern Methods of Organic Synthesis - Cambridge University Press, 4th Edition, Reprint 2008.
8. P.S. Kalsi - Organic Reaction and their Mechanism - New Age International Limited, Reprint 2010.
9. V.K.Ahluwalia - Organic Reaction Mechanisms - Narosa publishing House, 2nd Edition 2005.
10. R.K. Mackie and D.M. Smith - Organic Synthesis – Longman Publication, Reprint 1983.
11. P.S.Kalsi - Stereochemistry Conformation and Mechanism - New Age International (P) Ltd., Reprint 2005.
12. Jagdamba Singh and Jaya Singh - Photochemistry and Pericyclic Reactions - New Age International Publishers, 3rd Edition, 2010.
13. Dr. Raj K. Bansal - Organic Reaction Mechanisms - Tata Mc Graw- Hill Publishing Company Ltd., 9th Reprint 2005.

SEMESTER II

PCCHE19 - ADVANCED COORDINATION CHEMISTRY

Objectives:

- To have an in depth knowledge on coordination chemistry, stability of the complexes and stereochemistry of complexes.
- To study about the crystal field theory and applications of inorganic complexes.
- To gain knowledge about the concepts of electron transfer and substitution reactions.

Unit I: (15 Hours)

1.1 Thermodynamic and kinetic stability-stepwise and overall stability constant-Relationship between both the constants-Trend in K-value - Irrving-Williams series - Factors affecting the stability of complexes

1.2 Determination of stability constants by spectrophotometric, polarographic and potentiometric methods- Detection of complex formation

1.3 Optical rotatory dispersion and circular dichroism- application to complexes

1.4 Macrocyclic Ligands: Thermodynamic and kinetic template effect- structure, stability and applications of porphyrins, corrins, Schiffbases, Crown ethers and crypts

Unit II: (15 Hours)

2.1 CFT- salient features of CFT, crystal field splitting of d-orbitals in octahedral complexes – factors affecting the magnitude of Δ_o, crystal field splitting of d-orbitals in octahedral, tetrahedral, tetragonal and square planar complexes, consequences of splitting – high-spin and low-spin complexes, distribution of d-electrons.

2.2 CFSE- calculation of CFSE for various d systems in O_h and T_d fields – uses of CFSE values, applications of CFT, limitations.

2.3 Jahn-Teller distortion – theorem, z-in and z-out cases, causes and consequences.

2.4 MOT- experimental evidences for metal-ligand covalent bonding in complexes, σ and π–bonding in O_h complexes, effects of π –bonding on the value of Δ_o, comparison of CFT with MOT.

Unit III: (15 Hours)

3.1 Types of absorption spectra – ligand spectra, counter - ion spectra, CT spectra, ligand field spectra –R-S coupling

3.2 Microstates–Spectroscopic Terms-Ground state term: Hund's rule–Term states for 'd' - ions, Selection Rules– Laporte's and spin selection rule, Splitting of terms in octahedral and tetrahedral complexes

3.3 Correlation diagrams – Orgel diagrams and Tanabe-Sugano diagrams- important features- Spectra of different d systems – Racah parameters-nephelauxetic effect Charge Transfer spectra- Classification-Ligand to Metal, Metal to Ligand, Intervalence and Intra Ligand Charge transfer

3.4 Magnetic characteristics of transition metal complexes - types of magnetic character - determination of magnetic susceptibility - Guoy and Faraday's method-magnetic properties of complex ions - magnetic criterion of bond type in complex and orbital contribution to magnetic moment.

Unit IV: (15 Hours)

4.1Electron transfer reactions (redox reactions): Outer Sphere Mechanism-characteristics, factors influencing OSM, cross reactions – Marcus-Hush principle.
4.2 Inner Sphere Mechanism - characteristics, factors influencing ISM, OSM versus ISM.
4.3 Two electron transfers, Non-complementary electron transfer reactions, Reactions of the coordinated ligands, geometrical and optical isomerization reactions, electron transfer reactions in biological systems – Cytochromes, Rubredoxins and Ferredoxins.
4.4 Ligand substitution reactions in square-planar complexes – mechanism – influences of entering, leaving and central metal ion on the reactivity of square planar complexes of Pt (II).

Unit V: (15 Hours)

5.1 Trans effect – Trans effect series – theories and applications, cis effect – Mechanisms of substitutions in octahedral complexes- Dissociative, Associative and Interchange (I_a and I_d) mechanisms.
5.2 Hydrolysis reactions – acid hydrolysis and base hydrolysis reactions of six-coordinated Co(III) ammine complexes – mechanisms – evidences.
5.3 Replacement of coordinated water – mechanisms – evidences - rates of water replacement - orbital occupation effects.
5.4 Synthesis of coordination compounds by substitution reactions – chemistry of Pt and Co compounds- Metal complexes in medicinal chemistry, industrial processes and agriculture.

Reference:

1. K.F. Purcell and J.C. Kotz, Inorganic Chemistry, WB Saunders Co., USA, 1977.
2. J.E. Huheey, Inorganic Chemistry, Harper and Collins, NY, 4th Edition, Reprint 2004.
3. FA Cotton and G.W. Wilkinson, Advanced Inorganic Chemistry: A Comprehensive Text, John Wiley and Sons, 3rd Edition, Reprint 1992.
4. R. Gopalan, Concise Coordination Chemistry, Vikas Publishing House Pvt Ltd, Reprint 2008.
5. B.E. Douglas DH McDaniel's and Alexander, Concepts and Models of Inorganic Chemistry, Wiley Publication, 2nd Edition, Reprint 2006.
6. Wahid U. Malik, G.D. Tuli, R.D. Madan, Selected Topics in Inorganic Chemistry, S. Chand and Co., New Delhi, Reprint 1992.
7. S.F.A. Kettle, Coordination Chemistry, ELBS, Reprint 1975.
8. M.C. Shrivers, P.W Atkins, CH. Langford , Inorganic Chemistry , Oxford University Press, 3rd Edition, Reprint 2002.
9. G.S.Manku, Theoretical Principles of Inorganic Chemistry, Tata McGraw Publishers, Reprint 2006.

SEMESTER II

PCCHF19 – GROUP THEORY AND QUANTUM CHEMISTRY

Objectives:

- To learn the concepts of Group theory and its applications.
- To study the fundamental principles of Quantum Chemistry, Schrodinger wave equation and its applications.
- To understand the application of Quantum Chemistry to chemical bonding.

Unit I: (15 Hours)

1.1 Introduction - Symmetry elements and symmetry operations, group postulates and types of groups, sub groups, abelian and non abelian groups, group multiplication table, similarity transformations and classes of symmetry operations.
1.2 Molecular point groups - point groups of molecules, Point groups of tetrahedral, octahedral molecules. Identification of symmetry operation and determination of point group
1.3 Matrices –Matrix representations of symmetry operations, Reducible and irreducible representations, Orthogonality theorem and its consequences, properties of irreducible representations, labeling of irreducible representations.
1.4 Crystallographic symmetry-The 32 Crystallographic Point groups-Space groups-Screw axis-Glide Planes–comparison of crystallographic symmetry with molecular symmetry.

Unit II: (15 Hours)

2.1 Construction of character table for C_{2V} and C_{3V} point groups- Explanation for the complete character table for C_{2V} and C_{3V} point groups.
2.2 Selection rules for vibrational IR and Raman spectra – Mutual exclusion rule for molecules with centre of symmetry, applications to molecular vibrations (IR and Raman) for determining symmetry of normal modes of vibration in nonlinear molecules H_2O, CH_4, BF_3 and NH_3 using group theory.
2.3 Hybrid orbitals in non linear molecules CH_4, XeF_4, BF_3, SF_6, NH_3.
2.4 Application of group theory to electronic spectra of ethylene and formaldehyde.

Unit III: (15 Hours)

3.1 Introduction to Quantum Mechanics-Black body radiation - Distribution of energy in the black body radiation- Rayleigh Jeans's and Planck law of radiation.
3.2 Photoelectric effect, Bohr's quantum theory and subsequent developments – Duality of electron and Compton Effect.
3.3 Quantum theory-Quantum mechanical postulates – Operators- Definition, types of operators and Hermitian property.
3.4 Particle in a box model (one, two and three dimensional cases).
3.5 Schrodinger equation for hydrogen atom and He^+ ion, origin of quantum numbers and their significance.

Unit IV: (15 Hours)

4.1 One dimensional harmonic oscillator – Classical treatment and quantum mechanical treatment.
4.2 Normalization and the characteristics of the eigen functions of a harmonic oscillator.
4.3 The recursion formula for the Hermite polynomials, selection rules of the harmonic oscillator and space quantization of electronic orbitals.
4.4 Wave equation and solution of the rigid rotor and particle in a ring, calculation of rotational constants and bond length of diatomic molecules.

Unit V: (Hours)

5.1 Approximation methods –Variation methods- Trial wave function- Application of variation method to hydrogen and helium atoms- Perturbation method and its application to particle in one dimensional box.
5.2 Application to Helium atom- Born Oppenheimer approximation
5.3 Hydrogen and Helium molecules: Molecular orbital theory and Heitler –London (VB) treatment Energy level diagram.
5.4 Slater orbital and Hartree Fock – Self Consistent Field (HFSCF) methods for many electron systems – restricted and unrestricted HF-SCF methods
5.5 Application of Huckel Molecular Orbital (HMO) treatment to ethylene, butadiene and benzene.

Reference:

1. R.K.Prasad - Quantum Chemistry - New Age International (P) Ltd. Publishers, New Delhi, 3rd Edition 2006.
2. D.A.Mcquarrie - Quantum Chemistry - University Science Books, Mil Valley, California, Reprint 2007.
3. R.Anantharaman - Fundamentals of Quantum Chemistry - Macmillan India Ltd, 2001.
4. Ira N. Levine - Quantum Chemistry - Prentice Hall of India, New Delhi, 5^{th} Edition, 2006.
5. Mahendra. R. Awode - Quantum Chemistry - S. Chand & Company Ltd., New Delhi, 2002.
6. A.K.Chandra - Quantum Chemistry - Tata McGraw Hill Publishing Company, New Delhi, 10^{th} Edition, 2008.
7. Melvin W.Hanna - Quantum Mechanics in Chemistry - The Benjamin / Cummings Publishing Company, 2^{nd} Edition, 1969.
8. K.V.Raman - Group Theory and Its Applications to Chemistry - Tata McGraw Hill Publishing Company Ltd., Reprint 2004.
9. M.S.Gopinathan and V.Ramakrishnan - Group Theory in Chemistry - Vishal Publishing Co., Reprint 2005.
10. F.A.Cotton - Group Theory and Its Applications to Chemistry - John Wiley & Sons (Asia) Pvt. Ltd., Singapore, 2004.
11. A. Salahuddin Kunju and G. Krishnan –Group theory and its Applications in Chemistry –AsokeK. Ghosh, PHI Learning Pvt. Ltd., New Delhi, 2010.

SEMESTER II

PECHC19 – ELECTIVE – IIA: PHARMACEUTICAL CHEMISTRY

Objectives:

- To learn about the drugs, metabolism and the side effects
- To understand the importance of drug design and development of drugs
- To know the cancer and the drugs used
- To learn about the various Nutraceuticals and anticoagulants

Unit I: (15 Hours)

1.1 Classification of drugs: biological, Chemical, commercial consideration, lay public. Mechanism of drug action and metabolism of Drugs: mechanism of action, drug receptors binding, biological responses - covalent bond, hydrogen bond, Vanderwaal's forces.
1.2 Mechanism of drug action – Metabolism of drugs - chemical pathways - phase I and phase II reactions, Biotransformation.
1.3 Absorption of drugs: Routes of administration, factors affecting absorption, digestion and absorption of proteins and fats.

Unit II: (15 Hours)

2.1 Assay of drugs - Chemical, biological and immunological assay.
2.2 Psychopharmacology-Antipsychotic drugs, phenothiazines, LSD, Marijuana, barbiturates mechanism of action.
2.3 Biological role of some inorganic compounds - Sodium and their compounds, potassium and their compounds, calcium and their compounds, iodine and their compounds, copper and their compounds, Zinc and their compounds.

Unit III: (15 Hours)

3.1 Drug design and development - Introduction, discovery of lead compounds. modification of lead compounds - modification of functional group, Structure Activity Relationship (SAR), structure modification to increase potency.
3.2 Quantitative Structure Activity Relationship (QSAR) - Hammett equation (Electronic effects), Taft Equation (Steric effects), Hansch Equation (Lipophilicity effect), Hansch analysis, Craig plot.
3.3 Drug design using QSAR, Computer assisted drug design (CADD).

Unit IV: (15 Hours)

4.1 Cancer Chemotherapy – types of neoplasms, causes of cancer, tumor formation and mechanism, metastasis.
4.2 Treatment of cancer - Radiation, surgery, chemotherapy, Determination of drug response.
4.3 Cytotoxic anticancer drugs - Alkylating agents and its mode of action, antimetabolites, pyrimidine antagonist, antitumor antibiotics, Podophyllotoxins and its mechanism of action, endocrine agents, taxol.

Unit V: (15 Hours)

5.1 Nutraceuticals - Introduction, types - plant sources, animal sources, microbial sources, derived from all sources, role of antioxidants.
5.2 Toxins and their Medicinal value- Introduction, classification of toxins – toxins from reptiles, animals, insects, plants, marine origin, and microorganisms.
5.3 Anticoagulants: Blood coagulation pathway, prevention of coagulation, direct and indirect acting anticoagulants, anticoagulation therapy.

Reference:

1. V.K. Ahluwalia Madhu - Medicinal Chemistry - ANE Books India, 2008.
2. Jayashree Ghosh - Fundamental Concepts of Applied Chemistry - S. Chand Company Ltd., 2006.
3. Graham L. Patrick - Medicinal Chemistry - Oxford University press, Reprinted 2006.
4. W.O. Foye - Principles of Medicinal Chemistry – 1st Edition, Henry Kimpton Publishers, London, Reprint 1976.
5. Asuthosh Kar - Medicinal Chemistry - New Age International (P) Publishers, New Delhi, 3rd Edition, 2006.
6. N.K.Jain - Progress in Controlled and Novel Drug Delivery Systems - CBS Publishers & Distributors, New Delhi, Reprint 2005.
7. P.S. Kalsi and Sangeeta Jagtap, Pharmaaceutical, Medicinal and Natural Product Chemistry, Narosa Publishing House, New Delhi, 2013.

SEMESTER II

PCCHG19 - PRACTICAL I: ORGANIC CHEMISTRY - I

1. Identification of components in a two component mixture and preparation of their derivatives.

2. Preparations
   (i) p-Nitrobenzoic acid from p-Nitrotoluene (Oxidation)
   (ii) Anthroquinone from Anthracene (Oxidation)
   (iii) 1,2,3,4 – Tetrahydrocarbazole from Cyclohexanone (Reduction)
   (iv) Methyl orange from Sulphanilic acid
   (v) m-nitro aniline from m-dinitrobenzene (Reduction)

Reference:

1. Furniss Brain S. - Vogel's Textbook of Practical Organic Chemistry - Pearson Publication, 5th Edition**,** Reprint 2004.

2. Dr.N.S. Gnanapragasam & Prof. G.Ramamurthy - Organic Lab Manual (Semi-Micro Qualitative Analysis and Separation) - S. Viswanathan (Printers & Publishers), Pvt., Ltd, Reprint 2002.

Continuous Assessment - 40 marks

I C.A. - 50
II C.A. - 50
Average - 25
Performance during regular practicals -10
Regularity in submission of observation notebook and Record – 5

CA Practical Examination Mark Distribution

Record - 5 Mark
Viva - 5 Mark
Experiment - 30 Mark
Preparation - 10 Marks
(Quality - 4 Marks, Quantity – 4 Marks, Recrystallization - 2 Marks)

Semester Practical Examination – 60 marks

Record 10 Marks
Viva 5 Marks
Qualitative Organic Analysis 35 Marks
Preparation 10 Marks
(Quality - 4 Marks, Quantity – 4 Marks, Recrystallization - 2 Marks)

SEMESTER II

PCCHH19 – PRACTICAL II: INORGANIC CHEMISTRY - I

1. Semi micro qualitative analysis of mixture containing two common and two rare cations. (The following are the rare cations to be included. W, Te, Se, Ce, Th, Zr, Be, V, Mo, L.,)

2. Colorimetric Analysis using photoelectric method: Estimation of Iron, Nickel, Copper and Manganese.

3. Preparations:

   i. Potassium tris(oxalato)aluminate(III) trihydrate

   ii. Tris(thiourea)copper(I) chloride

   iii. Sodium hexanitrocobaltate (III)

   iv. Tetrammine copper(II) sulphate

   v. Sodium cuprousthiosulphate

Reference:

1. V.V.Ramanujam, Inorganic Semi Micro Qualitative Analysis, The National Publication, 3rd Edition, Reprint 2004.
2. G. Svehila, Vogel's Qualitative Inorganic Analysis, Pearson Publication, 5th Edition**,** Reprint 2004.

Continuous Assessment – 40 marks

I C.A.	- 50
II C.A.	- 50
Average	- 25

Performance during regular practicals -10

Regularity in submission of observation note-book and Record – 5

CA Practical Examination Mark Distribution

Record	- 5 Marks	
Viva	- 5 Marks	
Short Procedure	- 5 Marks	
Semi micro qualitative analysis (2 rare + 2 common cations)		15 Marks
Preparation		10 Marks
Colorimetric analysis		10 Marks

Error Percentage for Colorimetric estimation:

Upto 5%	10 Marks
5 – 7%	9 Marks
7 – 9%	8 Marks
9 – 12%	7 Marks
Above 12%	5 Marks

Semester Practical Examination – 60 marks

Record	10 Marks	
Viva – Voce	5 Marks	
Short Procedure	5 Marks	
Semi micro qualitative analysis (2 rare + 2 common cations)		20 Marks
Preparation		10 Marks
Colorimetric analysis		10 Marks

Error Percentage for Colorimetric estimation:

Upto 5%	10 Marks
5 – 7%	9 Marks
7 – 9%	8 Marks
9 – 12%	7 Marks
Above 12%	5 Marks

SEMESTER - II

PCCHI19 - PRACTICAL III: PHYSICAL CHEMISTRY - I

1. Determination of rate constant and order of the reaction of iodination of acetone in the presence of acid catalyst.

2. Kinetics of Reaction between KI and $K_2S_2O_8$-Determination of order of a Reaction

3. Comparison of Acid Strength by acid catalysed ester hydrolysis

4. Determination of activation energy and Arrhenius parameter for the acid catalysed hydrolysis of methyl acetate.

5. Kinetics of Reaction between KI and $K_2S_2O_8$-Determination of Rate constant – Primary salt effect.

6. Verification of the Freundlich and Langmuir isotherms for adsorption of acetic acid on activated charcoal.

7. Verification of Freundlich adsorption isotherm of Oxalic acid

8. Construction of the phase diagram - simple eutetic system.

9. Saponification of ethyl acetate with sodium hydroxide at equal concentrations of ester and alkali.

10. Kinetics of Inversion of Sucrose-Polarimetry

11. *Determination of composition of ferric ions – salicyclic acid by Job's method.

12. *Determination of the Partial molar volume of acetic acid in aqueous solution by apparent molar volume method.

*Not to be given for examination

Reference:

1. V.K. Ahluwalia, Sunita Dhingra Adarsh Gulati - College Practical Chemistry - University Press (India) Private Limited, Reprint 2008.
2. V. Venkateswaran, R. Veeraswamy, A. R. Kulandaivelu - Basic Principles of Practical Physical Chemistry - Sultan Chand and Sons Educational Publishers, Reprint, 1995.
3. David Shoemaker, Joseph Nibler, Carl Garland- Experimetns in Physical Chemistry, 7th Edition, 2003.
4. B. D. Khosla, V.C. Garg, Adarsh Gulati – Senior Practical Physical Chemistry - R. Chand and Co. Edition 2007.

Continuous Assessment - 40 Marks

I C.A.	- 50
II C.A.	- 50
Average	- 25

Performance during regular practicals -10
Regularity in submission of observation notebook and Record – 5

CA Practical Examination Mark Distribution

Record	-5 Marks
Viva	-5 Marks
Principle and model graph	- 5 Marks
Manipulation	-15 Marks
Result	-20 Marks

1. Kinetics: [Iodination of acetone, Second order kinetics)

Error:
Upto + 0.2= 20 marks
>+ 0.2 to + 0.4 =13 marks
> + 0.4 = 7 marks

2. Phase diagram for simple eutetic system
Eutectic temperature and composition : 20
Unknown :10
Error:
Eutectic temperature
Upto + 2°C =10
>+ 2°C to + 4°C = 7
>+4°C =5
Unknown composition:10
Upto 5% =10
>5-6% =7
>6% =5
3. Arrhenius parameter (Activation energy= 10; Arrhenius parameter =10)
Error:
Arrhenius parameter
< 1% = 10
>1-2% = 7
> 2% = 5
Activation Energy:
Below a factor of 10= 10
By a factor of 10= 7
Above a factor of 10= 5.

4. Primary salt effect (Absence of electrolyte= 10; Presence =10)
Error:
Below a factor of 10=10
By a factor of 10=7
Above a factor of 10= 5

5. Acid strength
Error:
< 2% =20
>2-3% =13
> 3% =7

6. Adsorption of acetic acid /oxalic acid on charcoal
Error:
< 2% =20
>2-3% =13
> 3% =7

Semester Practical Examination – 60 Marks

Record	- 10 Marks
Viva–Voce	- 5 Marks
Principle and model graph	- 5 Marks
Manipulation	-20 Marks
Result	-20 Marks

1. Kinetics:: [Iodination of acetone, Second order kinetics)
   Error:
   Upto + 0.2= 20 marks
   >+ 0.2 to + 0.4 =13 marks
   > + 0.4 = 7 marks

2. Phase diagram for simple eutetic system
   Eutectic temperature and composition: 20
   Unknown: 10
   Error:
   Eutectic temperature
   Upto + 2°C =10
   >+ 2°C to + 4°C = 7
   >+4°C =5
   Unknown composition
   Upto 5% =10
   >5-6% =7
   >6% =5

3. Arrhenius parameter (Activation energy= 10; Arrhenius parameter =10)
Error:
Arrhenius parameter
< 1% = 10
>1-2% = 7

> 2% = 5
Activation Energy:
Below a factor of 10= 10
By a factor of 10= 7
Above a factor of 10= 5.

4. Primary salt effect (Absence of electrolyte= 10; presence =10)
Error:
Below a factor of 10=10
By a factor of 10=7
Above a factor of 10= 5

5. Acid strength
Error:
< 2% =20
>2-3% =13
> 3% =7

6. Adsorption of acetic acid /oxalic acid on charcoal
Error:
< 2% =20
>2-3% =13
> 3% =7

SEMESTER -II

PICHC19 - INDEPENDENT ELECTIVE II A: CSIR-NET PREPARATORY COURSE IN INORGANIC CHEMISTRY

Learning Outcomes:

- Upon studying this paper, the students will be able to answer the CSIR-NET questions in Inorganic Chemistry.

Unit I

1.1 Chemical periodicity: Periodic table, classification of elements - s, p, d and f block elements, periodic trends - atomic size, ionic size, ionization potential, electronegativity.
1.2 Structure and bonding: Molecular Orbital Theory - bonding and anti-bonding molecular orbitals, bond order, bonding in homo and hetero nuclear molecules.
1.3 VSEPR Theory: Geometries of molecules.

Unit II

2.1 Acids and bases: Concepts of acids and bases - Arrhenius, Bronsted-Lowry and Lewis concepts, Hard-Soft acid base concept - Pearson theory, Non-aqueous solvents.
2.2 Main group elements: General characteristics of alkali metals, alkaline earth metals, boron family, carbon family, nitrogen family, chalcogens, halogens and noble gases.
2.3 Compounds of main group elements- Allotropy, synthesis, structure and bonding, industrial importance of the compounds.

Unit III

3.1 Transition elements: General characteristics, Ti, V, Cr, Mn and Fe group elements.
3.2 Coordination compounds: Structure, bonding theories – VBT, CFT and MOT, spectral and magnetic properties, reaction mechanisms in octahedral and square planar complexes.
3.3 Inner transition elements: Spectral and magnetic properties, redox chemistry, analytical applications.

Unit IV

4.1 Organometallic compounds: Synthesis, bonding and structure, and reactivity. Organometallics in homogeneous catalysis. Cages and metal clusters.
4.2 Analytical chemistry: Separation, spectroscopic, electro- and thermo analytical methods.
4.3 Bioinorganic chemistry: photosystems, porphyrins, metallo enzymes, oxygen transport, electron- transfer reactions; nitrogen fixation, metal complexes in medicine.

Unit V

5.1 Characterization of inorganic compounds: By IR, Raman, NMR, EPR, Mössbauer, UV-Vis, NQR and MS.
5.2 Microscopic techniques – Optical, electron and scanning probe techniques.
5.3 Nuclear chemistry: Nuclear reactions, fission and fusion, radio-analytical techniques and activation analysis.

References:

1. P.S. Kalsi, Bioorganic, Bioinorganic and Supramolecular Chemistry, New Age International Publishers Ltd., New Delhi,3rdedition, 2017.
2. H J Arnikar, Essentials of Nuclear Chemistry, New Age International Publishers Ltd., New Delhi,4threvised edition, 2011.
3. H J Arnikar,Nuclear Chemistry Through Problems, New Age International Publishers Ltd., New Delhi, 2ndedition, 2016.
4. R.C. Mehrotra, Organometallic Chemistry: A Unified Approach, New Age International Publishers Ltd., New Delhi, 2ndedition, 2000.
5. K. Veera Reddy, Symmetry and Spectroscopy of Molecules, New Age International Publishers Ltd., New Delhi,2ndrevised edition, 2009.
6. Malik W. U. & et al., Selected Topics in Inorganic Chemistry, S. Chand, revised edition, 2010.
7. R. Gupta, Joint CSIR-UGC NET: Chemical Sciences - Previous Years' Papers (Solved) by RPH Editorial Board, Ramesh Publishing House, 2019.
8. J.D. Lee, Concise Inorganic Chemistry, Wiley,5thedition, 2008.
9. James E. Huheey& et al.,Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Education India, 4th edition, 2006.
10. Svehla / Sivasankar,Vogel's Qualitative Inorganic Analysis, Pearson Education India, 7th edition, 2012.
11. Mark Weller, Overton andRourke,Inorganic Chemistry, 7th edition, 2018.
12. D. N. Sathyanarayana,Introduction to Magnetic Resonance Spectroscopy ESR, NMR, NQR, 2nd edition, 2013.

SEMESTER -II
PICHD19 - INDEPENDENT ELECTIVE II B: WATER CHEMISTRY

Objectives

- The objective is to transfer knowledge of the subject to students interested in continuing their study in sanitary technology and maintenance of water and waste water**.**
- To understand the various purification techniques available and the need for purity of compounds.

Unit I

1.1 Elements, radicals and compounds – Potable drinking water.
1.2 Sources of Water - Hardness, Definition, Types of Hardness - Temporary & Permanent.
1.3 Chemical Water Analysis – Hydrogen ion concentration and pH, Gas Solubility.
1.4 Alkalinity-Colloids & Coagulation-Organic Compounds-Organic matter in Waste Water.

Unit II

2.1 Boiler Feed Water – Requirements - Formation of Deposits in Steam Boilers and heat exchangers-Disadvantages (Wastage of Fuels, Decrease in Efficiency, Boiler Explosion).
2.2 Water Softening Methods – External treatment- Ion-Exchange Method and Activated charcoal method Zeolite method.
2.3 Internal Treatment-Boiler Compounds (Phosphate, Calgon, Carbonate, Colloidal methods)-Caustic Embrittlement.
2.4Water quality monitoring instruments – types of water quality instruments – pH meter, conductivity meter, DO meter, Turbidity meter, BOD incubator, COD meter, Nephelometer – turbidity, GC – volatile organics, AAS- metal pollutants.

Unit III

3.1 Water Pollution:
Physical examination of water (colour, conductivity, temperature, odour, and taste, turbidity, hardness)
3.2 Chemical characterization of water (calcium, magnesium, sodium, potassium, chlorine, sulphate, carbonates, bicarbonates, and solids). Minor elements of water (fluorine, iron, manganese, silica, and nitrogen elements)
3.3 Biological investigation of water – Deoxygenation – dissolved oxygen in water, biological oxygen demand and chemical oxygen demand - Algal toxins.
3.4 Water pollution and water borne diseases.

Unit IV

4.1 Introduction- characteristics of waste water – nutrient content and controls – toxicity evaluation – recovery of aluminium by liquid ion exchangers - removal of iron as its chelated complex with plants.

4.2 Treatment of waste water for reuse – membrane based filtration – microfiltration, Ultra filtration, desalinization of Brackish Water-Reverse Osmosis, Nano filtration and Electro dialysis Electrooxidation- method, diagram and advantages. Biosensors in water/environmental monitoring.
4.3 Recycle and reuse of treated waste water – recycling and reuse of distillery waste water, recycling of waste water – status in India – reuse of water.
4.4 Health guidelines before reuse of waste water – Health protection - recycled water- use in metropolitan cities.

Unit V

5.1 Water and the Constitution of India- Inter-State Water Disputes Act-1956-Difficulties and Solution.
5.2 The Cauvery Water Dispute-The Story of the National Water Policy-1987, The Water Prevention and Control of Pollution Act-2003 and the National Water Policy -2012.
5.3 National Rain-fed Authority, Inland Waterways Authority of India, Central Ground Water Authority, Central Pollution Control Board.
5.4 National Water Resources Council, Integrated Watershed Management Programme, National Rural Drinking Water Programme.

References:

1. S M Khopkar - Environmental pollution monitoring and control - second edition, New age International Publishers, 2015.
2. N.F Gray - Water Technology an Introduction for Environmental Scientists and Engineers - Second edition, Butterworth – Heinemann An imprint of Elsevier, 2006.
3. Mark J. Hammer, Mark J. Hammer Jr - Water and waste water Technology - Third edition, Asoke K Ghosh Publishers, October 2000.
4. Ramaswamy R. Iyer - Water, Perspectives, Issues, Concerns - Sage publications, 2008.

SEMESTER III

PCCHJ19 - SYNTHETIC ORGANIC CHEMISTRY

Objectives:

- To understand the importance of different organic reagents in organic synthesis
- To get exposed to the mechanisms of retro synthesis and its applications.
- To learn the transition metal catalysed reactions.

Unit I: (12 Hours)

1.1 Retrosynthesis, disconnection approach, synthons, linear and convergent synthesis, one group C-X disconnection and two group C-X disconnection.
1.2 Umpolung of reactivity, protection of functional groups (hydroxyl, amino, carbonyl and carboxyl groups).
1.3 Synthesis of target molecules based on disconnection and synthon approach - Asprin, 3- methyl-1- pentane, methyl - 3- phenyl butanoate, cis - 1- isopropyl -2- benzyl ethylene and 2,6 dibromoaniline.
1.4 Synthesis of target molecules based on disconnection and synthon approach -- reserpine, saccharine, paracetamol, morpholine).

Unit II: (12 Hours)

2.1 Prostereoisomerism- prochirality, topicity of ligands and faces- homotopic, heterotopic and enantiotopic.
2.2 Asymmetric synthesis, chiral auxiliaries, methods of asymmetric induction, substrate, reagent and catalyst controlled reactions- Examples.
2.3 Determination of enantiomeric and diastereomeric excess, enantio-discrimination.
2.4 Methods of resolution- mechanical separation, formation of diastereomers, chromatography and biochemical transformation.

Unit III: (12 Hours)

3.1 Polymer supported reagents (synthesis of oligosaccharides), Microwave synthesis (esterification, deesterification and hydrolysis).
3.2 Alkylation of enamines-Stork enamine alkylation and Synthesis and applications of active methylene compounds.
3.3 Preparation and uses of phosphorous, nitrogen and sulphur ylides - Robinson annulations.
3.4 Uses of the following reagents - DCC, Trimethylsilyliodide, 1, 3 dithiane (Umpolung), diisobutylaluminium hydride (DIBAL), (BBN), Trimethylsilylchloride.

Unit IV: (12 Hours)

4.1 Principles and synthetic process involving phase transfer catalysis - Nitriles from alkyl halides, benzoyl cyanides from benzoyl chlorides.

4.2 Alkyl fluorides from alkyl halides, alcohols from alkyl halides, azides from alkyl halides, sodium alkyl sulphonates from alkyl halides.
4.3 Alkyl nitrates, thiocyanates, cyanates and p-toluenesulphonates from alkyl halides.
4.4 Aryl ethers, thioethers, esterification, diazotransfer by phase transfer catalyst – dihalocarbenes.

Unit V: (12 Hours)

5.1 Transition metal catalysed reactions – Reaction and Mechanism of Heck reaction and Suzuki cross coupling reaction.
5.2 Reaction and mechanism of carboxymethylation, hydro formylation and epoxide - allylic alcohol rearrangement.
5.3 Chemoselectivity –reduction and oxidation-examples, calculation.
Regioselectivity- Birch reduction.
5.4 Stereoselectivity –Principle, diastereoselective reaction – hydroboration (formation of an alcohol).

Reference:

1. J. March - Advanced Organic Chemistry - Wiley Inter Science, 4th Edition, Reprint 2001.
2. P.S. Kalsi – Stereochemistry Conformation and Mechanism, New Age International Publishers ,7Th Edition, 2009.
3. W. Carruthers - Some Modern Methods of Organic Synthesis - Cambridge University Press, 4th Edition, Reprint 2004.
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5. V.K.Ahluwalia - Organic Synthesis: Special Techniques - Narosa publishing House, 2nd Edition, 2005.
6. R.O.C. Norman - Principles of Organic Synthesis - Chapman and Hall, London, 2nd Edition, Reprint 1980.
7. E.S. Gould - Structure and Mechanism - Copyright @ 1959
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9. S.M. Mukherji and S.P. Singh - Organic Reaction Mechanism - Mac Millan India Ltd., Chennai, 3rd Edition, 1990.
10. R.K. Mackie and D.M. Smith - Organic Synthesis - Longman Publication, Reprint 1983.
11. Sanyal S.N.Bharathi Bhawan - Molecular Rearrangements - Bharati Bhawan, Reprint 2003.
12. Stuart Warren, Organic Synthesis, The Disconnection Approach, Wiley India Edition, Reprint 2007.

SEMESTER III

PCCHK19 - MOLECULAR SPECTROSCOPY

Objectives:

- To understand the concepts of spectral techniques and to apply these techniques for the quantitative and structural analysis of organic and inorganic compounds.
- To work out combined spectroscopic problems.

Unit I: (12 Hours)

1.1 Ultra violet spectroscopy - Woodward-Fieser rules for conjugated dienes, polyenes and alpha, beta unsaturated carbonyl compound – the effect of steric hindrance to coplanarity – charge transfer spectral absorption.

1.2 Transitions in transition metal complexes – selection rules for electronic transitions – band widths – nature of electronic transitions in complexes. Auxochrome – types – chromophore concept – types – Applications of UV Spectroscopy

1.3 Applications of IR spectroscopy to identify alkane, alkene, alkyne, aromatic compounds, nitrile and aromatic residues. Identification of alcohols, ethers, phenols, amines and carbonyl compounds such as ketones, aldehydes, esters, amides, acids, hetero aromatic compounds, halogen compounds, sulphur compounds, thiocyanates and isothiocynates, amino acids and amines.

1.4 Metal-ligand stretching vibrations for metal carbonyls, sulphates, thiocyanides, nitro and nitrito complexes.Applications of IR Spectroscopy – quantitative analysis, qualitative analysis, coordination compounds, hydrogen bonding studies, calculation of force constants and determination of aromaticity.

Unit II: (12 Hours)

2.1 Mass spectroscopy –Ionization techniques such as Chemical ionization, Electron ionization, (ESI, FD, FAB, SIMS, MALDI).

2.2 Molecular ions, isotope ions, meta stable peak, secondary ion mass spectroscopy. Nitrogen rule and ring rule, fragment ions of odd and even electron types - rearrangement ions - cleavage patterns – simple and multi center fragmentation -

2.3 Applications of mass spectra to elucidate molecular formula and structure. McLafferty rearrangement- Interpretation of fragmentation pattern of phenols, aldehydes, lactones, nitro compounds, esters, acetals and ketals, hetero aromatic compounds and sulphides.

2.4 Introduction to GC-MS- and its advantages over MS.

Unit III: (12 Hours)

3.1 NMR spectroscopy – introduction – nuclear spin – Larmor frequency, precesssional frequency– relaxation process – chemical shift – shielding constants – ring current and aromaticity – shifts for ^{1}H and ^{13}C.

3.2 Spin-spin interaction – nuclear magnetic double resonance – nuclear overhauser effect (NOE) - applications of ^{1}H NMR, ^{13}C NMR, ^{31}P NMR (HPF_2, H_3PO_2,

H_3PO_3, H_3PO_4 and P_4S_3) , ^{19}F NMR (ClF_3, ClF_5, SF_4 and BrF_5) and their applications to inorganic systems.

3.3 Mossbauer spectroscopy - Mossbauer effect, recoilless emission and absorption, Doppler effect, instrumentation, hyperfine interaction - chemical isomer shift, quadruple interaction and magnetic splitting.

3.4 Interpretation of spectra - bonding and structures of Fe^{2+} and Fe^{3+} compounds, Sn^{2+} and Sn^{4+} compounds and detection of oxidation states and in-equivalent MB atoms, applications of Mossbauer spectroscopy.

Unit IV: (12 Hours)

4.1 ESR – principle, origin of an EPR signal, derivative spectra, g value – factors affecting the magnitude of g values, anisotropy, hyperfine interactions – hyperfine coupling constant, relative intensities of EPR signals, hyperfine splitting in Cu and Mn compounds.

4.2 Interpretation of the spectra of simple carbon centered free radicals, zero field splitting and Kramer's degeneracy; electron delocalization – Mc Connell's equation, line width in solid state EPR, applications.

4.3 Photoelectron spectroscopy – Photo electric effect, UV and X-ray PES, Koopmans' theorem, fine structure in PES, interpretation of photo electron spectra of H_2, N_2, O_2, CO, NO, N_2O, H_2O, azide, HCl and NH_3.

4.4 Electron Spectroscopy for Chemical Analysis – applications of ESCA.

Unit V: (12 Hours)

5.1 Rotational spectroscopy: Classification of molecules, rigid rotor model, selection rules, intensity of spectral lines, effect of isotopic substitution; non rigid rotator, microwave spectra of polyatomic molecules.

5.2 Vibrational spectroscopy: Harmonic oscillator, selection rules, vibrational energy of diatomic molecules, zero point energy, force constant and bond strength; anharmonicity, Morse potential energy diagram, Franck Condon principle, vibrational spectra of poly atomic molecules.

5.3 Vibration-rotation spectroscopy, P, Q, R, branches. Breakdown of Born-Oppenheimer approximation, vibration of polyatomic molecules, normal modes of vibration, overtones, hot bands, Fermi resonance.

5.4 Raman: Classical and quantum theories of Raman effect, pure rotational, vibrational and vibrational-rotational Raman spectra, selection rules, stokes and anti-stokes lines, mutual exclusion principle.

Combined spectroscopic problems (organic and inorganic compounds)

Reference:

1. J. Dyer - Application of Absorption Spectroscopy of Organic Compounds - Prentice Hall of India Pvt. Ltd., New Delhi, 2005.
2. R.M. Silverstein, G.C. Bassler and T.C. Morril - Spectrometric Identification of Organic Compounds - John Wiley and Sons, New York, 6th Edition, 2005.
3. I.L. Finar - Organic Chemistry - Vol. II, ELBS Publication, 5th Edition, 2005.
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5. G.Aruldhas - Molecular Structure and Spectroscopy - Eastern Economy, 2nd Edition.
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7. Dr.H.Kaur – Spectroscopy - Pragati prakashan, Meerut, 2nd Edition, 2005.
8. B.K.Sharma – Spectroscopy - Goel Publishing House, Delhi, 20th Edition, 2008.
9. William Kemp - Organic Spectroscopy - Palgrave Publishers Ltd, New York, Reprint 2005.
10. Dudley H.Williams, Ian Fleming - Spectroscopic Methods in Organic Chemistry - Tata McGraw-Hill, New Delhi, 3rd Reprint 2004.
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12. J. A. Weil and J. R. Bolton - Electron Paramagnetic Resonance: Elementary Theory and Practical Applications - Wiley Inter Science, John Wiley & Sons, Inc., Second Edition, 2007.
13. E. B. Wilson, Jr., J. C. Decius and P. C. Cross - Molecular Vibrations: The Theory of Infrared and Raman Spectra - Dover Publications, 1980.
14. W. Demtroder - Molecular Physics - Wiley-VCH, 2005.

SEMESTER III
PCCHL19 - ELECTRO CHEMISTRY

Objectives:

- To have an in-depth knowledge on the theory of strong electrolytes.
- To learn the principles and techniques involved in polarography and amperometry
- To gain knowledge regarding electrode – electrolytic interface.
- To study the principle and functioning of fuel cells and electrochemical sensors.

Unit I: (12 Hours)

1.1 Activity and activity coefficients, Mean ionic activity and mean ionic activity coefficient, concept of ionic strength.

1.2 Debye Huckel theory of strong electrolytes.

1.3 Determination of activity coefficient by electro chemical method - Derivation of Debye Huckel limiting law, qualitative and quantitative verification, limitation of Debye Huckel limiting law at appreciable concentrations of electrolytes.

1.4 Derivation of Debye Huckel Onsager equation-experimental verification and limitations.

Unit II: (12 Hours)

2.1 Polarography - theory, apparatus, DME, Diffusion, kinetic and catalytic currents, current for reversible and irreversible system, qualitative and quantitative application to inorganic system.

2.2 Amperometric titrations – Theory, apparatus, types of titration curves, successive titrations, indicator electrodes, applications.

2.3 Cyclic Voltammetry - theory, application to inorganic system.

2.4 Potentiometry – Potentiometric titrations, equivalence point potential for Fe^{2+}/Fe^{3+}-MnO_4^-, H^+/Mn^{2+} Systems, determination of concentration of the species at the equivalence point.

Unit III: (12 Hours)

3.1 Electrode-electrolyte interface, adsorption at electrified interface, electrical double layer, electro capillary phenomenon.

3.2 Lipmann equation, structure of double layers - Helmholtz Perrin, Guoy-Chapmann and Stern model of electrical double layers.

3.3 Diffusion – Ficks law of diffusion- Membrane potential.

3.4 Electro kinetic phenomenon- Electroosmosis, Electrophoresis, Sedimentation Potential.

Unit IV: (12 Hours)

4.1 Over potential- mechanism of the hydrogen and oxygen evolution reaction. Rates of simple electrode reactions-elementary electron –electrode process. Butler Volmer equation for single step electron transfer reaction, significance of electron exchange current density and symmetry factor.

4.2 Rates of multistep electrode reactions, Butler –Volmer equation for a multistep reaction. Transfer coefficients and its significance.

4.3 Corrosion and Passivation of metals - Pourbaix diagram and Evan's diagram,

4.4 Electro deposition – principle and applications, electrochemical reactions of technological interest.

Unit V: (12 Hours)

5.1 Fuel cells, efficiency, Types of fuel cells, alkaline fuel cell, phosphoric acid, high temperature, solid polymer electrolyte, kinetics of fuel cell, general development of fuel cell technology

5.2 Electrochemical sensors- ion selective electrodes - Problems with ion selective electrode, chemically modified electrodes – gas sensing electrodes

5.3 Enzyme electrodes, sensors based on modified metal oxide field effect transistors (MOSFET) - The wall jet ring disc electrodes (WJRDE).

Reference:

1. S.Glasstone - Introduction to Electro Chemistry - Affiliated East West Press, New Delhi, 1960.
2. J.O.M.Bockris and A. K. N. Reddy - Electro Chemistry - Volumes 1and 2, Plenum, New York, 1977.
3. Willard, Merritt, Dean and Settle - Instrumental Methods of Analysis - CBS Publications, New Delhi, 6th Edition, 1986.
4. D.A.Skoog - Principles of Instrumental Methods of Analysis - Saunders College Publication, 3rd Edition, 1985.
5. G.D.Christian and J.E.G.Reily, Allegn Becon - Instrumental Analysis - 2nd Edition, 1986.
6. M.S. Yadav - Instrumental Methods of Chemical Analysis - Campus Books International, 2006.
7. B. Viswanathan and M. Aulice Scibioh - Fuel Cells: Principles and Applications - Reprint 2009.

SEMESTER III

PECHE19 - ELECTIVE III A: ANALYTICAL CHEMISTRY

Objectives:

- To study in detail the different types of chromatographic techniques and applications.
- To give an in-depth knowledge on environmental chemistry and its impacts.
- To understand the applications of computers in chemistry.

Unit I: (15 hours)

1.1 Thermal Analysis - Thermo Gravimetric Analysis (TGA)- principle, instrumentation, thermogravimetric curves of $CaC_2O_4H_2O$, $MgCr_2O_4$, Hg_2CrO_4, Ag_2CrO_4, $AgNO_3$ and $Cu(NO_3)_2$, factors affecting TGA and applications.

1.2 Differential Thermal Analysis (DTA) - principle, instrumentation, simultaneous TGA and DTA curves and applications. Differential Scanning Calorimetry (DSC) principle, instrumentation and applications.

1.3 Thermometric titrations - principle, instrumentation and applications.

Unit II: (15 hours)

2.1 Chromatographic Techniques: Gas Chromatography, principle, types, instrumentation with block diagram- carrier gas, sample injection system, column, thermal compartment, detectors, recorder and applications.

2.2 High Pressure Chromatography (HPLC) - principle, characteristics of HPLC, instrumentation, applications, comparison of HPLC with GLC,

2.3 Super Critical Fluid Chromatography (SCFC) – principle, properties, instrumentation, comparison with other types of chromatography, super critical fluid extraction and applications.

Unit III: (15 hours)

3.1 Atomic absorption spectrometry- principle, terms involved, measurement of absorption, instrumentation with block diagram-radiation source, atomization unit, oxidizing agents, burners, monochromators, detectors, amplifier and readout devices.

3.2 Interferences in AAS: spectral, chemical, ionization, dissociation of metal compounds, difference between atomic absorption and emission method, advantages and disadvantages of atomic emission spectroscopy, advantages of AAS over flame emission spectroscopy, Disadvantages of AAS.

3.3 Applications of AAS, some typical analysis like determination of metals in biological systems, lead in petrol. Photo acoustic spectroscopy: principle, instrumentation with block diagram and applications.

Unit IV: (15 hours)

4.1 Computers in Chemistry - introduction to computers - hardware, software and programming languages, C – programming: variables, constant, operators, input and output functions, control statement, loop, Go To statement - functions, arrays and pointers.

4.2 Calculation of pH, solubility product, calculation of bond energy using Born-Lande equation.

4.3 Internet: Introduction to internet service provided in India, terms used in internet, www, http, html, TCP/IP band width, dialup service, ISDN and search engines.

Unit V: (15 hours)

5.1 Environmental Chemistry: Water quality standards - BOD, COD - Analysis of Waste Water and its treatment – salinity of water and its treatment – Reverse Osmosis.

5.2 Toxic Chemicals in environment - Toxicity of Mercury, Lead, Chromium, Arsenic.

5.3 Green chemistry: principle, conditions followed in green synthesis, carbon-carbon bond formation in aldol condensations like silyl enol ethers in aqueous media, solid phase, supercritical water and asymmetric aldol condensation.

Reference:

1. H. Kaur - Instrumental Methods of Chemical Analysis - Pragati Prakashan, Meerut 3rd Edition, 2006.
2. B.K Sharma - Instrumental Methods of Chemical Analysis - Geol Publishing House, Meerut, 2005.
3. Y.Anjaneyulu, K. Chandrasekhar, Valli Manickam - A Textbook of Analytical Chemistry - Pharma Book syndicate, Hyderabad, 2006.
4. V.K Ahluwalia-Strategies for green organic synthesis-Ane Books pvt.Ltd, New Delhi, 2012.
4. Willard Merritt, Dean Settle - Instrumental Methods of Analysis - CBS Publishers and Distributors, New Delhi, 6th Edition. 1986.
5. Skoog, Holler, Nieman - Principles of Instrumental Analysis - Thomson Books, United Kingdom, 5th Edition, 2005.
6. Skoog, West, Holler, Rouch - Fundamentals of Analytical Chemistry - Brooks/ Cole Cengage Learning, 8th Edition, Fourth Indian Reprint, 2008.
7. Jag Mohan - Organic Analytical Chemistry Theory and Practice - Narosa Publishing House, New Delhi, 2008.
8. A.K De - Environmental Chemistry - New Age International Publishers, New Delhi, 7th Edition, 2010.
9. G.S Sodhi - Fundamental Concept of Environmental Chemistry - Narosa Publishing House, 2nd Edition, New Delhi, 2005.
10. S. S. Dara - A Textbook of Environmental Chemistry and Pollution Control - S. Chand and Company Ltd., New Delhi, 2004.
11. S.M. Khopkar - Basic Concept of Analytical Chemistry - New Age International (P) Ltd. Publishers, New Delhi, 2nd Edition, 2000.
12. G.I. David Krupadanan, D. Vijaya Prasad, K. Varaprasad Rao, K.L.N. Reddy, C. Sudhakar - Analytical Chemistry - University Press, Hyderabad, Andarapradesh, 2001.
13. K.V. Raman - Computers in Chemistry - Tata McGraw Hill, New Delhi, 1993.
14. Krishnan Kannan - Environmental Chemistry - Chand and Co. Ltd., 1995
15. M.S. Yadav - Instrumental Methods of Chemical Analysis - Campus Books International, 2006.

SEMESTER III

PICHE19 - INDEPENDENT ELECTIVE III A: CSIR NET PREPARATORY COURSE IN ORGANIC CHEMISTRY

Learning Outcomes:

- Upon studying this paper, the students will be able to answer the CSIR-NET questions in Organic Chemistry.

Unit I

1.1 IUPAC nomenclature of organic molecules including regio-and stereoisomers.
1.2 Principles of stereochemistry: Configurational and conformational isomerism in acyclic and cyclic compounds.
1.3 Stereogenicity, stereoselectivity, enantioselectivity, diastereoselectivity and asymmetric induction.
1.4 Aromaticity: Benzenoid and non-benzenoid compounds–generation and reactions.

Unit II

2.1 Organic reactive intermediates: Generation, stability and reactivity of carbocations, carbanions, free radicals, radical anions, radical cations, carbenes, benzynes and nitrenes.
2.2 Organic reaction mechanisms involving addition, elimination and substitution reactions with electrophilic, nucleophilic or radical species.
2.3 Determination of reaction pathways.
2.4 Common named reactions(C-C and C=C formation) and rearrangements (anionotropic, cationotropic, intermolecular and intramolecular) - applications in organic synthesis.

Unit III

3.1 Organic transformations and reagents: Functional group interconversion including oxidations and reductions; common catalysts and reagents (organic, inorganic, organometallic and enzymatic).
3.2 Chemo, regio and stereoselective transformations. (CAN, Grignard reagent, Gilmann reagent, PCC, DCC, 9BBN, BBQ and other reagents)
3.3 Concepts in organic synthesis: Retrosynthesis, disconnection, synthons, linear and convergent synthesis, umpolung of reactivity and protecting groups.
3.4 Asymmetric synthesis: Chiral auxiliaries, methods of asymmetric induction - substrate, reagent and catalyst controlled reactions; determination of enantiomeric and diastereomeric excess; enantio-discrimination. Resolution – optical and kinetic.

Unit IV

4.1.Pericyclic reactions –electrocyclisation, cycloaddition, sigmatropic rearrangements and other related concerted reactions.
4.2 Principles and applications of photochemical reactions in organic chemistry.

4.3 Synthesis and reactivity of common heterocyclic compounds containing one or two heteroatoms (O, N, S) – oxirane, azirane, aziridine,
4.4 Thioepoxides, pyrrole, furan, thiophene, pyridine, pyran.

Unit V

5.1 Chemistry of natural products: Carbohydrates, proteins and peptides, fatty acids.
5.2 Nucleic acids, terpenes, steroids and alkaloids.
5.3 Biogenesis of terpenoids and alkaloids.
5.4 Structure determination of organic compounds by IR, UV-Vis, ^{1}H and ^{13}C NMR and Mass spectroscopic techniques.

References:

1. B.S. Bahl and Arun Bahl, Advanced Organic Chemistry, Sultan Chand &Co., Reprint 2008.
2. K.S.Tewari, S.N.Mehrotra,N.K.Vishnoi, A Text book of Organic Chemistry, 2nd Edition, Vikas Publishing House, 2001.
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5. Jerry March, Reaction, Mechanism and Structure, 4th Edition, John Wiley and Sons, 1992.
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7. P.L.Soni, Text book of Organic Chemistry, 25th Edition, Sultan and Chand, 1992.
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10. M.K. Jain and S.C.Sharma, Modern Organic Chemistry, 1st Edition, S. Chand & Co 2004.
11. Gurdeep R. Chatwaal, Reaction Mechanism and Reagents in Organic Chemistry, 4th Edition, Himalaya Publishing House, 2005.
12. O.P Agarwal, Organic Chemistry-Reactions and Reagents, 24th Edition, GOEL Publishing House, 1996.
13. David L. Nelson and Michael M. Cox, Lehninge Principles of Biochemistry, 3rd Edition, Macmillan Worth Publishers, 2002.
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15. O.P.Agarwal, Chemistry of Natural Products Vol I, 26th Edition, Goel Publication House, 2000.
16. O.P.Agarwal, Chemistry of Natural Products Vol II, 24th Edition, Goel Publication House, 2001.
17. Gurdeep Chatwal, Organic Chemistry of Natural Products, Vol. I, Himalaya Publishing House, Reprint, 2003.
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PICHF19 - INDEPENDENT ELECTIVE III B FORENSIC CHEMISTRY

Objectives:

- To impart knowledge on the principles and practical applications of various immunochemical and forensic analysis.
- Students will understand and perform forensic analysis using physical, biochemical and instrumental methods of analysis.

Unit I:

1.1 History of development of Forensic Science in India - Historical aspects of forensic science.
1.2 Definitions and Concepts of Forensic Science.
1.3 Functions of Forensic Science, Scope of Forensic Science, Need of Forensic Frye Case and Daubert Standard.

Unit II:

2.1 Forensic Toxicology – Classification of Poisons on the basis of Physical states Corrosive, analgesic, irritant, hypnotic, tranquilizer, narcotic, stimulants, paralytic, antihistamine - mode of action and chemical properties with examples for each type.
2.2 Domestic and Industrial Food Poisoning – mode of action and chemical properties with examples for each type.
2.3 Study of Common Poisons – signs and symptoms of As, Pb, Hg, and cyanide poisoning.

Unit III:

3.1 Analytical Chemistry in Forensic Science – Analysis of Biological stains and materials including Blood, Semen and Saliva (Qualitative and Quantitative).
3.2.Isolation, sample preparation, identification and determination of the following:
a) Narcotics – Heroin, Morphine and Cocaine, b) Stimulants – Amphetamines and Caffeine, c) Depressants – Benzodiazepines, Barbiturates and Mandrax and d) Hallucinogens - LSD and Cannabis

Unit IV:

4.1 Physical and Chemical methods of analysis in Forensic Science – Basic Principles of Non- destructive testing probes including Radiography, Xera – radiography, surface penetration methods (SEM and Laser probes).
4.2 Lie Detection – Introduction, process, merits and demerits.
4.3 Chemical analysis of Forensic samples - Atomic absorption spectroscopy, GC-MS, FT-IR, UV-Visible spectroscopy.

Unit V:

5.1 Fingerprints –Definition, Characteristics of fingerprints, Classification of fingerprints – Plain and Rolled.

5.2 Chemical methods of developing fingerprints, biological basis of fingerprints, formation of ridges.

5.3 Application of light source in fingerprint detection, Latent fingerprints detection by physical and chemical methods – Alternate light source method and chemical developer method.

References:

1. B.B.Nanda and R.K.Tiwari, Forensic Science in India: A vision for 21st Century, Select Publishers, New Delhi (2001).
2. S.H.James and J.J.Nordby, Forensic Science: An introduction to Scientific and Investigative techniques, 2nd edition, CRC Press, Boca Raton (2005).
3. Thomas J. Kennedy Donnell R. Christian Jr., Basic Principles of Forensic Chemistry, and Publisher: Humana Press; 2012 edition (2014), ISBN-13: 978-1627038928
4. A Lucas,Forensic Chemistry, Publisher: Forgotten Books (2017), ISBN-13: 978-1330672037
5. Udai Arvind, Textbook of forensic Chemistry, Hardcover, Publisher: Centrum Press. (2014), ISBN13: 978-9350843031

PICHG19 - INDEPENDENT ELECTIVE III C: RESEARCH METHODOLOGY

Learning Outcomes:

- To know the purpose and importance of research.
- To gain information about the various sources of literature.
- To learn the scientific method of collecting data and to compute statistical parameters to arrive at meaningful conclusions.
- To emphasize the importance of ethics in research and chemical safety.

Unit I

1.1 Scope of research - Research Methodology – definition of research, purpose of research. Types of research – descriptive vs analytical, applied vs fundamental, quantitative vs qualitative and conceptual vs empirical and other types of research.
1.2 Research design - planning of research, selection of a problem for research, research process – steps involved.

Unit II

2.1 Literature search techniques -Sources of information, need for reviewing literature, primary, secondary and tertiary sources - journals, E-journals, journal access, journal abbreviations, chemical abstracts, Beilstein, reviews, monographs, dictionaries, text books, UGC infonet, E-books.
2.2 Search engines- Google scholar, chemical industry, Wiki-databases, chemSpider, Science Direct, SciFinder, Scopus, orbit.com and Thomson innovations.
2.3 Indices - subject index, substance index, author index, formula index and other indices with examples, searches through structure, knowledge of national and international journals, Impact Factor, Citation-Index, h Index, I-index, SCI Journals.

Unit III

3.1 Data Analysis - errors in chemical analysis, types of errors, precision and accuracy, significant figures, measures of central tendency - arithmetic mean, median, mode.
3.2 Methods of dispersion - standard deviation, co-efficient of variation (discrete series and continuous series).
3.3 Comparison of results – t- test, F- test and chi square test.
3.4 Correlation – coefficient of correlation, linear regression – coefficient of regression, multiple linear regression.

Unit IV

4.1 Research Ethics – honesty, intellectual ownership - copy right, royalty, intellectual property rights and patent law.
4.2 Plagiarism - responsibility, reproduction of published material and accountability of the researcher, situation that raise ethical issues, freedom and privacy from coercion.

4.3 Ethics in relation to other people, role of research participant. Softwares for detecting plagiarism.

Unit V

5.1 Concepts of chemical safety: Chemical safety and ethical handling of chemicals, safe working procedure and protective environment.
5.2 Emergency procedure and first aid, laboratory ventilation, safe storage and handling of hazardous chemicals, procedure for working with substances that pose hazards, flammable or explosive hazards.
5.3 Procedures for working with gases at pressures above or below atmosphere.
5.4 Safe storage and disposal of waste chemicals, recovery, recycling and reuse of laboratory chemicals.

References:

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical statistics, Sultan Chand & Sons, New Delhi,2017.
2. G.W. Snedecor and W.G. Cochran, Statistical Methods, Lowa state University Press,8th edition, 1989.
3. R. PanneerSelvam, Research Methodology, 2nd edition, 2014.
4. S.P.Satarkar, Intellectual property rights and Copy right,EssEss Publications, 2003.
5. Anthony M Graziano and Michael L Rau, Research Methods: A Process of Inquiry, Prentice Hall, 2006.
6. P. Rajamal and P. Devadoss, A Hand Book of Methodology of Research, R.M.M.Vidya Press, 1976.
7. Paul Oliver, The student's Guide to Research Ethics, Open University Press, 2nd edition, 2010.
8. Loue & Sana, Textbook of Research Ethics Theory and Practice, 2002.

SEMESTER IV

PCCHM19 – NATURAL PRODUCTS AND BIOORGANIC CHEMISTRY

Objectives:

- To impart knowledge on aminoacids, peptides and proteins
- To study in detail the chemistry of nucleic acids and enzymes.

Unit I: (15 Hours)

1.1 Synthesis and reactions of Imidazole, Oxazole, thiazole.
1.2 Pigments –Synthesis and reactions of Flavones, isoflavones, Anthocyanins, Nucleic acids – Synthesis and reactions of pyrimidines (cytosine and uracil only) and purines (adenines, guanine only).
1.3 Vitamins- Synthesis of Vitamin A (Reformatsky and Wittig reaction methods only), Synthesis of Vitamin B_1 – Thiamine.
1.4 Alkaloids- Total synthesis of Morphine, Quinine and Papaverine.

Unit II: (15 Hours)

2.1 Lipids- Classification- Chemical Properties- Saponification, rancidity, oxidation, hydrogenation, dehydration and halogenations reactions – Iodine number, Saponification number, Acetyl number.
2.2 Synthesis and degradation of neutral lipids - Metabolism of lipids-Beta oxidation of fatty acids- Biosynthesis of fatty acids.
2.3 Metabolism of cholesterol, Biosynthesis of Cholesterol.
2.4 Biosynthesis of Steroid harmones -Conversion of Cholesterol to Progesterone, Oestrone and Testosterone.

Unit III: (15 Hours)

3.1 Amino acids-Metabolism of Amino acids-Oxidative deamination, Transamination reactions and Urea cycle.
3.2 Peptides- Synthesis of tripeptide- Solid phase peptide synthesis -Merrifield Synthesis.
3.3 Separation and purification of proteins-dialysis, gel filtration-electrophoresis Structural aspects of proteins- Determination of tertiary structure of proteins- Biosynthesis of proteins.
3.4 Biosynthesis of aminoacids -Phenyl alanine, Tyrosine and 3,4 Proline only.

Unit IV: (15 Hours)

4.1 Nucleic acids- Introduction- Types of nucleic acids- Structure of nucleosides and nucleotides - DNA and RNA-polynucleotide chain – Structural features of DNA and RNA- Watson-Crick Model.
4.2 Chemical and Enzymatic hydrolysis of Nucleic acids – DNA sequence determination by chemical and enzymatic methods.
4.3 DNA metabolism- Replication- Transcription and Translation.
4.4 Genetic code – Origin- Salient features, Wobble hypothesis- Gene mutation.

Unit V: (15 Hours)

5.1 Enzyme Chemistry- Enzyme mechanism of alpha chymotrypsin.
5.2 Immobilised enzyme technology- Enzymes in synthetic organic chemistry.
5.3 Coenzyme chemistry - Prosthetic groups, apo enzymes, structure, biological function and mechanism of reactions catalysed by coenzyme A, thiamine pyrophosphate, pyridoxal phosphate.
5.4 Structure and Biological functions of NAD^+, NADP, FAD, Lipoic acid and Vitamin B_{12}.

Reference:

1. I.L. Finar - Organic Chemistry - Vol. II, ELBS Publication, 5th Edition, 2005.
2. Raj K Bansal - Heterocyclic Chemistry - New Age International, 3rd Edition, Reprint 2005.
3. Nelson and Cox (Lehninger) - Principles of Biochemistry - Freeman and Company, 4th Edition, 2005.
4. Harper's Illustrated Biochemistry, Robert K. Murray, Granner, Mayes, Rodwell, McGraw Hill, 6th Edition, 2003.
5. Lippincott's Illustrated Reviews Biochemistry, Champe and Harvey, Lippincott Williams, Willkins, 3rd Edition, 2005.
6. U. Satyanarayana and Chakrapani - Fundamentals of Biochemistry - Uppala Author (P) Ltd, Reprint 2008.
7. Dr. R. Hannah Sulochana - Principles of Biochemistry - PBS private limited Chennai, 1stEdition 2010.
8. A C Deb – Fundamentals of Biochemistry – New Central Book Agency (P) Ltd, 10th Edition, 2011.
9. Hermann Dugas – Bioorganic chemistry – A Chemical approach to Enzyme action – Springer 3 rd Edition, Reprint 2007.
10. P.S. Kalsi and Sangeeta Jagtap, Pharmaaceutical, Medicinal and Natural Product Chemistry, Narosa Publishing House, New Delhi, 2013.
11. Gurdeep R. Chatwal – Organic Chemistry of Natural Products (Vol I & II) – Himalaya Publishing House, Mumbai, 1st Edition, Reprint 2003.
12. R.C. Dubey and D.K. Maheshwari –A Textbook of Microbiology, S. Chand and Company, Ltd., Revised Edition, 2010.

SEMESTER IV

PCCHN19 - SOLID STATE CHEMISTRY AND NUCLEAR CHEMISTRY

Objectives:

- To know about the structure and properties of solids.
- To gain knowledge on nuclear chemistry and nuclear reactors.

Unit I: (15 Hours)

1.1 Structure of solids- Comparison of X-ray and Neutron diffraction.
1.2 Structure of Pervoskite, Cadmium iodide, Nickel arsenide, Spinels and inverse spinels.
1.3 Hall effect and its applications, Pyroelectricity, piezo electricity and ferro electricity.
1.4 Magnetic properties of solids- Hysteresis loss and loops.
1.5 Types of magnetic behaviour- Dia, Para, Ferro, Anti Ferro, Ferri magnetism- Ferrites, Garnets.

Unit II: (15 Hours)

2.1 Optical properties of solids (Luminescence and Phosphors), Lasers (Ruby laser, Neodynium laser).
2.2 Solid state electrolyte-β-alumina-application of solid state electrolytes.
2.3 Solid-state reactions-Formation of spinel ($MgAl_2O_4$), co-precipitation and sol-gel method ($LiNbO_3$, Silica).
2.4 Diffusion, Diffusion co-efficient, Diffusion mechanisms- Vacancy and interstitial diffusion.
2.5 Growing single crystals- crystal growth from solution, growth from melt and chemical vapour deposition technique.

Unit III: (15 Hours)

3.1 The Quark theory-Quarks-classification, mass and charge, quark-quark gluon interaction.
3.2 The magnetic properties of the Nucleus-Bohr magneton, Nuclear magneton, the neutron magnetic moment and the structure of the nucleon.
3.3 The net magnetic moments of the nuclei -the spin I, the magnetic moment μ_I and Nordheim rules.
3.4 Salient feature of the Liquid drop model with derivations, Fermi –Gas model, Collective model.
3.5 Nuclear reaction cross-section, Q value, Threshold energy and compound nucleus theory

Unit IV: (15 Hours)

4.1 Bethe's Notation, Types of nuclear reactions- Direct reactions, Photonuclear and thermo nuclear reactions.
4.2 Modes of radioactive decay, nuclear isomerism and isomeric transition, Internal Conversion.

4.3 Stellar energy, the nucleosynthesis of light and heavy elements, Hydrogen burning, Carbon burning, the e, s, r, p and x processes.
4.4 Separation of isotopes- Boron isotope-isotope exchange and laser irradiation, Uranium isotope -ultracentrifugation and laser irradiation.
4.5 Analytical applications of Radioisotopes as traces-Isotope dilution analysis and neutron activation analysis, Age determination by tritium and carbon-14 content.

Unit V: (15 Hours)

5.1 Hot atom Chemistry and chemical effect of radioactive decay.
5.2 Fast breeder reactors- Reprocessing of spent fuels: Recovery of Uranium and Plutonium.
5.3 Detectors: Cloud chamber, Bubble chamber, Geiger-Muller counter, Scintillation and Cherenkov counters.
5.4 Particle accelerators- Linear accelerators, Cyclotron and Synchrotron.
5.5 Nuclear Waste Management-low level, intermediate level, high level wastes and ultimate disposal.

Reference:

1. A.R. West, Solid State Chemistry and Its Application, John Wiley, Reprint 2011.

2. Smart & Moore, An Introduction to Solid State Chemistry, Chapmann& Hall, 2nd Edition, Reprint 2004.

3. D.K. Chakrabarty, Solid state Chemistry, New Age International, Reprint 2017.

4. Glen E. Rodgers, Inorganic and solid state, Brooks/Cole Cengage Learning Publication, First Indian Reprint 2009.

5. U.N. Dash, Nuclear Chemistry, Sulthan Chand and Son Publication, First edition 1991.

6. H.J.Arnikar, Essentials of Nuclear Chemistry, New Age International, Reprint 2011.

7. R.K.Dave, Nuclear Chemistry, Campus Book International, 2006.

8. Maheshwar Sharon, Madhuri Sharon, Nuclear Chemisty, Anne Books Pvt Ltd, 2009.

SEMESTER IV

PCCHO19 – THERMODYNAMICS

Objectives:

- To give an in-depth knowledge on thermodynamics.
- To understand the concepts of statistical thermodynamics
- To give insight into the applications of the M-B, B-E and F-D statistics.
- To gain knowledge on the Irreversible Thermodynamics.

Unit I: (15 Hours)

1.1 Partial molar properties - Partial molar free energy - Partial molar volume and Partial molar heat content-their significance and determination of these quantities - Determination of partial molar properties.

1.2 Chemical potential - Variation of chemical potential with temperature and pressure, Duhem Margules equation. Free energy – standard free energy - determination of standard free energies from entropy values, equilibrium constant and ionization method.

1.3 Fugacity and Activity – Definition of fugacity, Variation of fugacity with temperature and pressure, Concept of activity and activity co-efficient - determination of activity and activity co-efficient of non-electrolytes by Henry's Distribution law and vapor pressure measurements, Choice of standard states.

Unit II: (15 Hours)

2.1 Thermodynamic and mathematical probability - Sterling approximation-Lagrange's method of indeterminate multipliers - Distribution and most probable distributions, distinguishable and indistinguishable particles.

2.2 Statistical mechanics - Maxwell-Boltzmann, Bose-Einstein and Fermi Dirac distribution laws – derivation and applications, Comparison of the distribution laws.

2.3 Relation between partition and thermodynamic functions.

2.4 Different types of ensembles and Ensemble averaging.

Unit III: (15 Hours)

3.1 Partition function - Factorization of molecular partition function, partition functions for Mixture of gases.

3.2 Evaluation of the independent molecular partition function - Translational, Rotational, Vibrational, Electronic and Nuclear partition function - Law of equi partition of energies.

3.3 Heat capacity of solids – Specific heat capacity of solids, determination of heat capacity of solids at low temperature - Einstein model and Debye model.

Unit IV: (15 Hours)

4.1 Nuclear spin statistics – ortho - para nuclear states – ortho - para hydrogen, nuclear spin statistics of Deuterium.
4.2 Investigation on system containing Indistinguishable particles - Electron in metals, Black body radiation - Planck's distribution law, Stefan-Boltzmann law, Wein's law.
4.3 Application of statistical thermodynamics –Uses of spectroscopic and structural data to calculate thermodynamic functions.

Unit V: (15 Hours)

5.1 Non equilibrium thermodynamics: Irreversible thermodynamics - Postulates of non equilibrium thermodynamics - conservation of mass and energy.
5.2 Entropy production - entropy production in chemical reactions - entropy flow in open systems.
5.3 Flux and Force - Transformation properties of rates and affinities - linear laws relative to fluxes and forces - Onsager's reciprocity relation, Curie's theorem, Relaxation phenomenon.

Reference:

1. B.G.Kyle - Chemical and Process Thermodynamics - Prentice Hall of India, 3rd Edition, 2004.
2. Samuel Glasstone - Thermodynamics for Chemistry - East and West Press, 10th Edition, 2002.
3. M.C.Gupta - Statistical Thermodynamics - New Age International, 2nd Edition, 2003.
4. R.C.Srivatsava, Subit K. Saha, Abhay K. Jain - Thermodynamics: A Core Course -PHC Pvt. Ltd., 2nd Edition, 2005.
5. Rajaram Kuriacose – Thermodynamics - Shoban Lal & Co, 3rd Edition, 1999.
6. Evelyn Guha - Basic Thermodynamics - Narosa Publishing House, 1st Edition, 2000.
7. P.C.Rakshit – Thermodynamics - The New Book Stall, 4th Edition, 1983.
8. Y.V.C Rao - An Introduction to Thermodynamics - New Age International Pvt. Ltd., 1st Edition, 1993.
9. Sears Salinger - Thermodynamics, Kinetic Theory and Statistical Thermodynamics - Narosa Publishing House, 3rd Edition 1975.
10. R.P.Rastogi and R.R.Misra - An Introduction to Chemical Thermodynamics – Vikas Publishing House Pvt. Ltd., 1995, Reprint 2007.
11. K.L.Kapoor – A textbook of Physical Chemistry Dynamics of Chemical Reactions, Statistical Thermodynamics, Macromolecules and Irreversible Processes, McGraw Hill Education, 2017.

SEMESTER IV

PECHG19 – ELECTIVE IV A:

ORGANOMETALLIC AND BIO INORGANIC CHEMISTRY

Objectives:

- To expose the students to the principles and reactions involved in Organo Metallic Chemistry.
- To understand the role of catalysts in different types of reactions.
- To have a clear understanding on bioinorganic compounds.

Unit I: (15 Hours)

1.1 Introduction-18 electron rule and EAN rule – calculation, hapacity- definition.
1.2 Metal carbonyl complexes and poly nuclear carbonyl complexes-- Preparation and properties, Structure and Bonding.
1.3 Carbonylate ion, Carbonyl hydride complex- Preparation and properties, Structure and Bonding.
1.4 Nitrosyl complex, Metal alkyls - Preparation and properties, Structure and Bonding.
1.5 Carbenes, Carbynes and carbides, non-aromatic alkenes and alkyne complex, metallocenes - Preparation and properties, Structure and Bonding.

Unit II: (15 Hours)

2.1 Addition reactions-1,2 Addition to double bonds, Carbonylation and decarbonylation.
2.2 Oxidative addition reactions, Reductive elimination reactions.
2.3 Substitution reactions of octahedral complexes and their mechanisms.
2.4 Insertion reaction, Rearrangement reactions of aluminium and tin compounds and their mechanism.
2.5 Fluxional Isomerism- Definition, examples and mechanism.

Unit III: (15 Hours)

3.1 Hydrogenation of olefins (Wilkinson's catalyst), Modification of the original catalyst. 3.2 Hydroformylation of olefins using cobalt and rhodium catalyst (oxo process).
3.2 Oxidation of olefins to aldehydes and ketones (Wacker process).
3.3 Cyclo oligomerisation of acetylene using Nickel catalyst (Reppe's catalyst), Olefin isomerisation and its mechanism.
3.4 Olefin metathesis and Polymer bound catalyst.

Unit IV: (15 Hours)

4.1 Metallo porphyrin and respiration (cytochromes).
4.2 Interaction between heme and dioxygen - Structure and function of haemoglobin
4.3 Ferredoxin and Rubredoxin, Blue copper protein.
4.4 Ion transport in membranes, Na, K balance, calcium in living cells (transport and regulation) selectivity of Ca^{2+} over Mg^{2+}.
4.5 Nitrogen fixation- atmospheric, industrial and biological.

Unit V: (15 Hours)

5.1 Biological role of metalloenzymes - carboxy peptidases, carbonic anhydrase-catalase, peroxidase, oxatransferase enzymes, xanthine oxidase.
5.2 Metals used for diagnosis and chemotherapy with particular reference to anticancer drugs (platinum ammine halides, metallocenes and their halides).

Reference:

1. K.F. Purcell and J.C. Kotz - Inorganic Chemistry - W.B. Saunders Co., 1977.
2. J. Huheey - Inorganic Chemistry - Harper and Collins, NY, 4^{th} Edition, 1993.
3. FA Cotton and G Wilkinson - Advanced Inorganic Chemistry - John Wiley and Sons, 5^{th} Edition, 1988.
4. F. Basolo and RG Pearson - Mechanism of Inorganic Reactions - Wiley, 1967.
5. Asim K. Das, Bioinorganic Chemistry, Books and Allied Ltd, 2013.
6. R. Gopalan, Concise Coordination Chemistry, Vikas Publishing House Pvt Ltd, Reprint 2008.

SEMESTER IV

PCCHP19 - PRACTICAL IV: ORGANIC CHEMISTRY - II

Estimations

1. Estimation of aniline
2. Estimation of phenol
3. Estimation of ethyl methyl ketone
4. Estimation of glucose (Bertrand's methods)
5. Estimation of glycine
6. Saponification value of an oil
7. *Estimation of an amide

Preparations

1. Benzanilide from benzophenone
2. m-nitrobenzoic acid from methyl benzoate
3. m-nitrobenzoic acid from benzaldehyde
4. 2,4-dinitrophenylhydrazine from chlorobenzene
5. Acetyl Salicylic acid from methyl salicylate
6. Benzilic acid from Benzoin

*** Chromatographic Separations**

1) Column Chromatography- Separation of dyes
2) Paper Chromatography- Separation of mixture of amino acids
3) Thin Layer Chromatography- Separation of mixture of amino acids

Interpretation of organic spectra of 10 compounds

*** Not to be given for examination**

Reference:

1. Mann and Saunders - Laboratory Manual of Organic Chemistry - 4th Edition, 1983.
2. Arthur I. Vogel - A Textbook of Practical Organic Chemistry - 5th Edition, 1989.
3. Raj K. Bansal - Laboratory Manual of Organic Chemistry - Wiley Eastern Limited, New Delhi, 1980.
4. Gnanaprakasam, Ramamurthy - Organic Chemistry Manual - S. Viswanathan Publications, 1996

Continuous Assessment – 40 marks

I C.A. - 50
II C.A. - 50
Average - 25
Performance during regular practicals -10
Regularity in submission of observation note-book and Record – 5

CA Practical Examination Mark Distribution

Spectra - 5 Marks

Record -5 Marks

Viva - 5 Marks

Estimation - 15 Mark

Preparation - 20 Marks

(Stage1 – Quantity-5Marks, Quality – 5 Marks, Stage2- Quantity – 4 Marks, Quality – 4 Marks, Recrystallisation-2Marks)

Semester Practical Examination - 60 Marks

Spectra - 5 marks
Record - 5 marks
Viva - 5 marks
Preparation - 20 marks
Estimation - 25 marks

Quantitative Estimation

Upto 2% - 25 marks
2 - 3% - 20 marks
3- 4% - 15 marks
> 4% - 10 Marks

SEMESTER IV

PCCHQ19 - PRACTICAL V: INORGANIC CHEMISTRY - II

Estimations

1. Estimation of Copper and Nickel
2. Estimation of Copper and Zinc
3. Estimation of Iron and Nickel
4. Estimation of Iron and Magnesium
5. Estimation of Iron and Zinc

Preparations

1. Hexaamminenickel(II) chloride
2. Bis(acetylacetonato)copper(II) complex
3. Hexaamminecobalt(III) chloride
4. Pentamminechlorocobalt(III) chloride
5. Tris(thiourea)copper(I) sulphate
6. Potassium tetrachlorocuprate(II)
7. *Potassium tris(oxalato)aluminate(III) trihydrate

***Analysis of Alloys**

1. Determination of percentage of Copper and Zinc in Brass
2. Determination of percentage of Chromium and Nickel in Stainless Steel

***Analysis of Ores**

1. Determination of percentage of Calcium and Magnesium in Dolomite
2. Determination of percentage of MnO_2 in pyrolusite

Interpretation of spectra for 10 inorganic compounds.

*** Not to be given for examination**

Reference:

1. V. Venkateswaran, R. Veeraswamy, A.R. Kulandaivelu - Basic Principles of Practical Chemistry - Sultan Chand & Sons, Educational Publishers, Reprint 1995.
2. G. Svehila - Vogel's Qualitative Inorganic Analysis - Pearson Publication, 5^{th} Edition**,** Reprint 2004.
3. R. Mukhopadhyay and P. Chatterjee - Advanced Practical Chemistry - Arunabha Sen Books and Allied (P) Ltd., Kolkatta, Third Edition 2007.

Continuous Assessment – 40 marks

I C.A. - 50
II C.A. - 50
Average - 25
Performance during regular practical -10
Regularity in submission of observation note-book and Record – 5

CA Practical Examination Mark Distribution

Spectra	-5 marks
Record	-5 marks
Viva	-5 marks
Preparation	-10 marks (Quantity – 5, Quality – 5)
Quantitative Estimation	-25 marks (Volumetric & Gravimetric - 10 marks + 15 marks)

Semester Practical Examination - 60 Marks

Spectra	-5 marks
Record	-5 marks
Viva-Voce	-5 marks
Preparation	-20 marks (Quantity – 10, Quality – 10)
Quantitative Estimation	-25 marks (Volumetric & Gravimetric - 10 marks + 15 marks)

Gravimetric Estimation		**Volumetric Estimation**	
up to 2%	- 15 marks	up to 1%	- 10 marks
2 - 3%	- 13 marks	1% to 2%	- 8 marks
3- 4%	- 10 marks	2% to 3%	- 5 marks
> 4%	- 7 Marks	>3%	- 4 marks

SEMESTER IV

PCCHR19 – PRACTICAL VI: PHYSICAL CHEMISTRY – II

1. Determination of the strength of given weak acid by titrating potentiometrically with a strong base and determine dissociation constant of the weak acid to 1/4, 1/2 and 3/4 neutralization.

2. Determination of the strength of weak acid by titrating conductometrically against a standard sodium hydroxide solution.

3. Determination of pH values of the given buffer solutions by potentiometric method. You are provided with a buffer of known pH.

4. Determination of the strength of potassium iodide by titrating against standard potassium permanganate potentiometrically.

5. Verify the Onsager equation using the given solution and determine the equivalent conductance at infinite dilution.

6. Determination of the strength of Ferrous Ammonium Sulphate solution by titrating against standard potassium permanganate potentiometrically.

7. Verify the Ostwald's dilution law and determine the dissociation constant of given acid.

8. Determination of the strength of potassium chloride by precipitation titration potentiometrically.

9. Titrate conductometrically the given mixture of strong and weak acid against a standard sodium hydroxide solution and determine the individual strengths of the two acids in the mixture.

10. Determination of the strength of given strong acid by titrating potentiometrically with a strong base.

11. Determination of the strength of mixture of halides (KCl & KI) by precipitation titration potentiometrically.

12. Determination of the strength of given strong acid by titrating conductometrically with a strong base.

13. *Titrate conductometrically the given mixture of HCl, $CH_3COOH$and $CuSO_4$ against NaOH and determine the individual strengths of the mixture.

*** Not to be given for examination.**

Interpretation of Spectra:

Interpretation of simple UV-Visible spectra of simple molecules for the calculation of molecular data and identification of functional groups (5 typical spectra will be provided).

IR and NMR spectral calculations of force constant- identification and interpretation of a spectra (5 each in IR and NMR will be provided).

References:

1. V. Venkateswaran, R. Veeraswamy, A. R. Kulandaivelu - Basic Principles of Practical Physical Chemistry - Sultan Chand and Sons Educational Publishers, Reprint, 1995.
2. V.K. Ahluwalia, Sunita Dhingra Adarsh Gulati - College Practical Chemistry - University Press (India) Private Limited, Reprint 2008.
3. B.Viswanathan, P.S. Raghavan – Practical Physical Chemistry – Viva publishers.
4. Gupta, Renu- Practical Physical Chemistry, New Age International, 2018

Continuous Assessment - 40 Marks

I C.A. - 50
II C.A. - 50
Average - 25
Performance during regular practicals -10
Regularity in submission of observation notebook and Record – 5

CA Practical Examination Mark Distribution

Spectra - 5 Marks
Conductometry - 17.5Marks
Potentiometry - 17.5 Marks
Record - 5 Marks
Viva–Voce - 5 Marks

Semester Practical Examination – 60 Marks

Spectra - 5 Marks
Conductometry - 20 Marks
Potentiometry - 20 Marks
Record -10 Marks
Viva–Voce - 5 Marks

Error:

Upto 10% - 20 Marks
10% to 15% - 15 Marks
15% to 20% - 10 Marks
>20% - 5 Marks

SEMESTER -IV

PICHH19 - INDEPENDENT ELECTIVE IV A: CSIR NET PREPARATORY COURSE IN PHYSICAL CHEMISTRY

Learning Outcomes:

Upon studying this paper, the students will be able to answer the CSIR-NET questions in Physical Chemistry

Unit I

1.1 Basic principles and applications of quantum mechanics – hydrogen atom, angular momentum. Approximation methods- Variation and perturbation methods- Application of variation and perturbation method.
1.2. Basics of atomic structure, electronic configuration, shape of orbitals, hydrogen atom Spectra. Theoretical treatment of atomic structures and chemical bonding.
1.3. Chemical applications of group theory.

Unit II

2.1. Basic principles and application of spectroscopy – rotational, vibrational, electronic, Raman, ESR, NMR.
2.2 Chemical thermodynamics.
2.3. Phase equilibria.

Unit III

3.1. Statistical thermodynamics.
3.2 Chemical equilibria.
3.3. Electrochemistry – Nernst equation, electrode kinetics, electrical double layer, Debye-Hückel theory.

Unit IV

4.1 Chemical kinetics – empirical rate laws, Arrhenius equation, theories of reaction rates, determination of reaction mechanisms, experimental techniques for fast reactions. Concepts of catalysis.
4.2. Polymer chemistry. Molecular weights and their determinations. Kinetics of chain polymerization.
4.3 Solids - structural classification of binary and ternary compounds, diffraction techniques, bonding, thermal, electrical and magnetic properties

Unit V

5.1. Colloids and surface phenomena.
5.2. Data analysis.

References:

1.J.E. Huheey - Inorganic Chemistry, Principles, Structure and Reactivity - Harper Collins, New York, 4th Edition, 1993.

2.F.A. Cotton and G. Wilkinson - Advanced Inorganic Chemistry: A Comprehensive Text - John Wiley and Sons, 5th Edition, 1988.

3.K.F. Purcell and J.C. Kotz - Inorganic Chemistry - WB Saunders Co., USA, 1977.

4.R.G.Frost and Pearson - Kinetics and Mechanism - Wiley, New York, First Reprint 1970.

5.Keith J.Laidler - Chemical Kinetics - Pearson Edition Company Pvt. Ltd., Third Edition, 2005.

6.P.W.Atkins - Physical Chemistry - Oxford University Press, 7th Edition, 2002.

7.J.Rajaram J.C. Kuriacose - Kinetics and Mechanisms of Chemical Transformations: Applications of Femto Chemistry - Mc Millan Publishers India Ltd., Reprint 2009.

8.V.R. Gowarikar, Viswanathan J. Sridhar - Polymer Science - Wiley Eastern, Reprint 2005.

9.F.W. Billmeyer - Textbook of Polymer Science - Wiley Inter Science, 3rd Edition. 2005.

10. K.V.Raman - Group Theory and Its Applications to Chemistry - Tata McGraw Hill Publishing Company Ltd., Reprint 2004.

11. M.S.Gopinathan and V.Ramakrishnan - Group Theory in Chemistry - Vishal Publishing Co., Reprint 2005.

12. F.A.Cotton - Group Theory and Its Applications to Chemistry - John Wiley & Sons (Asia) Pvt. Ltd., Singapore, 2004.

13. A. Salahuddin Kunju and G. Krishnan –Group theory and its Applications in Chemistry –AsokeK. Ghosh, PHI Learning Pvt. Ltd., New Delhi, 2010.

PICHI19 - INDEPENDENT ELECTIVE IV B: ADVANCED INSTRUMENTATION TECHNIQUES

Objectives:

- To study in detail the advanced instrumentation methods including spectroscopic, separation and voltametric techniques.
- To give an in-depth knowledge about the techniques used in monitoring environmental pollution.

Unit I

1.1 NMR: 1D and 2D: Principles, Solid state NMR with examples
1.2 ESR: Basic principles, Experimental conditions
1.3 Mossbauer Spectroscopy: Principle, Preparation of Mossbauer source, hyperfine interactions, Evaluation of Mossbauer spectra, selected applications.

Unit II

2.1 X-ray photoelectron spectroscopy (XPS)
2.2 Auger Electron spectroscopy (AES)
2.3 Scanning tunnelling methods: AFM, STM, STS
2.4 SEM, TEM, STEM: Operating principle, Sample preparation and Imaging modes

Unit III

3.1 Separation methods: HPLC, NP-HPLC, RP-HPLC, HPTLC, Capillary zone electrophoresis (CZE), ICP – Basic principles.
3.2 Hyphenated techniques: LC-MS, GC-MS, ICP-MS, CZE-MS (Capillary zone electrophoresis – MS), SFC-MS (Supercritical fluid chromatography-MS), MALDI, and LASER-MS: principles, instrumentation, applications.

Unit IV

4.1 Voltammetric techniques: Linear Sweep Voltammetry (LSV), Square wave voltammetry (SWV), Anodic stripping voltammetry (ASV) and Differential pulse voltammetry (DPV)
4.2 Cyclic Voltammetry (CV): Basic principles and theory of CV – Important parameters in a Cyclic voltammogram – Applications of CV.
4.3 Fast Scan Cyclic Voltammetry (FSCV)

Unit V

5.1 Air pollution monitoring techniques for Carbon monoxide, Sulphur dioxide, Nitrogen dioxide, Hydrocarbons and Ozone – Continuous monitoring method, Gravitational particulate method and passive monitoring method (diffusion tubes and badges).
5.2 Automated Wet-chemical air analysis
5.3 Water pollution monitoring techniques – Flame photometry, AAS, TDS

Reference:

1. Helmet Gunzler and Alex Williams - Handbook of Analytical techniques – Wiley Interscience, Reprinted in 2014. (Online)
2. Ray F. Egerton - Physical Principles of Electron microscopy: An introduction to TEM, SEM and AEM – Springer, 2005. (Online)
3. R. S. Khandpur - Handbook of Analytical Instruments - McGraw-Hill Education, 2nd Edition, 2006.
4. H. Kaur - Instrumental Methods of Chemical Analysis - Pragati Prakashan, Meerut 3rd Edition, 2006.
5. B.K Sharma - Instrumental Methods of Chemical Analysis - Geol Publishing House, Meerut, 2005.
6. Y.Anjaneyulu, K. Chandrasekhar, Valli Manickam - A Textbook of Analytical Chemistry - Pharma Book syndicate, Hyderabad, 2006.

PICHJ19 - INDEPENDENT ELECTIVE IV C: LEATHER CHEMISTRY

Objectives:

- To highlight the leather tanning processes
- To know the new concepts in leather manufacturing process

Unit-I

1.1 Raw materials, stages in the leather processing.
1.2 Pre-tanning operations- soaking, liming, deliming, bating, pickling, degreasing.
1.3 Tanning process- chrome tanning, vegetable tanning.
1.4 Post -tanning operations-rechroming of wet blue leathers, neutralisation, retanning, dyeing and fatliquoring and finishing.

Unit-II

2.1 Environmental challenges in leather industries.
2.2 Cleaner technology options- curing-air drying, frame drying, freezing, chemical methods, biocides for curing and control drying.
2.3 Desalting, soaking after desalting.
2.4 Liming- advantages of sulphide free unhairing system by using dehairing process, advantages of less sulphide unhairing system, advantages of sulphide lime unhairing system and deliming.

Unit-III

3.1 Chrome tanning, chrome management options- Chrome recovery and reuse- Partial replacement of chrome tanning agent by other tanning agents- High exhaust tanning systems- Closed loop tanning systems.
3.2 Wet finishing operations- Rechroming, Neutralisation, Retanning, Dyeing, Fat liquoring and Finishing.
3.3 Role of surface charge and importance of electrostatic, H-bond, dipole-dipole and hydrophobic interactions.
3.4 Theory of finishing with special emphasis to optical properties of pigments and binders.

Unit-IV

4.1 Mechanism of tanning-transport of tanning materials into pelt.
4.2 Diffusion equilibria and mechanism of vegetable, mineral and combination tannages.
4.3 Role of crosslinking and fibre coating in matrix stability.

Unit-V

5.1 Newer concepts in leather manufacture-process controls and automation.
5.2 Productivity and quality consistency.
5.3 Water management and zero discharge approaches.

References:

1. P.S.Briggs, “Gloving,clothing and special leathers” products Institute, London 1981.
2. J.H.Sharphouse, “Leather Technicians Hand Book”, Leather Producers Association, Northampton NN3 1 JD, Reprinted 1995.
3. O. Flaherty, William T.Roddy and Rbert M. Lollar, “ The Chemistry and Technology of Leather, Vol. I, Preparation for tannages”,E. Robert Krieger Publishing Company, New York, 1978.
5. Bienkiewicz, “Physical Chemistry of Leather Making”, Krieger Publishing Co., Frorida 1982.
6. D. Covington, Tanning Chemistry: The Science of Leather, Royal Society of Chemistry, 2009.

M.Sc. Computer Science
Academic Year 2019 – 2020

Sem	Code	Title	Hours/ Week	Exam Hours		Credits	Marks
				Th	Pr		
I	PCCSA19	Java Programming	5	3	-	5	40+60
	PCCSB19	Data Structures and Algorithms	5	3	-	5	40+60
	PCCSC19	Theory of Computation	5	3	-	5	40+60
	PECSA19	Elective I A: Cryptography and Network Security	5	3	-	5	40+60
	PECSB19	Elective I B: Multimedia Communication					
	PCCSD19	Practical I:Java Programming Lab	5	-	3	3	40+60
	PCCSE19	Practical II:Data Structure and Algorithm Lab	5	-	3	3	40+60
	PICSA19	IEP:Wireless Sensor Networks	-	-	-	2	100
Total						**28**	**700**
				Th	**Pr**		
II	PCCSF19	.Net Framework	5	3	-	5	40+60
	PCCSG19	Open Source Programming	4	3	-	4	40+60
	PCCSH19	Wireless Communications and Networks	5	3	-	5	40+60
	PCCSI19	Distributed and Cloud Computing	4	3	-	4	40+60
	PECSC19	Elective II A:Digital Image Processing	4	3	-	4	40+60
	PECSD19	Elective II B: Embedded System					
	PCCSJ19	Practical III: .Net Programming Lab	3	-	3	2	40+60
	PCCSK19	Practical IV: Open Source Programming Lab	3	-	3	2	40+60
	PNHRA12	Human Rights	2	3	-	2	40+60
	PICSB19	IEP: Steganography And Digital Watermarking	-	-	-	2	100
Total						**32**	**900**

Sem	Code	Title	Hours/ Week	Exam Hours		Credits	Marks
				Th	Pr		
III	PCCSL19	Web Services	5	3	-	5	40+60
	PCCSM19	Soft Computing	5	3	-	4	40+60
	PCCSN19	Principles of Compiler Design	5	3	-	4	40+60
	PECSE19	Elective III A : Internet of Things	5	3	-	4	40+60
	PECSF19	Elective III B:Cyber Security					
	PECSG19	Elective IV A: Big Data Analytics	4	3	-	4	40+60
	PECSH19	Elective IV B:Software Project Management					
	PCCSO19	Practical V: Web Services Lab	3	-	3	2	40+60
	PCCSP19	Practical VI: Mini Project	3	-	3	3	40+60
	PICSC19	IEP: Cloud Solutions With Azure	-	-	-	2	100
Total						**28**	**800**
IV	PCCSQ19	Project Work				10	40+60
Grand Total						**96**	**2500**

SEMESTER I
PCCSA19-JAVA PROGRAMMING

Objective

This paper helps to enhance the knowledge in advanced features of Java and programming skill as per the industry need.

Unit I

Introduction to Java – Features of Java– Constructors - Exception handling: try, catch - Throw and throws – Java AWT.

Unit II

Java Swing: JFC –Features of Swing – Swing Components – Working With Swing – Event Handling Using Swing.

Unit III

JDBC: Introduction- Architecture- JDBC Drivers – Java, Sql Package – Data Manipulation – Data Navigation – JDBC Classes and Interfaces. RMI – Introduction - RMI Architecture – RMI for Distributed Computing – Simple Programs.

Unit IV

Servlets: Background – Life Cycle of Servlets – Servlet Architecture - Servlet API – Javax Servlet Packages – Creating Servlets – Simple Programs.

Unit V

JSP: Introduction and Marketplace – JSP and HTTP – JSP Engines – JSP Works – Anatomy of JSP page -JSP Expressions – Declarations - Accessing a Database from JSP – Inserting Applet into JSP – Spring Boot.

Book for Study

1. Herbert Schildt (2017). The Complete Reference:Java. Tata McGraw Hill Publishing, Eighth edition.
2. Ivan Bayross (2013). Web Enabled Commercial Applications Development using Java. 2-BPB Publications, Second Edition.
3. Phil Hanna (2013). The Complete Reference: JSP 2.0. Tata McGraw Hill Publishing.
4. UttamK.Roy (2017). Advanced Java Programming. Oxford University Press ,Third Edition.

References

1. Jim Keogh (2012). The Complete reference to J2EE. Tata McGraw-Hill.
2. Hall Brown (2011).Core Servlet and JavaServer page. Pearson Education, Second edition.
3. Mike Mcgrath(2012).Java Server Pages in Easy Steps.DreamTech Publications.

SEMESTER I

PCCSB19 - DATA STRUCTURES AND ALGORITHMS

Objective

This paper gives an in-depth discussion of algorithms and computing time analysis.

Unit I

Introduction: Fundamentals of algorithmic problem solving – Asymptotic notations – Mathematical Analysis for Recursive and Non-Recursive Algorithms – External Sorting: k-way Merge Sort – Buffer Handling for Parallel Operation – Quick Sort – Binary Search – Strassen's Matrix Multiplication – Closest Pair and Convex-Hull Problem.

Unit II

Graphs: Graph Terminology – Directed Graphs – Representation of Graphs – Graph Traversal Algorithms – Topological Sorting – Minimum Spanning Trees: Kruskal's Algorithm – Prim's Algorithm – Shortest Path Algorithms: Dijkstra's Algorithm – Bellman-Ford Algorithm – Warshall's Algorithm – Floyd's Algorithm.

Unit III

Trees: Basic Terminology – Types of Trees – Creating a Binary Tree from a General Tree – Traversing a Binary Tree – Efficient Binary Search Trees: Binary Search Trees – Optimal Binary Search Tree (OBST) – AVL Trees – Red Black Trees – Multi-way Search Trees: M-way Search Trees – B-Trees - B+ Trees.

Unit IV

Hashing: Introduction to Static Hashing – Hash Tables – Different Hash Functions – Secure Hash Functions Dynamic Hashing – Priority Queues (Heaps): Binary Heaps – Basic Heap Operations – Applications of Priority Queues – Binomial Heaps Structure and Implementation – Binomial Queue Operations – Comparison between Binary and Binary Heaps.

Unit V

Backtracking: N-Queens problem – Hamiltonian Circuit Problem – Subset-Sum Problem – Branch and Bound – Assignment Problem – Knapsack Problem – Travelling Salesman Problem - P & NP Problems – NP-Complete Problems – Approximation Algorithms for NP-Hard Problems.

Book for Study

1. ReemaThareja, S. Rama Sree (2018). Advanced Data Structure. Oxford University Press.
2. Anany Levitin (2011). Introduction to the Design and Analysis of Algorithms. Edition III, Addison-Wesley.

References

1. J.LalithaVani, T. Priya Radhika Devi (2015). Design and Analysis of Algorithms. First Edition.
2. Thomas H. Carmen, Charles Eric Leiserson, Ronald L. Rivest, Clifford Stein (2009). Introduction to Algorithms. Edition III - MIT Press.

SEMESTER I

PCCSC19 - THEORY OF COMPUTATION

Objectives

- To understand the concepts and operations of matrix algebra needed for computing graphics modeling.
- To understand and apply the class of functions which transform a finite set into another finite set which relates to input output functions in computer science.
- To impart discrete knowledge in computer engineering through finite automata and Context free grammars.

Unit I

Introduction- Propositions and Compound Propositions- Basic Logical Operations – Tautologies and Contradictions – Logical Equivalence – Algebra of Propositions – Conditional and Bi conditional Statements – Argument- Logical Implications- Propositional Functions, Quantifiers- Negation of Quantified Statements- Normal Forms- Predicate Logic.

Unit II

Graph Theory: Introduction, Data Structures- Graphs and Multi graphs- Sub graphs, Isomorphic and Homeomorphic Graphs- Paths, Connectivity- The Bridges of Konigsberg, Traversable Multigraphs- Labeled and Weighted Graphs- Complete, Regular and Bipartite Graphs- Tree Graphs- Planar Graphs-Graph Coloring.

Unit III

Finite Automaton – DFA & NDFA – Finite Automaton with €- moves – Regular Languages- Regular Expression – Equivalence of NFA and DFA – Equivalence of NDFA‟s with and without €-moves – Equivalence of finite Automaton and regular expressions –Minimization of DFA.

Unit IV

Grammar Introduction– Types of Grammar – Context Free Grammars and Languages– Derivations and Languages – Ambiguity- Relationship between derivation and derivation trees – Simplification of CFG – Elimination of Useless symbols – Unit productions – Null productions – Greiback Normal form – Chomsky normal form – Problems related to CNF and GNF.

Unit V

Pushdown Automata- Definitions – Moves – Instantaneous descriptions – Deterministic pushdown automata – Equivalence of Pushdown automata and CFL – pumping lemma for CFL – problems based on pumping Lemma - Design Finite State Machine, Pushdown Automata.

Book for Study

1. Seymour Lipschutz, Marc Las Lipson, Varsha H Patil (2010).Discrete Mathametics. Tata McGraw Hill, Fourth Edition.
2. Hopcroft J.E., Motwani R. and Ullman J.D (2008). Introduction to Automata Theory, Languages and Computations. Pearson Education, Second Edition.

References

1. Kenneth H.Rosen (2002). Discrete Mathematics and Its Applications. Tata McGraw Hill, Fourth Edition.

2. A.Tamilarasi,A.M.Natarajan (2005). Discrete Mathematics and its Application. Khanna Publishers, Second Edition.
3. Mishra K L P and Chandrasekaran N (2004).Theory of Computer Science Automata, Languages and Computation. Prentice Hall of India,Third Edition.
4. Harry R Lewis and Christos H Papadimitriou (2003). Elements of the Theory of Computation. Prentice Hall of India, Pearson Education, New Delhi,Second Edition.

SEMESTER I
PECSA19 - ELECTIVE I A: CRYPTOGRAPHY AND NETWORK SECURITY

Objective

Enable the student to understand the importance of physical security for a network center- describe the encryption technique - various security protection methods- apply audit and trial to ensure transaction security- have the knowledge to design a secure computer network and establish a good security policy in a business environment.

Unit I

Introduction – Classical Encryption techniques: Symmetric Cipher Model – Substitution Techniques – Transposition Techniques – Steganography - Block Ciphers and the Data Encryption Standards: Principles – DES – Strength of DES – Differential and Linear Cryptanalysis – Block Cipher Design principles.

Unit II

Advanced Encryption Standard: Evaluation Criteria for AES – AES cipher – Multiple Encryption and Triple DES – Block Cipher Modes of Operation. Confidentiality Using Symmetric Encryption: Placement of Encryption Function – Traffic Confidentiality – Key Distribution – Random Number Generation.

Unit III

Introduction to Number Theory – Prime numbers – Fermat's and Euler's Theorem – Testing for Primality – The Chinese Remainder Theorem. Public Key Cryptography and RSA: Principles of Public Key Cryptosystems –RSA Algorithm - Elliptical Curve Algorithm - Key Management – Diffie -Hellman Key Exchange – Kerberos.

Unit IV

Message Authentication and Hash functions – Authentication Requirements – Authentication Functions – MAC – Hash Functions – Security of Hash functions and MACs. Digital Signatures and Authentication Protocols: Digital Signatures – Authentication Protocols – Digital Signature Standard.

Unit V

Intruders – Intrusion Detection – Password Management. Malicious Software – Viruses and Related Threats – Virus Countermeasures – Distributed Denial Of Service Attacks. Firewall – Design Principles – Trusted System.

Book for Study

1. William Stallings (2011). Cryptography and Network Security: Principles and Practices. Prentice Hall India,Fifth Edition.

Reference

1. Charlie Kaufman, Radia Perlman and Mike Speciner (2002). Network Security: Private Communication in a Public World, Prentice Hall India, Second Edition.
2. William Stallings (2010). Network Security Essentials: Applications and Standards. PearsonEducationAsia,Third Edition.

SEMESTER I

PECSD19 - ELECTIVE IV B: MULTIMEDIA COMMUNICATION

Objective

- Understanding the Multimedia Communications Systems, Application and Basic Principles.
- Analysis of the Multimedia Streaming.
- Performing and Establishing Multimedia Communication Terminals.
- Presentation of Multimedia Communications.

Unit I

Multimedia communication: Introduction Networks-Multimedia Applications - Multimedia Information representation: Introduction –Principles-text-Image-Audio-video- Broadcast Television – Digital video. Text and Image Compression: Compression principles – Text compression – Image compression. Audio and video compression: Audio compression – Video compression – Principles, H.261, H.263, MPEG, MPEG-1.

Unit II

Standards For Multimedia Communications: Reference Models - Interpersonal Communications. Digital Communication Basis: Transmission Media – Sources Of Signal Impairment – Asynchronous Transmission – Synchronous Transmission – Error Detection Methods. Circuit Switched Networks: Transmission Systems- Analog, PSTN Modems, Digital – Switching Systems –Signal Systems.

Unit III

Enterprise Networks: Introduction- Lans- Ethernet – Token Ring – Bridges – FDDI – High Speed Lans- LAN Protocols. The Internet: IP Datagram- IP Address – ARP And RARP- Routing Algorithms- Static Routing, Flooding, Vector Routing, Shortest Path-ICMP-Ipv6-

Unit IV

Transport Protocols: TCP/IP Protocol Suite- TCP- User Service, Protocol Operations-UDP-User Service, Protocol Operations. Application Support Functions: ASN.1-Security- Data Encryption- Terminology, Basics Techniques- Authentication-Pubic Key Certification Authorities.

Unit V

Internet Applications: DNS-Email –FTP-TFTP-Internet Telephony – SNTP. World Wide Web:Urls And HTTP –HTML-Text, List, Color, Images, Tables, Forms- Java And Java Script- Security- Web Operations.

Books for Study

1. Fred Halsall (2013). Multimedia Communications: Applications, Protocols, and Standards. Pearson Education Asia.

Reference

1. SugataMitra and Gaurav Bhatnagar (2014). Introduction to Multimedia Systems (Communications, Networking and Multimedia).Pearson Publications.
2. Steinmetz (2010). Multimedia: Computing Communications & Applications", Pearson Publications.

SEMESTER I
PCCSD19 - PRACTICAL I: JAVA PROGRAMMING LAB

1. Program using Basic User Interface Components and Layouts
2. Create Payroll Processing form using swing
3. Student Mark Sheet Processing using JDBC
4. Bank Account Processing using JDBC
5. Survey form using applets and JDBC
6. Creating authentication form using servlets
7. Creating survey form using servlets
8. Programs using JSP
    - JSP program that creates a table of power of 2
    - Factorial of a number
9. Registration and Login form using JSP
10. JSP program to process credit card information

SEMESTER I

PCCSE19 - PRACTICAL II: DATA STRUCTURES AND ALGORITHMS LAB

1. Iterative version of Quick sort.
2. Merge sort using Divide and Conquer Technique.
3. Strassen's matrix multiplication using Divide and Conquer Technique.
4. Prim's Algorithm using Greedy Method.
5. Kruskal's Algorithm using Greedy Method.
6. Warshall's Algorithm using Dynamic Programming.
7. Floyd's Algorithm using Dynamic Programming.
8. Knapsack problem using Greedy Method.
9. 8 Queens problem using Backtracking.
10. Recursive Backtracking Algorithm for Sum of Subset Problem.

SEMESTER I

PICSA19 - INDEPENDENT ELECTIVE II: WIRELESS SENSOR NETWORKS

Objective

The wireless sensor network are balancing network energy consumption and extending the entire network lifetime.

Unit I

Introduction-Unique Constraints and Challenges-Advantages-Applications-Collaborative Processing-Key Definitions of Sensor Networks. Canonical Problem: Localization and Tracking- Tracking Scenario-Problem Formulation-Distributed Representation and Inference of States-Tracking Multiple Objects-Sensor Models-Performance Comparison and Metrics.

Unit II

Networking Sensors: Key Assumptions-MAC-General Issues-Geographic, Energy-Aware Routing-Attribute-Based Routing. Infrastructure Establishment: Topology Control-Clustering-Time Synchronization-Localization and Services.

Unit III

Sensor Tasking and Control: Task-Driven Sensing-Roles-Information-Based Sensor-Joint Routing and Information Aggregation. Sensor Network Databases: Sensor Database Challenges-Querying-Query Interfaces-High-Level Database Organization-In-Network Aggregation-Data-Centric Storage-Data Indices and Range Queries-Distributed Hierarchical Aggregation-Temporal Data.

Unit IV

Sensor Network Platforms and Tools: Sensor Node Hardware-Sensor Network Programming Challenges-Node-Level Software Platforms-Node-Level Simulators-Programming beyond Individual Nodes.

Unit V

Application and Future Directions: Emerging Applications-Future Research Directions: Secure Embedded Systems-Programming Models-Management of Collaborative Groups-Lightweight Signal Processing-High-Data-Rate Sensors-Google-Closing the Loop – Distributed Information Architecture.

Book for Study

1. Feng ZHAO and Leonidas GUIBAS (2014). Wireless Sensor Networks, An Information Processing Approach. MK Morgan Kaufmann. First Edition.

Reference

1. C.S. Raghavendra and Krishna M. Sivalingam (2010). Wireless Sensor Networks. BSP Books.
2. Holger Karl and Andreas Willig (2011). Protocols and Architectures for Wireless Sensor Networks. WILLEY Publication.

SEMESTER II

PCCSF19 - .NET FRAMEWORK

Objective

The student will gain knowledge in the concepts of the .NET framework as a whole and the technologies that constitute the framework.The student will gain programming skills in C# both in basic and advanced levels. By building sample applications, the student will get experience and be ready for large - scale projects.

Unit I

Introducing C# - .NET Framework - The C# Language - Namespace - Variables and Data - Operators: Classification of Operators - Expression - Checked and Unchecked Operator - Control Structures - C# Array - ArrayList Class - String - StringBuilder Class - Functions and Methods - Structures.

Unit II

Classes and Objects - Constructor and Destructors - Types of Classes - Various Class Members - Interfaces - Delegates - Events - Inheritance - Access Modifiers - Class Modifiers - Polymorphism - Operator Overloading - Errors and Exceptions - C# Files and IO - C# Collections.

Unit III

ADO.NET: C# Graphical User Interface and Application Development - .Net Environment - User Interface Elements and Control Class Hierarchy in C# - Programming with the Windows Controls - C# MDI Form - Dialog Box - C# ADO.Net: Data Providers - ADO.NET Objects - Data Set - Working with Data.

Unit IV

XML.Net: XML-A Brief Introduction - XML Syntax - Reading and Writing XML Files - Searching XML File using XPATH - XML and ADO.NET for Handling Data - Fundamentals of Web Programming - ASP.NET Life Cycle - ASP.NET Applications and Configuration - Web Forms - SOAP and Web Services - Creating and Consuming Web Service.

Unit V

.Net Assemblies: Integrating Application Files - Security in .NET - Attributes - Reflections - Type Discovery - Remote Programming: C# Remoting Architecture - Domains - Contexts - Proxies - Marshalling and Unmarshalling.

Book for Study

1. AnamitraDeshmukh–Nimbalkar (2018). C# and .Net Programming. Technical Publications. First Edition.
2. Herbert Schildt (2012). The Complete Reference: C# 4.0. Tata McGraw Hill.

References

1. Christian Nageletal (2012). Professional C# 2012 with .NET 4.5. Wiley India.
2. Andrew Troelsen (2010). Pro C# 2010 and the .NET 4 Platform. Fifth Edition.
3. Ian Griffiths- Matthew Adams- Jesse Liberty (2010). Programming C# 4.0. Sixth Edition. O'Reilly.

SEMESTER II

PCCSG19 - OPEN SOURCE PROGRAMMING

Objective

- To understand concepts of Open Source Technology
- To gain knowledge in Linux administration- features and multimedia using Red Hat Linux

Unit I

Installing AndConfiguring PHP: The Basics Of PHP Scripts – The Building Blocks Of PHP: Variables – Data Types – Operators and Expression – Constants. Flow Control Functions inPHP: Switching Flow – Loops – Code Blocks and Browser Output. Working With Functions: Variable Scope – Saving State Between Function Calls With The Static Statement – More About Arguments – Testing for the Existence of a Function. Working With Arrays: Array – Creating Arrays – Some Array-Related Constructs and Functions.

Unit II

Working with objects: creating an object – object inheritance. Working with strings-dates and time – formatting strings with PHP – investigating strings with PHP – manipulating strings with PHP – using date and time functions in PHP – other strings-date and Time functions. Working with Forms : creating a sample input form – accessing form input with User-defines arrays – combing HTML and PHP code on a single page – working with file uploads. Working with Cookies and user sessions – introducing cookies – setting and deleting a cookie with PHP – session function overview – starting a session – working with session variables – destroying sessions and unsetting variables – using sessions in an Environment with registered users.

Unit III

Working with files and Directories: including files – using include_once – validating files – creating and deleting files – opening a file for writing- reading or appending – reading from files – writing or appending to a file – working with directories.Working with images – understanding the image-creation process – necessary modification to PHP – drawing a new image – modifying existing images – image creation from user input – using images created by scripts.

Unit IV

Learning Basics SQL commands: Learning the MySQL data Types – Learning the Table-creation syntax – using DDL and DML – Frequently used string function in MySQL – Using Date and Time Function in MySQL. Interacting with MySQL using PHP: MySQL or MySQLi functions? – Connecting to MySQL with PHP – Working with MySQL data.

Unit V

Case Study: creating a shopping cart mechanism. An overview of Red Hat Linux – What is Linux? – Common Linux features – Primary advantages of Linux. Using Linux commands: The shell Interface – understanding the Red Hat Linux shell – working with the Red Hat Linux file system – Using the vi text Editor.

Book for Study

1. Julie C. Meloni- (2013). PHP- MySQL and Apache. Pearson Education.
2. Christopher Negus (2003).Red Hat Linux 9 Bible. Wiley publishing.
3. Ivan Bayross (2010). Web Enabled Commercial Application Development Using HTML, DHTML Java Script and PHP. BPB Publications. 4th Edition.

References

1. AnBayross (2002).Using Linux- Apache MySQL PHP PERL on Linux-IV BPB publications.
2. Ed Lecky-ThompsonSsteven d. Nowicki- Thomas Myer (2012). Professional PHP6. Wiley India Edition.

SEMESTER II
PCCSH19 - WIRELESS COMMUNICATIONS AND NETWORKS

Objective

To understand the basics of Wireless and Data Communication Technologies.

Unit I

Introduction to Wireless Communications and Networks – Cellular Mobile Wireless Networks: Description of Cellular Systems – Propagation Models for Wireless Networks – Mobile Communication Antennas – Evolution of Modern Mobile Wireless Communication Systems: Personal Area Networks (PAN) – Low-Tier Wireless System – Public Wide-area Wireless Networks – Wireless Local Area Networks (WLANs) – Wireless Technology Divisions – Cellular-WLAN Integration – All-IP Networks: Vision for 4G.

Unit II

Multiple Access Techniques in Wireless Communications: FDMA –TDMA –SDMA – CDMA –GSM: Architecture and Protocols: GSM Network Architecture– GSM Authentication and Security

Unit III

2.5G GPRS: Revisited– GPRS Networks Architecture– Overview of CDMA - CDMA Evolution – CDMA IS-95 Systems – Handoff Process in a CDMA System – 3G- UMTS: UMTS Network Architecture – UMTS Interfaces– UMTS FDD and TDD – UMTS Channels –UMTS Network Protocol.

Unit IV

Overview of Internet Protocol and Mobile Internet Protocol: – TCP –UDP –DNS – Network Address Resolution Protocol – IP Routing Protocols – Basic Mobile IP – Problems and Limitations of MIP – Cellular and WLAN integration – Internetworking Network Integration.

Unit V

Fundamentals of Wireless Local Area Networks: IEEE 802.11 – WLAN Transmission Technology – Spread Spectrum Technology – WLAN System Architecture – IEEE 802.11 Logical Architecture – Collision Sense Multiple Access with Collision Detection: CSMA/CD - Collision Sense Multiple Access with Collision Avoidance: CSMA/CA – MAC Frame Format and Fragmentation – IEEE 802.11 PCF – IEEE 802.11 PHY Layer – 802.11 Systems Performance – Security Issues: Some Basic 802.11 Services – Roaming Handover and Mobility Management for WLAN – WLAN Applications – Overview of WiMAX Technologies:– IEEE 802.16 Standard Architecture.

Book for Study

1. ITI SahaMisra (2013). Wireless Communications and Networks. McGraw Hill Education.

Reference

1. Jochen Schiller (2011). Mobile Communications. PHI/Pearson Education. 2nd Edition.
2. Dharma Prakash Agrawal- Qing-An Zeng (2006). Introduction to Wireless and Mobile SystemsCencage Learning.
3. William Stallings (2002). Wireless Communications and Networks. PHI/ Pearson Education.Second Edition.
4. KavehPahlavan-PrasanthKrishnamoorthy (2003). Principles of Wireless Networks. PHI/ Pearson Education.

SEMESTER II
PCCSI19 - DISTRIBUTED AND CLOUD COMPUTING

Objective

The students will learn about the cloud environment, building software systems and components that scale to millions of users in modern internet, cloud concepts capabilities across the various cloud service models including Iaas, Paas, Saas and developing cloud based software applications on top of cloud platform.

Unit I

Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.

Unit II

Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds – laaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.

Unit III

Parallel and Distributed Programming Paradigms – MapReduce, Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Google App Engine, Amazon AWS - Cloud Software Environments - CloudSim.

Unit IV

Clustering for Massive Parallelism – Computer Clusters and MPP Architectures – Design Principles of Computer Clusters – Cluster Job and Resource Management – Case Studies of Top Supercomputer Systems.

Unit V

Implementation Levels of Virtualization – Virtualization Structures/Tools and Mechanisms – Virtualization of CPU, Memory, and I/O Devices – Virtual Clusters and Resource Management – Virtualization for Data-Center Automation.

Book for Study

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra (2012). Distributed and Cloud Computing, From Parallel Processing to the Internet of Things.Morgan Kaufmann Publishers.
2. Rittinghouse, John W and James F. Ransome (2017) Cloud Computing: Implementation, Management and Security.CRC Press.

References

1. RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi (2013). Mastering Cloud Computing. Tata Mcgraw Hill.
2. Toby Velte, Anthony Velte, Robert Elsenpeter (2009). Cloud Computing – A Practical Approach. Tata Mcgraw Hill.
3. George Reese (2009). Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice). O'Reilly.

SEMESTER II
PECSC19 - ELECTIVE II A: DIGITALIMAGE PROCESSING

Objectives

This syllabus focus on contemporary developments in all mainstream areas of image is processing like image fundamentals, image enhancement in the spatial and frequency domains, restoration, Color image processing.

Unit I

Introduction To Computer Graphics - Video Display Devices- Raster Scan Systems - Random Scan Systems - Interactive Input Devices - Hard Copy Devices - Graphics Software - Output Primitives -Line Drawing Algorithms: DDA Algorithm-InitializingLines - Line Function.

Unit II

Digital Image Processing – Introduction – The Origins of Digital Image Processing – Classification of Digital Images – Image Types - Examples of Fields That Use Digital Image Processing – Fundamental Steps In Digital Image Processing – Components of An Image Processing System.

Unit III

Some Basic Relationship Between Pixels - Intensity Transformation And Spatial Filtering – Background – Some Basic Intensity Transformation Functions –

Histogram Processing – Fundamentals of Special Filtering – Smoothing Spatial Filters – Sharpening Spatial Filters.

Unit IV

ColorImage Processing – ColorFundamentals – ColorModels – PseudocolorImage Processing – Basics of Full-Color Image Processing – ColorTransformation.

Unit V

Region Based Segmentation – Region Growing – Region Splitting and Merging – Segmentation Using Morphological Watersheds – Background – Dam Construction – Watershed Segmentation Algorithm.

Book for Study

1.Rafael C. Gonzalez & Richard E. Woods (2018).Digital Image Processing.Fourth Edition.Pearson Edition.

References

1. Yogesh M. Rajput (Ramesh R. Manza Dnyaneshwari D. Patil (2017). Projects in Digital Image
Processing.Spd Edition.
2. Jayaraman (2012). Digital Image Processing.Tata McGraw-Hill Education.
3. Burger WilhemEt (2010). Al Principles of Digital Image Processing: Fundamental Techniques
springerutics publication.

SEMESTER II
PECSD19 - ELECTIVE II B: EMBEDDED SYSTEMS

Objective

This paper helps the students to develop projects in areas of networking, communication, robotics and real time systems.

Unit I

Introduction to Embedded Systems: Embedded Systems – Processor Embedded into a System – Embedded Hardware and Software – SOC and use of VLSI Circuit design Technology – Complex System Design and Processor - Design Process in Embedded System and Design Examples – Classification of Embedded Systems

Unit II

Devices and Communication Buses for Devices Networks: IO types – Serial Communication Devices – Parallel Devices Port – Interfacing Features in Device Ports – Wireless Devices – Timer and Counting Devices – Watchdog Timer – Real Time Clock - Networked Embedded Systems – Serial Bus Communication Protocols

Unit III

Device Drivers and Interrupts Servicing Mechanism: Programmed-I/O Busy-wait Approach without Interrupt Service Mechanism - ISR - Interrupt Sources - Interrupts Servicing Mechanism – Multiple Interrupts – Context and the Periods for Context Switching, Interrupt Latency and Deadline – Classification of Processors Interrupt Servicing Mechanism from Context Saving Angle

Unit IV

Real Time Operating Systems: OS Services – Process Management – Timer and Event Functions – Memory Management – Device, file and IO Subsystems Management – Interrupt Routines in RTOS Environment and Handling of Interrupts Source Calls – RTOS – Basic Design using RTOS – RTOS Task Designing Models

Unit V

Program Modeling Concepts: Program and DFG Models – State Machine Programming Models – Modeling of Multiprocessor Systems – ADL Modeling – Embedded Software Development Process and Tools: Introduction Embedded Software Development Process and Tools .

Book for Study

1. Raj Kamal (2014). Embedded Systems Architecture, Programming and Design.Tata McGraw Hill Publishing Company Limited. Second Edition.

Reference

1. Julio Sanchez Maria P. Canton (2017).Embedded Systems Circuits and Programming.crc press.
2. Jack Ganssle (2012). The Art of Designing Embedded Systems. Elsevier.Second Edition.
3. David E. Simon (2010). An Embedded Software Primer.Pearson Education.

SEMESTER II
PCCSJ19 - PRACTICAL III: .NET PROGRAMMING LAB

1. Write a Program to accept a String and Convert the Case of the Characters.
2. Write a Program to implement a Calculator with Memory and Recall operations.
3. Develop a menu based .Net application to implement a text editor with Cut- Copy- Paste- Save and Close operations using Master pages.
4. "How is the book ASP.NET with C# by DreamTech?" Give the user three choices: i) Good ii) Satisfactory iii) Bad. Provide a VOTE button. After user votes- present the result in percentage using labels next to the choices.
5. Develop aapplication to perform timer based quiz of 10 questions.
6. Develop a database application to store the details of students using ADO.NET
   a. Develop a database application using ADO.NET to insert- modify- update and delete operations.
   b. Develop a .Net application using Datagrid to display records.
   c. Develop a .Net application using Datagrid to add- edit and modify records. .
7. Create anOnline Shopping web application in ASP.NET.
8. Create an application for Accessing a SQL Database by Using ADO.NET by connecting to the SQL Server database and call a stored procedure. You then display the data in a Repeater control.
9. Develop a web application to read the details of a selected country stored in XML database and display back to the user using Web controls.
10. Write a Program to implement View State and Session State.

SEMESTER II
PCCSK19 - PRACTICAL IV: OPEN SOURCE PROGRAMMING LAB

1. Write a server side PHP program that displays marks- total- grade of a student in tabular format by accepting user inputs for name- number and marks from a HTML form.
2. Write a PHP program implement Simple Calculator Operations.
3. Write a PHP program interface to create a database and to insert a table into it.
   a. Use classes to create a table.
   b. Create a directory- and to read contents from the directory.
4. a. Write a PHP program to display a digital clock which displays the current time of the server.
   b. Write a Program and check message passing mechanism between pages.
5. Create a MYSQL table and execute queries to read- add- remove and modify a record from that table.
6. a. Write a shell script to stimulate the file commands.
   b. Write a shell script program to find out the maximum and minimum number of the given series.
7. a. Write a shell script to show the system configuration.
   b. Write a shell script program to check whether the given string is palindrome or not
8. a. Write a shell script to implement the following: pipes-Redirection and tee commands.
   b. Write a Shell Script program to develop a calculator application.
9. a. Write a shell script to implement the filter commands.
   b. Write a shell script to print the multiplication table of the given argument using for loop.
10. a. Write a shell script to swap two numbers.
    b. Write a shell script to find greatest of given three numbers.

SEMESTER II
PICSB19 - INDEPENDENT ELECTIVE I : STEGANOGRAPHY AND DIGITAL WATERMARKING

Objective

To provide the importance of digital watermarking and Steganography and to know the properties of watermarking and steganography systems. To discuss the different models of watermarking and steganography

Unit I

Information Hiding - Steganography, and Watermarking. History of Watermarking - History of Steganography - Importance of Digital Watermarking - Importance of Steganography

Unit II

Steganographic Communication: The Channel - The BuildingBlocks - Notation and Terminology, Information - Theoretic Foundations of Steganography -Cachin's Definition of Steganographic Security - Practical Steganographic Methods – Statistics Preserving Steganography - Model-Based Steganograpy -Steganalysis Scenarios - Detection, Forensic Steganalysis. The Influence of the Cover Work on Steganalysis - Some Significant Steganalysis Algorithms, LSB Embedding and the Histogram Attack.

Unit III

Properties – Evaluating watermarking systems. Notation – Communications – Communication based models – Geometric models – Mapping messages into message vectors – Error correction coding – Detecting multi-symbol watermarks – Attacks

Unit IV

Communications: Components of Communications Systems - Classes of Transmission Channels - Secure Transmission - Communication-Based Models of Watermarking. Basic Model, Watermarking as Communications with Side Information at the Transmitter - Watermarking as Multiplexed Communications - Geometric Models of Watermarking - Distributions and Regions in Media Space - Marking Spaces -Modeling Watermark Detection by Correlation, Linear Correlation, Normalized Correlation, Correlation Coefficient

Unit V

Applications of Watermarking - Broadcast Monitoring - Copyrights, Proof of Ownership, Transaction Tracking, Content Authentication, Copy Control, Device Control, Legacy Enhancement. Applications of Steganography - Steganography for Dissidents - Steganography for Criminals

Book for Study

1. Ingemar J. Cox, Mathew L. Miler, Jefrey A. Blom, JesicaFridrich, Ton Kalker (2008). Digital Watermarking and Steganography. Morgan Kaufmann Publishers.

Reference

1. Ingemar Cox, Mathew Miler,JefreyBlom,JesicaFridrich and Ton Kalker (2007). Digital Watermarking and Steganography. Morgan Kaufmann Publishers.
2. JesicaFridrich (2010). Steganography in Digital Media: Principles, Algorithms, and Applications. Cambridge University press.
3. Michael Arnold, Martin Schmucker, Stephen D. Wolthusen (2003). Techniques and Aplications of Digital Watermarking and Contest Protection. Artech House, London.

SEMESTER III
PCCSL19 - WEB SERVICES

Objectives

- To understand Web Services and its implementation model
- To understand XML concepts
- To learn how to implement and deploy Web Services

Unit I

Evolution of Distributed Computing: Basics of Distributed Computing - Evolution of Middleware-The importance of Distributed Computing – Web Service Architecture - Client Server Applications – CORBA – Java RMI - Microsoft DCOM - Message Oriented Middleware - Common Challenges in Distributed Computing - The Emergence of Web Services – SOA – Architecture

Unit II

Introduction to Web Services: What are Web Services? Motivation and Characteristics – Use of Web Services - Basic Operational Model of Web Services - Core Web Services Standards-Other industry Standards Supporting Web Services-challenges in Web Services-Web Services Software and Tools-Benefits of Web Services.

Unit III

Web Services Architecture and Technologies: Building the Web Service Architecture – Web Service Architecture and its Core Building Blocks - Tools of the Trade - SOAP-WSDL-UDDI - Web Services Communication Models - RPC Based Communication Models -Messaging Based Communication Model - Implementing Web Services - To develop java based Web Services - Developing Web Services using J2EE-Description and Discovery of Web Services: Web Services Description Language (WSDL)-Universal Description, Discovery, and Integration (UDDI).

Unit IV

Serialization - Developing Web Services using SOAP: XML based Protocols and SOAP - Anatomy of a SOAP Message - SOAP Encoding - SOAP Message Exchange Protocol - SOAP Communication - SOAP Messaging - SOAP Bindings for Transport Protocols - SOAP Security - Building SOAP Web Services.

Unit V

Creating .NET Interoperability: Means of Ensuring Interoperability - Microsoft .NET Framework: An Overview - Challenges in Creating Web Services Interoperability. XML Processing and Data Binding with Java API's: XML Basics - Java Architecture for XML Binding – Data Binding Generation - Marshalling XML - Unmarshalling Java - Sample Code for XML Data Binding.

Book for Study

1. R. Nagappan, R. Skoczylas, R.P. Sriganesh (2014). Developing Java Web Services.Wiley India.

2. Michael P. Papazoglou (2011). Web Services & SOA Principles and Technology. Second Edition.

Reference

1. F.P.Coyle (2010). XML- Web Servicesand the Data Revolution.Pearson Education.
2. S. Graham (2005).Building web Services with Java. Pearson Education.Second Edition.
3. D.A. Chappell & T. Jewell- O'Reilly (2012).Java Web Services.SPD.
4. McGovern- et al. (2005). Java web Services Architecture.Morgan Kaufmann Publishers.
5. Richard Monson-Haefel (2009).J2EE Web Services.Pearson Education.

SEMESTER III

PCCSM19 - SOFT COMPUTING

Objective

To learn and understand Fuzzy logic-Neural Networks and Genetic Algorithm.

Unit I

Artificial Neural Networks-Basic Concepts: Single layer Perceptron-Multi layer Perceptron- Supervised and Unsupervised learning-Back propagation networks-Application.

Unit II

Fuzzy systems-Fuzzy sets and Fuzzy reasoning-Fuzzy function-decomposition-Fuzzy control methods-Fuzzy decision making-applications.

Unit III

Neuro Fuzzy modeling-Adaptive Networks Based Fuzzy Interfaces-Classification and Representation Trees-Rule Based Structure Identification.

Unit IV

Genetic Algorithm-Crossover-Mutation-Reproduction-Rank method-Rank Space method-Optimization techniques-Derivation based Optimization-Application.

Unit V

Soft computing and Conventional AI-AI Search Algorithm-Predicate Calculus-Semantic Network-Hybrid model Application-Fuzzy implementation using Matlab.

Books for Study

1. S.N.Deepa and S.N.Sivanandham (2018). Principles of Soft computing. Wiley India Pvt.Ltd. Third Edition.
2. N.P Padhy and S.P Simon (2015). Soft computing with mat lab programming. Oxford University Press.
3. Jang J.S.R,Sun C.T and Mizutami E (2015). Neuro Fuzzy and Soft Computing. Prentice Hail India. New Delhi.
4. LaureneFauseett (2008). Fundamentals of Neural Networks. Prentice Hall India. New Delhi.

Reference

1. S.Rajasekeran,G.AVijayalakshmipai (2017). NeuralNetwoks,Fuzzylogicand Genetic Algorithm, Synthesis and Application. PHI learning Pvt.Ltd.
2. Timothy J.Ross (2009).Fuzzy Logic Engineering Application. Tata McGraw Hill.

SEMESTER III
PCCSN19 - PRINCIPLES OF COMPILER DESIGN

Objective

The student should be made to: Learn the design principles of a Compiler.Learn the various parsing techniques and different levels of translation. Learn how to optimize and effectively generate machine codes.

Unit I

Introduction:The Structure of a Compiler - Lexical Analysis-BootStrap - Syntax Analysis - Semantic Analysis-Intermediate Code Generation - Code Optimization-Code Generation – SymbolTable Management-The Grouping of Phases into Passes-CompilerConstruction Tools - The Evolution of Programming Languages.

Unit II

Lexical Analysis: The Role of the Lexical Analyzer - Input Buffering -Specification of Tokens - Recognition of Tokens - Finite Automata - Nondeterministic Finite Automata - From Regular Expressions to Automata - Conversion of an NFA to a DFA - Construction of an NFA from a Regular Expression.

Unit III

Syntax Analysis: Introduction- Context-Free Grammars - Top-Down Parsing- Bottom-Up Parsing- Introduction to LR Parsing (Simple LR).

Unit IV

IntermediateCode Generation:Variants of Syntax Trees - Three-Address Code - Types and Declarations - Translation of Expressions.

Unit V

Code Generation: Design of a Code Generator- Basic Blocks and Flow Graphs-Optimization of Basic Blocks- Peephole Optimization- the Principal Sources of Optimization –Introduction to data flow Analysis - Apply their basic knowledge of Data Structure to design Symbol Table, Lexical Analyser , Intermediate Code Generation, Parser (Top Down and Bottom Up Design).

Book for Study

1. Alfred V Aho- Monica S. Lam- Ravi Sethi- Jeffrey D Ullman (2007). Compilers-Principles- Techniques and Tools. Addison-Wesley. Second Edition.

Reference

1. Charles N. Fischer, Richard. J. LeBlanc (2008).Crafting a Compiler with C.
2. Randy Allen, Ken Kennedy (2002). Optimizing Compilers for Modern Architectures: A Dependence-based Approach. Morgan Kaufmann Publishers.
3. Steven S. Muchnick (2003). Advanced Compiler Design and Implementation. Morgan Kaufmann Publishers Elsevier Science. Indian Reprint.
4. Keith D Cooper and Linda Torczon (2004).Engineering a Compiler. Morgan Kaufmann Publishers Elsevier Science.

SEMESTER III
PECSE19 - ELECTIVE III A: INTERNET OF THINGS

Objective

Internet of Things is a new revolution of the Internet that is rapidly gathering momentum driven by the advancements in sensor networks, mobile devices, wireless communications, networking and cloud technologies.

Unit I

Introduction – Physical Design-Logical Design-Enabling Technologies-Levels and Deployment Templates. Domain Specific IoTs: Home Automation-Cities – Environment-Enery-Retail-Logistics-Agriculture-Industry-Health & Lifestyle.

Unit II

M2M-Difference between IoT and M2M-SDN and NFV – System Management: SNMP-Network Operator Requirements – NETCONF-YANG-IoT with NETCONF-YANG-NETOPEER.

Unit III

IoT Platforms Design Methodology: IoT Design Methodology-Case Study for Weather Monitoring-Motivation for using Python.

Unit IV

IEEE 802.15.4: IEEE 802 Committee Family of Protocols-Physical Layer-MAC Layer-Uses. PLC Landscape-Power line Communication-Ideal PLC System. Zigbee: Standard-Architecture-Association.

Unit V

Zigbee Network Layer-APS Layer-ZDO and ZDP-Security-Cluster Library-Application-Gateway Specification for Network Devices.

Book for Study

1. ArshdeepBahga and Vijay Madisetti (2014).Internet of Things.1st Edition.
2. Oliver Hersent and David Boswarthick and Omar Elloumi (2018).The Internet of Things: Key Applications and Protocols. WILEY.

Reference

1. RajkumarBuyya, Amir VahidDastjerdi (2016). Internet of Things: Principles and Paradigms. Elsevier Science.
2. Peter Waher (2018).Internet of Things: Design and Create Your Own IoTApplications Packt.

SEMESTER III

PECSF19 - ELECTIVE IIIB: CYBER SECURITY

Objective

To study the Cyber Security the students will understand the cybercrime and security, types of cybercriminals, overview of cybercrime scenario in India and understand the legal perspective on cybercrime in Indian Act.

Unit I

Introduction to cybercrime – Cybercrime: Definition and Origins of the word – Cybercrime and Information Security – Cybercriminals – Classifications of Cybercrimes – Cybercrime – Cybercrimes – Cybercrime and the Indian ITA 2000 – A Global Perspective on Cybercrimes – Cybercrimes Era.

Unit II

Categories of Cybercrime – How Criminals Plan the Attacks – Social Engineering – Cyberstalking – Cybercafe and Cybercrimes – Botnets – Attack Vector – Cloud Computing

Unit III

Cybercrime: Mobile and Wireless Devices – Proliferation of Mobile and Wireless Devices – Trends in Mobility – Credit Card Frauds in Mobile and Wireless Computing Era – Security Challenges Posed by Mobile Devices - Authentication Service Security – Attacks on Mobile phones – Mobile Devices: Security Implications for Organizations – Organizational Measures for Handling Mobile Devices – Related Security Issues – Organizational Security Policies and Measures in Mobile Computing Era – Laptops

Unit IV

Tools and Methods used in Cybercrime – Proxy Servers and Anonymizers – Phishing – Password Cracking – Keyloggers and Spywares – Virus and Worms – Trojan Horses and Backdoors – Steganography – DoS and DDoS Attacks.

Unit V

Phishing and Identity Theft – Phishing- Identity Theft – The Indian IT Act – Challenges to Indian Law and Cybercrime Scenario in India – Consequences of Not Addressing the Weakness in Information Technology Act – Digital Signatures and the Indian IT Act.

Book for Study

1. Nina Godbole&SunitBelapure (2011).Cyber Security.Wiley Publication.

Reference

1. P.W. Singer and Allan FriedMan(2014).Cybersecurity and CyberWar.OXFORD University Press.
2. Michael Bush (2018).Cybersecurity Awareness – Media Pro Cybersecurity.Privacy Education.
3. Don Franke (2016). Cybersecurity Basics: Protect Your Organization by Applying the Fundamentals.

SEMESTER III

PECSG19 - ELECTIVE IV A: BIG DATA ANALYTICS

Objective

To learn more about the trends in Big Data and how they impact the business world like Risk-Marketing-Healthcare-Financial Services-etc.Explains this new technology and how companies can use them effectively to gather the data that they need and glean critical insights.

Unit I

Understanding Big Data: Types of Digital Data-Classification of digital data-Introduction to Big data-Characteristics of data-Evolution of Big data-Definition of Big data-Challenges with Big data- Sudden Hype around Big Data Analytics-Classification of Analytics-Data Science-Terminologies used in Big Data Environments - Few Top Analytics tools - NoSQL -Types of NoSQL Databases-Advantages of NoSQL.

Unit II

Basics of Hadoop: Introduction to Hadoop- Basics – RDBMS vsHadoop – Distributed computing challenges - History of Hadoop – Hadoop overview – use case of Hadoop – Hadoop distributors – Hadoop Distributed File system – Processing data with Hadoop.MongoDB: Introduction to MongoDB –Basics of MongoDB-Terms used in RDBMS and MongoDB-Data Types in MongoDB-MongoDB Query Language.

Unit III

Cassandra: Introduction to Cassandra-Apache Cassandra-An Introduction-Features of Cassandra.Introduction to MAPREDUCE Programming–Hive: Introduction to Hive - Hive Architecture-Hive Data Types-Hive File Format-Hive Query Language-RCFile Implementation – SerDe-UserDefinedFunction(UDF).

Unit IV

Mining Data Streams:Stream Data Model – Sampling Data in the Stream – Filtering Streams – Counting Distance Elements in a Stream – Estimating Moments – Counting Ones in Window – Decaying Windows

Unit V

Clustering: Introduction to Clustering Techniques – Hierarchical Clustering –Algorithms – K-Means – CURE – Clustering in Non – Euclidean Spaces – Streams and Parallelism – Case Study: Advertising on the Web.

Books for Study

1. Jure Leskovec, AnandRajaraman&Jeffrey David Ullman (2014). Mining of Massive Datasets. Cambridge University Press. Second Edition.
2. SeemaAcharya and SubhashiniChellappan (2015). Big Data and Analytics. Wiley Publication.

References

1. Michael Minelli, Michelle Chambers and AmbigaDhiraj (2013). Big Data and Big Analytics. Wiley Publication.
2. Jiawei Han, MichelineKamber& Jian Pei (2011). Data Mining Concepts and Techniques. MorganKaufmanPublications.Third Edition.

SEMESTER III

PECSH19 - ELECTIVE IV B: SOFTWARE PROJECT MANAGEMENT

Objective

- Define and highlight importance of software project management.
- Describe the software project management activities.
- Train software project manager and other individuals involved in software project planning.

Unit I

Project definition-Software Project Basics-Introduction-Types of Software Project-Classification of Software projects - Activities covered by software project management-Methods and Methodologies-stake holders-Business Case-Management Control-Software process and process models.

Unit II

Project Planning Infrastructure- Process Database- Contents of PDB-A sample entry-the capability baseline-Process asserts and body of knowledge system-process planning-Infosys development process-Requirement change management-Process planning for the ACIC project.

Unit III

Effort estimation and scheduling-Effort estimation models-Estimation schedule-Effort estimation-Scheduling-Quality planning-Quality concepts-Quantitative quality management planning-Defect prevention planning-The quality plan of the ACIC project.

Unit IV

Risk management- Concept of risk and risk management-Risk assessment-Risk control-Examples-Measurement and Tracking planning-concepts in measurement-measurements-project tracking- The ACIC measurement and tracking plan.

Unit V

The project management plan-Team management-customer communication and issue resolution-The structure of the project management plan-The ACIC project plan-Reviews-The Review process-Data collection-Monitoring and Control.

Books for Study

1. PankajJalote (2002).Software Project Management in Practice. Published by Pearson Education. Second Edition.
2. Bob Hughes, Mike Cotterell,Rajib Mall (2011). Software Project Management. McGraw Hill. Fifth Edition.

Reference

1. Greg Horine (2012). Project Management Absolute Beginner's Guide. Que Publishing. Third Edition.
2. Timothy Adolfo Villafiorita (2014). Introduction to Software Project Management AuerbachPublications.
3. MuraliChemuturi,ThomasM.cagley (2012). Mastering software project managemen. J.ross publishing.

SEMESTER III
PCCSO19 - PRACTICAL V: WEB SERVICES LAB

1. Write a program to implement WSDL Service.
2. To create a simple Web application using Web services in Java.
3. To write a factorial application program using Web services in java.
4. To implement calculator (+---*-/) web application.
5. Web Service creation using .NET.
6. Develop a J2EE client to access a .NET Web Service.
7. Write a program the service provider can be implement a single getprice(), staticbind() and getproduct () operation.
8. Write a program to implement the operation can receive request and will return a responseintwo ways.
   a) One-Way operation
   b) Request - Response

SEMESTER III
PICSC19 – INDEPENDENT ELECTIVE I : CLOUD SOLUTIONS WITH AZURE

Objective

To study the Cloud Solutions with AZURE the students will understand the design effective for an Organization and Cloud Computing Concepts.

Unit I

Getting started with Azure – Technical requirements – Introduction to Cloud Computing –Problems to solve – Basics of Azure – Extending Directory Services to Azure – Terminology to remember with Azure.

Unit II

Moving Existing Apps to Azure – Technical requirements – How I approach the discussion: Rehost , Refactor, Re-architect , Rewrite ,Creating resources in the Azure Portal – Migrating to Azure: Saas Migrations, Office 365,IaaS: PowerShell and ARM Template: Deploy-AzureResourceGroup.ps1,azuredeploy Parameters json, asuredeploy.json- PaaS :Deploy-Azure-Website and Database.parameters.json, Deploy-Azure-Website and Database.template.json.

Unit III

Building Solutions in Azure –Technical Requirements – Azure blueprints – Key Vault : VNet,Mobile,IoT,AI and Machine Learning – Understanding responsibility: Infrastructure as a Service ,Platform as a Service, Software as a Service, Azure Active Directory- Plan for Success – Architecture styles: Common application Patterns ,How to make technology choices – Designing applications in Azure:App Services, Database

Services, Storage accounts, CosmosDB,Microservices / Containers , Real-world examples.

Unit IV

Understanding the Infrastructure behind Solutions Built in Azure – Technical requirements-Setting up your development environment – Managing cost – How I approach guidance- Understanding Infrastructure as Code – Developing locally – How I develop locally – Security center – Application authentication- Dependency Injection – Logging – Data Storage- Understanding service lifetimes – Adding Intelligence to your solutions- Using Application Insights –Leveraging on-premises resources.

Unit V

Deploying Solutions to Azure- Technical requirements –Deploying solutions in Azure-What is devOps?: Azure Boards,AzureArtifacts,AzurePipelines,Azure Test Plans,How I use Azure DevOps- What are deployment slots?- How Azure helps with DevOps – Putting it all together Technical requirements-Dashboards-Azure Advisors: High Availability Advisor,Security Advisor / Security Center, Performance Advisor, Cost Advisor – Monitoring: Core capabilities,Shared capabilities, Infrastructure capabilities,Application capabilities.

Book for Study

1. Greg Leonardo (2018). Hands – On Cloud Solutions With AZURE. Packt Publication.

Reference

1. Mustafa Toroman (2018). Hands on Cloud Administration in AZURE. Packt Publication.
2. Neil Peterson (2016). Get started guide for AZURE IT Operators. Microsoft Publication.
3. David Chappell (2009). Introducting Windows AZURE. Microsoft Publication.

SEMESTER IV

PCCSQ19 – PROJECT WORK

The Project Work will be carried out under the supervision of a faculty member. It should be individual work.

The marks assigned are as follows:

Continuous Assessment : 40 Marks
(Based on Performance at Review Sessions)

Dissertation : 40 Marks

Viva Voce : 20 Marks

Communication Media

(With effect from the Academic Year 2019 - 2020)

PIEMA19 – INDEPENDENT ELECTIVE I A: RADIO & TELEVISION NEWSCASTING

Objectives :

To specialize in Radio and Television and gain analytical, technical and practical skills and be equipped in the broadcast marketplace.

Unit-1: Radio production fundamentals. Purpose of production and type. Information and scripting. Interviewing. Methods of interviews. Location of recording. Narration Styles. Music recording. Magazines and sequences. Remote broadcasts. Evolution of radio broadcast in India. Radio as an educational tool. Radio programmes and formats

Unit-2 News policy and practice. Structure of News Story. 5 Ws and 1 H of news. Inverted Pyramid style. Hard and Soft Leads. Mews reading and presentation methods. Pronunciation. Vocal stressing. Inflection. Quotation marks. Errors and emergencies. Headphones. Trails and promos. Phone-in programmes. Listener's letters.

Unit-3: Components of TV news. Live Telecast environment and its significance. Work elements. Video and Audio Elements. Interactive Elements. Technical elements. Types and Importance of news items. Priority Issues. Catchy items. Sequencing of TV news bulletins. Role of TV News editors. Role of Studio and media Professionals in TV News casting.

Unit-4: News production and requirement, electronic still, electronic news gathering, satellite news gathering. Role of OB vans. Webcasting Video Clips for News. Breaking News. Headlines. Repetitive cycles of news. Importance of archive and stock shots for news editing.

Unit-5: News production teams & their roles. Television News Language – Pronunciation, voice delivery (infliation and defliation), accent. TV news as compared to news in Print Media, news for Interval, news portals. Flash news scrolling. Logo and Weather updates. Risk Management in Newscasting.

Reference Books:

1. Radio Production, Robert Mc Leisch , third edition, Reed Elsevier, Oxford, 1994.
2. Multimedia and Virtual Reality Engineering, Richard Brice, Newnes Pub., 1997.
3. Standard handbook of Video and Television Engineering , Jerry Whitaker and Blair Benson, McGraw-Hill, New York, 2000. Film Cultures, Janet Harbord, Sage Publications, 2003
4. News and News Sources, Paul Manning, Sage Publications, 2001.
5. The Globalisation fo News, Oliver Boyd Barret, Sage Publications, New Delhi, 1998.

SEMESTER - II

PIEMB19 - INDEPENDENT ELECTIVE II: ELECTRONIC JOURNALISM

Objectives :

To provide the insight knowledge about the electronic news production and Produce the competent journalists and news producers for the current information world.

Unit I: Introduction To Electronic Journalism

Origin and Development of Electronic News Broadcasting, Differences between Print and Electronic Journalism, Consumption pattern of news in Television, Radio and Online, Importance of Sound and visuals, Emergence of electronic news gathering tools and practice.

Unit II: Radio News Production

Basics of Radio News, Components of News, Radio news room set-up, Radio News Reporting, News writing and presentation, Elements of editing, integrating audio bytes, Radio talks and discussions, radio interviews.

Unit III: Television News Production

TV News room work process, Basics of TV News, sources and contacts, news research and planning, hour glass structure, TV interviewing techniques, Piece-to –camera, Process of Live inputs, News anchoring.

Unit IV: Online Journalism

Development of the online news media, Features of online media: interactivity and hypertextuality, online storytelling, - Presentation with audio recording and editing, photo shooting and editing, slide show, character driven narrative - Identification of relative stories for hyperlinking ,Search engine optimization (SEO), user engagement, user generated content, Use of Twitter, Facebook, YouTube, Flickr, LinkedIn, blog

Unit V: Technologies For Electronic Journalism

Outside Broadcast van and its functions, Mobile technology and its role in aiding news coverage, Bi-media reporting, convergence newsroom, Multi-skilling, broadcasting software's. Final Assignment: At the end of the semester the students will be assigned individually or as group to work on an assignment. They will produce a two minutes news feature– for radio/ television / online individually (Which will be called 'news day assignment') and submit for evaluation, at the end of the semester.

Textbooks

1. Mitchell Stephens and Beth M. Olson, Broadcast News, Fourth Edition, Thomson Wordsworth, 2005.
2. Eric K. Gormly, Writing and Producing Television News, 2nd Edition, Surjeet Publications, New Delhi, 2005.
3. Singh PP., Jonge De., Hakemulder, Jan 'Broadcast Journalism' – Anmol Publication, New Delhi, India, 2005.
4. Andrew Boyd, Broadcast Journalism, Focal Press, 2007

References

1. N.C Pant, Modern Journalism, Kanishka Publishers, 2002
2. R.K. Ravindran, Radio, TV, Broadcast Journalism, Anmol Publications, 2000
3. Robert L. Hilliard, Writing for TV, Radio and New Media, Thomson Publications, 2003
4. Alfred Lawrence Lorenz and John Vivian, News Reporting and Writing, Pearson. 2006
5. Lynette Sheridan Burns, Understanding Journalism, Vistaar Publications, 2006

SEMESTER - III

PIEMC19 - INDEPENDENT ELECTIVE III - WOMEN AND ADVERTISING

Objective:

To provide the basic understanding about the role of women in the field of advertisement and to develop career opportunities.

Unit I: Women in Advertising

Commoditization of women in advertising - feminist and Advertising - Advertisement as gender scripts –Textually and Mediated Identities - Representation: Role, Character Traits and body Types -Trends in Advertisements - Advertising false ideals.

Unit II: Projection of Women in Advertisements

Sexism in advertising - Female objectification of women –women through the lens of commercial advertising-women- be sexualized case Study-Modern Advertisement-women as consumers, women as objects, changing the portrayal of women in advertisement in Social transformations.

Unit III: Ethics in Advertising

Ethical issues in advertising, NARB-ASCI-ASCI Codes & Guidelines –Case study on-Decisions by ASCI for unethical Ads, Laws Governing Advertisements- Drugs and cosmetics act 1940, Drugs and Magic Remedies Act 1954, Indecent representation of women act 1986 , Patent Act 1970 , Copy right act 1957, Trademarks Act 1999.

Unit IV: Women as Entrepreneurs

Creative women: Their potential, personality & Productivity - Evolution of women entrepreneurship in India, skills & requirements for women, role of women entrepreneurship in economic development.

Unit V: Careers in Advertising

Growth of Advertising Industry in India, careers in Advertising-creative development, Marketing, Management - Emerging women leader and notable women in Advertising field.

Books for study and Reference:

1. S.N. Murthy, U. Bhojana – Advertising an IMC perspective – Excel Books, 2007.
2. S.A. Chunawalla - Advertising, sales and promotion Management –Himalaya Publishing House, 2006.
3. Frank Jefkins,Daniel Yadin - Advertising ,4th Edition - Pearse Education, 2006
4. J.V. Vilanilam, A.K. Varghese - Advertising Basics: A resource Guide for Beginners-Response Books, 2004.
5. Sandage, Fryburger, Rotzoll-Advertising Theory and Practice ,11th Edition –AITBS publishers ,2004.
6. R.C. Bhatia –Marketing Communication and advertising –Galgotia Publishers,2003
7. John Philip Jones- International Advertising: Realities and Myths –Sage Publications,2000
8. John Philip Jones –How Advertising works –Sage publications ,1998
9. Mahendra Mohan –Advertising Management: concepts and Cases-Tata McGraw Hill,1989
10. Robert Cluley- Essential of advertising –Kogan page publishers, Fenruary,2017.
11. Courtland L. Bovee- advertising Excellence-McGraw hill,1995.

SEMESTER - IV

PIEMD19 - INDEPENDENT ELECTIVE IV: INTERNATIONAL COMMUNICATION

Objectives:

To study the global communication to learn about its effects and influence on Globalization.

Unit 1: Introduction to International Communication

What is international Communication? -International communication in the Internet age-(Imbalance in) International Information flow-The New World Information and Communication Order (NWICO)-Towards an integrative view of balanced information flow

Unit 2: Approaches to theorizing international communication

Modernization Theory-Dependency Theory-World Systems-Structural Imperialism-Hegemony-Propaganda-Global Village-Technological Determinism-Globalization-Cultural Imperialism-Theories of information society

Unit 3: International/transnational media organizations

News Agencies-Evolution-Functions-Typology-Broadcast Networks-Cable News Networks -(CNN)-British Broadcasting Service (BBC)-Al Jazeera Networks

Unit 4:Disappearing borders of empowerment

Global Homogenization-Cultural Hybridity-Revised Cultural imperialism-Spaces of empowerment

Unit 5: Key figures in international communication

Ralph Akinfeleye-Marshall McLuhan-Ted Warner-Bill Gates-Noam Chomsky-Herbert Schiller Walter Lippmann-Edward Herman-John Merrill-Cees Hamelink-Annabelle Sreberny-Hamid Mowlana-Sean Mcbrid.

Books for study and Reference:

1. Akinfeleye, R., Amobi, T. I., & Sunday, O. (2011). Unending imbalance in global news flow, direction and intensity: Comparing global media coverage of 2008 US and Ghana presidential elections. Saarbruken, Germany: LAP Lambert Academic Publishing
2. Alleyne M.O. (1997). News revolution: Political and economic decisions about global information. New York: St Martins Press.
3. Mojaye, E. M., Oyewo, O. O., M'Bayo, R. T. & Sobowale, I. A. (2008). Globalization and development communication in Africa, Ibadan: University Press
4. Morley, M (2002) How to manage global reputation: A guide to the dynamics of international public relations, New York, NY New York: University Press.

5. Mowlana, H. (1986) Global information and world communication: New frontiers in international relations, New York: Longman
6. M'Bayo, R.T (Undated). Genesis of the New World Information order, In Peter Nwosu, ChukaOnwumechili and RitchardM'Bayo (Eds.). Communication and the transformation of society, New York: University Press of America
7. Thusssu, D. K.(2006). International Communication: Continuity and change, New York, New York; Oxford University Press

M. Sc. MATHEMATICS

(With effective from the Academic Year 2019 - 2020)

Objectives of the Course

- To improve the level of mathematical maturity, logical and analytical thinking;
- To provide sufficient skill in the actual performance of mathematical processes, so as to meet the future needs of the students;
- To encourage them to take up intellectual pursuits in the wonderland of Abstract concepts and Applied Mathematics.

Conditions for Admission

A candidate who has passed the B.Sc. Degree Examination in Branch I Mathematics or B.Sc. Applied Science of Thiruvalluvar University or an examination of some other University accepted by the Syndicate as equivalent thereto shall be permitted to appear and qualify for the M.Sc. Degree Examination after a course of two academic years.

Durations of the Course:

The course of the Degree of Master of Science shall consist of two academic years with four semesters.

The Structure of the Course and Scheme of Examination:

Sem	Course Code	Title of the Course	Hours	Exam Hours		Credits	Marks
				Th	Pr		
I	PCMAA19	Modern Algebra	5	3	-	5	40+60
	PCMAB19	Real Analysis - I	6	3	-	5	40+60
	PCMAC19	Complex Analysis - I	6	3	-	4	40+60
	PCMAD19	Differential Equations	6	3	-	4	40+60
	PEMAA19	Elective – I A: Differential Geometry	6	3	-	4	40+60
	PEMAB19	Elective – I B: Bio – Mathematics					
	Independent Elective Course	Optional I: Fundamentals of Group Theory				2	100
		Optional II: Latex And Matlab					
	-	Value Education	1	-	-	-	-
		Total	**30**			**24**	**600**

Sem	Course Code	Title of the Course	Hours	Exam Hours		Credits	Marks
				Th	Pr		
II	PCMAE19	Linear Algebra	5	3	-	4	40+60
	PCMAF19	Real Analysis – II	6	3	-	4	40+60
	PCMAG19	Complex Analysis - II	5	3	-	4	40+60
	PCMAH19	Mechanics	6	3	-	4	40+60
	PEMAC19	Elective II A: Integral Equations & Partial Differential Equations	5	3	-	4	40+60
	PEMAD19	Elective II B: Mathematical Modelling					
	Independent Elective Course	Optional I: Fundamentals of Ring And Field Theory				2	100
		Optional II: Financial Mathematics					
	PNHRA16	Human Rights	2	3	-	2	40+60
	-	Value Education	1	-	-	-	-
		Total	**30**			**24**	**700**
III	PCMAI19	Topology	6	3	-	4	40+60
	PCMAJ19	Graph Theory	6	3	-	4	40+60
	PCMAK19	Calculus of Variations	6	3	-	4	40+60
	PCMAL19	Difference Equations	6	3	-	4	40+60
	PEMAE19	Elective III A: Operations Research	5	3	-	4	40+60
	PEMAF19	Elective III B: Industrial Mathematics					
	Independent Elective Course	Optional I: Skill Enhancement in Real and Complex Analysis -I					100
		Optional II: Fundamental of Research Methodology and Statistics- I					
		Value education	1	-	-	-	-
	PGTRA15	Teaching and Research Aptitude	-	3	-	3	40+60
		Total	**30**			**25**	**700**

Sem	Course Code	Title of the Course	Hours	Exam Hours		Credits	Marks
				Th	Pr		
IV	PCMAM19	Functional Analysis	6	3	-	5	40+60
	PCMAN19	Numerical Analysis	6	3	-	5	40+60
	PCMAO19	Mathematical Statistics	6	3	-	5	40+60
	PEMAG19	Elective IV A: Object Oriented Programming with C++	4	3	-	3	40+60
	PEMAI19	Elective IV A: Programming with Java					
	PEMAH19	Elective Practical: C++	2	-	3	1	40+60
	PEMAJ19	Elective Practical: Java					
	PCMAP19	Project	5	-	-	4	100
	Independent Elective Course	Optional I: Skill Enhancement in Real and Complex Analysis –II				2	100
		Optional II: Fundamental of Research Methodology and Statistics- II					
	-	Value Education	1	-	-	-	-
		Total	**30**			**25**	**700**
Grand Total						98	2700

SEMESTER I

PCMAA19- MODERN ALGEBRA

Objective:
To introduce the general concepts in Advanced Abstract Algebra and to deepen the knowledge of Algebraic structure to lay the foundation for a variety of courses.

Unit I: Group Theory

Another counting principle-S ylow's theorem (Theorem 1: first version of the proof) (Chapter 2: Sections 2.11, 2.12 Omit: Lemma 2.12.1, Lemma 2.12.2)

Unit II: Fields

Direct products –Finite abelian groups- Extension fields (Chapter 2: Sections: 2.13, 2.14, Chapter 5: Section 5.1)

Unit III: Fields (Contd..)

Transcendence of e -Roots of polynomials - More about roots (Chapter 5: Sections: 5.2, 5.3 and 5.5)

Unit IV: Galois Theory

The Elements of Galois Theory (Chapter 5: Section: 5.6)

Unit V: Solvability by Radicals

Solvability by radicals - Galois groups over the Rationals (Chapter 5: Sections: 5.7 and 5.8)

Textbook:

1. N. Herstein - Topics in Algebra, 2nd Edition - H.S. Polai for Wiley Eastern Limited, New Delhi –1993.

Books for Reference:

1. Joseph A. Gallian - Contemporary Abstract Algebra, 4th edition - Narosa, 1999.
2. John B. Fraleigh – A First Course in Abstract Algebra, 5th Edition - Addison Wesley Longman, Mexico City, Inc., 1999.
3. Kenneth Hoffman and Ray Kunze – Linear Algebra, 2nd Edition – Prentice Hall of India, New Delhi, 2005.

SEMESTRT I
PCMAB19 - REAL ANALYSIS – I

Objective:
To introduce some of the Abstract thinking that pervades Modern Analysis.

Unit I: Euclidean Space R^n
Euclidean space R^n – Open balls and open sets in R^n - The structure of open sets in R^n – Closed sets – Adherent and Accumulation points – Closed sets and Adherent points – Bolzano – Weierstrass Theorem –Cantor Intersection theorem - Lindelof Covering theorem – Heine Borel Covering theorem - Compactness in R^n – Metric spaces – Point set topology in metric spaces
– Compact subsets of a metric space - Boundary of a set (Chapter 3: Sections 3.2– 3.16).

Unit II: Functions of bounded variation and Rectifiable Curves
Properties of Functions- Functions of bounded variation-Total variation-Additive property of total variation- Total variation on [a,x] as a function of x – Functions of bounded variation expressed as the difference of increasing functions - Continuous functions of bounded variation- Curves and paths-Rectifiable paths and arc length – Additive and continuity properties of arc length - Equivalence of paths, change of parameter (Chapter 6: Sections 6.2
– 6.12).

Unit III: Double Sequences and Infinite Products
Double sequences – Double Series - Rearrangement theorem for double series - A sufficient condition for equality of Iterated series - Multiplication of series – Cesaro summability – Infinite products.(Chapter 8: Sections 8.20 - 8.26)

Unit IV: Sequences of Functions
Point-wise convergence of sequences of functions – Examples of sequences of real valued functions – Definition of uniform convergence – Uniform convergence and Continuity – Cauchy condition for uniform convergence – Uniform convergence of infinite series of functions – A space filling curve - Uniform convergence and Riemann- Stieltjes Integration - Non uniformly convergent sequences that can be integrated term by term - Uniform convergence and differentiation – Sufficient condition for Uniform convergence of a series – Uniform convergence and double sequences – Mean convergence. (Chapter 9: Sections 9.1– 9.13)

Unit V: Sequences of Functions (Contd.)
Multiplication of power series - The Substitution Theorem - The Reciprocal of Power series - Real Power series - The Taylor's Series generated by a function - Bernstein's Theorem - Abel's Limit Theorem - Tauber's Theorem (Chapter 9: Sections 9.15– 9.23, Omit 9.21)

Textbook:
1. Tom M. Apostol - Mathematical Analysis, 2nd Edition – Narosa Publishing House, New Delhi, 1985.

Books for Reference:

1. Walter Rudin - Principles of Mathematical Analysis, 3rd Edition – McGraw Hill Company, New York, 1976.
2. R.R. Goldberg - Methods of Real Analysis, Indian Edition - Oxford and IBH Publishing Company, 1970.
3. S. C. Malik, Savita Arora- Mathematical Analysis- New Age International Publishers, New Delhi, 2011.

SEMESTRT I

PCMAC19 -COMPLEX ANALYSIS – I

Objective:
To provide a wide knowledge about Complex Analysis and its relevance.

Unit I: Elementary Theory of Power Series, Conformality and Linear transformations

Sequences - Series - Uniform Convergence - Power Series - Abel's Limit Theorem - Arcs and Closed Curves - Analytic Functions in Regions - Conformal Mapping - Length and Area - The Linear Group - The Cross Ratio - Symmetry (Chapter 2 : Section 2.1 -2.5 and Chapter 3 : Section 2.1- 2.4, 3.1 -3.3)

Unit II: Complex Integration – Fundamental Theorems
Line Integrals - Rectifiable arcs – Line integrals as functions of arcs – Cauchy's Theorem for a Rectangle – Cauchy's Theorem in a Disk. (Chapter 4: Sections 1.1-1.5)

Unit III: Cauchy's Integral formula and Local Properties of Analytical functions

Index of a point with respect to a closed curve –Integral formula – Higher Derivatives – Removable Singularities– Taylor's Theorem –Zeroes and poles (Chapter 4: Sections 2.1 - 2.3 and 3.1 - 3.2)

Unit IV: Local Mapping and the General form of Cauchy's Theorem

Local Mapping –Maximum Principle – Chains and Cycles – Simple Connectivity – Homology
–General statement of Cauchy's Theorem – Proof of Cauchy's
Theorem. (Chapter 4: Sections 3.3, 3.4 and 4.1 - 4.5)

Unit V: The Calculus of Residues and Harmonic functions

The Residue Theorem –The Argument Principle –Evaluation of Definite Integrals - Definition and Basic properties - The Mean- value property - Poisson's Formula - Schwarz's Theorem (Chapter 4: Sections 5.1 - 5.3 and 6.1 - 6.4)

Text book:

1. Lars V. Ahlfors – Complex Analysis, 3rd Edition – McGraw Hill International Editions, Tokyo, 1979.

Books for Reference:

1. John B. Conway – Functions of one Complex Variable, 2nd Edition – Springer International Student Edition - 1987.
2. S. Ponnusamy - Foundation of Complex Analysis, 2nd Edition - Narosa Publishing House, New Delhi -2012.
3. S. Arumugam, A. Thangapandi Isaac, A. Somasundram - Complex Analysis- Scitech Publications Pvt.Ltd., New Delhi, 2009.
4. Serge Lang- Complex Analysis, 2nd Edition- Springer-Verlag, New York, 1993.

SEMESTER I

PCMAD19 - DIFFERENTIAL EQUATIONS

Objective:

To give an in-depth knowledge of solving differential equations that is encountered frequently in various walks of life.

Unit I: Linear Differential Equations of Higher Order

Introduction – Higher order equations – A mathematical model - Linear Dependence and Wronskian – Basic Theory for Linear Equations – Two useful formulae - Homogeneous linear equations with constant co-efficient (Chapter 4: Sections 4.1 – 4.6)

Unit II: Solutions in Power Series

Introduction - Second order linear equations with ordinary points – Legendre equation and Legendre polynomials – Second order equations with regular singular points – Bessel's functions (Chapter 6: Sections 6.1 – 6.5)

Unit III: Systems of Linear Differential Equations

Introduction - Systems of first order equations - Model for Arms Competition between two nations– Existence and uniqueness theorems – Fundamental matrix – Non-homogeneous linear systems – Linear systems with constant co-efficient (Chapter 5: Sections 5.1 – 5.7)

Unit IV: Existence and Uniqueness of Solutions

Introduction - Preliminaries – Picard's Successive approximations – Picard's Theorem – Some examples – Continuation and dependence on initial conditions (Chapter 2: Sections 2.1 –2.6)

Unit V: Oscillations of Second order Equations

Introduction – Sturm's comparison theorem - Elementary linear oscillations – Comparison theorem of Hille-Wintner – Oscilations of $X'' + a(t)X = 0$.(Chapter 7: Sections 7.1 – 7.5)

Textbook:

1. S.G. Deo and V. Raghavendra Rasmita kar , V. Lakshmikatham- Ordinary Differential Equations, 3^{rd} Edition - Tata McGraw Hill Publishing Company Ltd., New Delhi, 2015.

Books for Reference:

1. Earl A. Coddington - An Introduction to Ordinary Differential Equations - Prentice Hall of India Pvt. Ltd., New Delhi, 1992.
2. M.D. Raisinghania - Advanced Differential Equations, 8^{th} Edition – S. Chand and Co. Ltd., New Delhi, 2001.
3. M.D. Raisinghania - Ordinary and Partial Differential Equations - S. Chand and Co., Ltd., New Delhi, 1974.

PEMAA19- ELECTIVE I A: DIFFERENTIAL GEOMETRY

Objective:

To enlighten the students with various intrinsic concepts, theories of Differential Geometry and applications of this subject.

Unit I: Arc Length
Introduction – Definitions – Arc length – Tangent, normal, and binormal – Curvature and torsion of a curve given as the intersection of two surfaces- Contact between curves and surfaces. (Chapter 1: Sections 1 -6)

Unit II: Space Curves
Tangent surface – Involutes and evolutes – Intrinsic equations – Fundamental existence theorem for space curves – Helices. (Chapter 1: Sections 7 -9)

Unit III: Surfaces and Families of curves
Definition of a surface – Curves on a surface – Surfaces of revolution – Helicoids – Metric – Direction coefficients – Families of curves – Isometric correspondence – Intrinsic properties. (Chapter 2: Sections 1 - 9)

Unit IV: Geodesics
Geodesics – Canonical geodesic equations – Normal property of geodesics – Existence theorems – Geodesic curvature – Gauss–Bonnet theorem – Gaussian curvature. (Chapter 2: Sections 10 - 17)

Unit V: Developables
Second fundamental form – Principal curvatures – Lines of curvatures – Developable associated with space curves – Developable associated with curves on surfaces – Minimal Surface.(Chapter 3 : Sections 1 - 7)

Text book:

1. T.J Wilmore - An Introduction to Differential Geometry, 2nd Edition - Oxford at the Clarendon Press, First Reprint – 2000.

Books for Reference:

1. M. L. Khanna - Differential Geometry, 6th Edition - Jai Prakash Nath and Co., Garh Road, Meerut City, 1998.
2. D. Somasundaram - Differential Geometry, Second reprint, Narosa publishing house, 2008.

SEMESTER I

PEMAB19 – ELECTIVE I B: BIO MATHEMATICS

Objective:

To study and discuss the mathematical models in discrete population growth, continuous population growth, qualitative behavior of populations and epidemiology

Unit I: Discrete Population Growth Models
Arithmetic growth model – Geometric growth model – Generalizations – Age Structured populations – Size structured population growth models – Stock-Recruitment models (Chapter 2: 2.1 – 2.7 and 2.9)

Unit II: Continuous Growth Models
Linear Model –Exponential Model – A model for the distribution of drugs in the body – Coalition models – Models with growth regulations: Mitscherlich curve – Density dependent growth: the logistic model (Chapter 3: 3.2 – 3.7)

Unit III: Continuous Growth Models (Contd …)
Environmental resistance – A model for the spread of technological innovations – Geomertz model – Bertalanffy growth model – Richard's function (Chapter 3:3.8 – 3.12)

Unit IV: Qualitative behaviour of Populations
Autonomous equations – Steady and equilibrium states – Stability of equilibrium states – Logistic model with harvesting – Fixed points and their stability –Logistic map – Dynamic behaviour of the Ricker model – Chaos. (Chapter 5: 5.2-5.9)

Unit V: Mathematical Models in Epidemiology
Plant epidemics – Some features of human epidemics – A simple deterministic epidemic model – A more general epidemic: SIR disease – Plant epidemic models.
(Chapter 7: 7.2 –7.6)

Text book:

1. Ranganathan C. R. – A first Course in Mathematical Models of Population Growth – (With MATLAB Programs) – Associated Publishing Company, New Delhi – 2006.

Books for Reference:

1. Pundir – Bio Mathematics - A Pragati Edition, 2006.
2. Kapur J.N. – Mathematical Modelling – Wiley Eastern Limited, Reprint 2000.
3. Nicholas F. Britton – Essentials of Mathematical Biology – Springer International Edition, First Indian Reprint, 2004.
4. Murray – Mathematical Biology – Springer International Edition, First Indian Reprint, 2004.

SEMESTER I

PIMAA19 - INDEPENDENT ELECTIVE - I A: FUNDAMENTALS OF GROUP THEORY

Objective:

To prepare the students to develop the in-depth knowledge in Modern Algebra

Unit I: **Groups**

Introduction to Groups - Sub Groups – Coset – Abelian Group – Normal Sub Groups – Cyclic Groups.(Chapter 15: 15.1-15.3, 15.6)

Unit II: Groups (Continued)

Quotient Groups – Direct Products – Some important Groups – Homomorphism and isomorphism – centre of a Groups. (Chapter 15: 15.4-15.5)

Unit III: Groups (Continued)

Normalizer of Subgroups – Centralizer of an Element or Normalizer of an Element – Commutator Subgroups – Fundamental theorem of Finite Abelian groups – Number of Non isomorphic Abelian Groups. (Chapter 15: 15.4-15.5)

Unit IV: Permutations

Permutations – symmetric Group S_n - Alternating Group A_n Conjugacy Classes and Conjugacy Relation. (Chapter 15: 15.7)

Unit V: Sylows Theorem

Class Equation – Sylows theorem – Results on simple Group – Solvable Groups and Jondan - Holder theorem. (Chapter 15: 15.8-15.10)

Book for Study:

1. R. Gupta's - Joint CSIR - UGC-NET Mathematical Sciences Previous Year's Solved Paper, 2014.

Book for Reference:

1. Dr. A. P. Singh - Modern Algebra - Infostudy Publication, 2018.

SEMESTER I

PIMAB19 - INDEPENDENT ELECTIVE I B: LATEX AND MATLAB

Objectives: This course aims to practice the students in Mathematics documents preparations and utilizing the software facility available for tedious computations.

Creating a Document using LATEX

Simple Typesetting - Page Layout (Page size, margins, page style) - Formatting (Font size, Text Alignment) -Table and Figures -Typesetting Mathematics - Bibliography Management

MATLAB Basics

Algebra and Arithmetic - Calculus, Graphics and Linear Algebra - Curve Fitting and Interpolation - Ordinary Differential Equations

Books for Reference:

1. Latex Tutorials – A PRIMED Indian TEX Users Group, 2002, 2003 Indian TEX Users Group Floor III SJP Buildings- Cotton Hills Trivandram 695014, India.
2. Brain R. Hunt Ronald R. Lipsman and Jonathan M. Rosenberg- A Guide to MATLAB for beginners and experienced users- Cambridge University Press, 2003.
3. Rudra Pratap- Getting Started with MATLAB 7- Oxford University Press, India, 2006.
4. Rose L. Spencer, Introduction to MATLAB, 2006.

COMPUTER LABORATORY PRACTICE

EXERCISES LATEX

1. Create a document file to prepare a Chapter in a Book.
2. Create a Document file to prepare a research article.

MATLAB

1. Multiplication of matrices of order 4x4.
2. Solution to linear non- homogeneous equations (4 unknowns).
3. Rank of a matrix of order atleast 4.
4. Solving ordinary differential equations.
5. Plotting of two and three dimensional graphs SPSS.
6. Drawing Histograms, frequency curves and frequency polygons.
7. Finding central measures and measures of dispersion.
8. Finding correlation and rank correlation.
9. Finding partial and multiple correlations.
10. Calculation of ANOVA.

SEMESTER II

PCMAE19 - LINEAR ALGEBRA

Objective:

To introduce the canonical form for linear transformations on vector spaces - To deepen the knowledge of Algebraic Structures

Unit I: Modules & Canonical Forms

Modules -Triangular Form- Nilpotent Transformations- (Chapter 4: Sections 4.5; Chapter 6: Sections 6.4 and 6.5)

Unit II: Canonical Forms (Contd...)

Canonical forms: A decomposition of V: Jordan Form- Rational Canonical Form (Chapter 6: Sections 6.6 - 6.7)

Unit III: Linear Transformations

Hermitian - Unitary and Normal transformation – Real Quadratic Forms (Chapter 6: Sections 6.10 and 6.11)

Unit IV: Finite Fields

Finite fields - Wedderburn's theorem on finite division rings (first proof only) (Chapter 7: Sections 7.1 and 7.2)

Unit V: Finite Fields (Contd...)

A Theorem of Frobenius - Integral Quaternions and the Four-Square Theorem (Chapter 7: Sections 7.3 and 7.4)

Textbook:

1. I.N. Herstein - Topics in Algebra, 2nd Edition - H.S. Polai for Wiley Eastern Limited, New Delhi, 1993.

Books for Reference:

1. Joseph A. Gallian - Contemporary Abstract Algebra, 4th edition - Narosa,1999.
2. John B. Fraleigh - A First Course in Abstract Algebra, 5th Edition – Addison Wesley Longman Inc., Mexico City, 1999.
3. Kenneth Hoffman and Ray Kunze - Linear Algebra, 2nd Edition - Prentice Hall of India, New Delhi, 2005.

SEMESTER II
PCMAF19 - REAL ANALYSIS - II

Objective:

To deepen the knowledge on certain topics in Real Analysis such as R-S integral, Fourier series and Implicit functions.

Unit I: Riemann Stieltjes' Integral

Introduction – Notation –Definition of the Riemann–Stieltjes integral – Linear properties – Integration by parts – Change of variable in a Riemann-Stieltjes integral – Reduction to a Riemann integral – Step functions as integrators - Reduction of a Riemann Stieltjes integral to a finite sum – Euler's summation formula.(Chapter 7: Sections 7.1 – 7.10)

Unit II: Riemann Stieltjes' Integral (contd…)

Monotonically increasing integrators – Additive and linearity properties of upper and lower integrals -Riemann's condition – Comparison theorems – Integrators of bounded variation - Sufficient conditions for Existence of Riemann–Stieltjes integral - Necessary conditions for Existence of Riemann–Stieltjes integral - Mean Value Theorem for Riemann–Stieltjes integral

- The Integral as a function of the Intervals - Second fundamental Theorem of Integral Calculus

- Change of Variables in Riemann integral - Second Mean Value Theorem for Riemann integral- Riemann–Stieltjes integral depending on a parameter. (Chapter 7: Sections 7.11 - 7.23)

Unit III: Fourier series

Orthogonal systems of functions – The theorem on best approximation – The fourier series of a function relative to an orthonormal system – Properties of the fourier coefficients – The Riesz Fischer theorem – The convergence and representation problems for trigonometric series – The Riemann Lebesgue lemma – The Dirichlet integrals – An integral representation for the partial sums of a fourier series – Riemann's localization theorem.(Chapter 11: Sections 11.2 -11.11)

Unit IV: Multivariable Differential Calculus

Introduction – Directional derivative – Directional derivatives and continuity – Total derivative

– Total derivative expressed in terms of partial derivatives - Matrix of a linear function – Jacobian Matrix – Chain rule – Matrix form of the chain rule – Mean value theorem for differentiable functions - The sufficient condition for Differentiability - The sufficient condition for equality of Mixed partial derivatives - Taylor's Formula for functions from R^n to R^1 .(Chapter 12: Sections 12.1 - 12.14, Omit 12.6)

Unit V: Implicit Functions

Introduction – Functions with non-zero Jacobian determinant – Inverse function theorem – Implicit function theorem – Extrema of real valued functions of one variable(Chapter 13: Sections 13.1 to 13.5)

Text book:

1. Tom M. Apostol - Mathematical Analysis, 2nd Edition - Narosa Publishing House, New Delhi, 1985.

Books for Reference:

1. Walter Rudin – Principles of Mathematical Analysis, 3rd Edition – McGraw Hill Company, New York, 1976.
2. R.R. Goldberg - Methods of Real Analysis, Indian Edition - Oxford and IBH Publishing Company, 1970.

SEMESTER II

PCMAG19 - COMPLEX ANALYSIS – II

Objective:

To provide a detailed knowledge about the Functions and Mappings.

Unit I: Series and Product Developments

Weierstrass's Theorem - The Taylor Series - The Laurent Series - Partial Fractions - Infinite Products - Canonical Products - The Gamma Function (Chapter 5: Sections 1.1 -1.3 and 2.1 - 2.4)

Unit II: Series and Product Developments (contd...)

Jensen's Formula - Hadamard's Theorem - The Product Development - Extension of $\zeta(s)$ to the whole plane - The Functional Equation (Chapter 5: Sections 3.1 - 3.2 and 4.1 - 4.3)

Unit III: Normal Families and Riemann Mapping Theorem

Equicontinuity - Normality and Compactness - Arzela's Theorem - Families of Analytic Functions - Statement and Proof - Functions with the Mean-value property - Harnack's principle (Chapter5: Sections 5.1 - 5.4, Chapter6: Sections 1.1, 3.1 - 3.2)

Unit IV: Elliptic Function

The Period Module – Unimodular Transformations – The Canonical Basis – General Properties of Elliptic Functions (Chapter 7: Sections 2.1 - 2.4)

Unit V: The Weierstrass Theory

Weierstrass ρ function – The functions (z) and (z) – Differential Equation – Modular Function ( ) (Chapter 7: Sections 3.1 – 3.4)

Text book:

1. Lars V. Ahlfors – Complex Analysis, 3rd Edition – McGraw Hill International Editions, Tokyo, 1979.

Books for Reference:

1. John B. Conway – Functions of one Complex Variable, 2nd Edition – Springer International Student Edition - 1987.
2. S. Ponnusamy - Foundation of Complex Analysis, 2nd Edition - Narosa Publishing House, New Delhi -2012.
3. S. Arumugam, A. Thangapandi Isaac, A. Somasundram - Complex Analysis- Scitech Publications Pvt.Ltd., New Delhi, 2009.
4. Serge Lang- Complex Analysis, 2 Edition- Springer-Verlag, New York, 1993.

SEMESTER II
PCMAH19 - MECHANICS

Objective:

To help the students develop their knowledge about the Physics concepts and its applications to Mathematics.

Unit I: Introductory Concepts

Mechanical system – Generalized co-ordinates – Constraints – Virtual Work – Energy and Momentum. (Chapter 1: Sections 1.1 – 1.5)

Unit II: Lagrange's Equations

Derivation of Lagrange's equations –Examples - Integrals of Motion (Chapter 2: Sections 2.1- 2.3)

Unit III: Hamilton's Equations

Hamilton's Principle – Hamilton's Equations – Other variational principles (Chapter 4: Sections 4.1 – 4.3)

Unit IV: Hamilton's Equations

Hamilton's principal function –Hamilton – Jacobi Equation - Separability (Chapter 5: Sections 5.1-5.3)

Unit V: Canonical Transformations

Differential Forms and Generating Functions - Special Transformations - Lagrange and Poisson Brackets (Chapter6: Sections 6.1 - 6.3)

Text book:

1. T. Greenwood - Classical Dynamics, 2nd Edition – Prentice Hall of India Pvt. Ltd., New Delhi, 1985.

Books for Reference:

1. Goldstein - Classical Mechanics - Narosa Publishing House, New Delhi, 17th Reprint, 1998.
2. N.C. Ran and P.S. Joag - Classical Mechanics - Tata McGraw Hill Publishing Company Limited, New Delhi, 2004.
3. J. L. Synge and P. S. C. Joag - Classical Mechanics - Tata McGraw Hill, New Delhi, 1991.
4. P. G. Bergmann- Introduction to Theory of Relativity- Prentice Hall of India, Eddington, New Delhi, 1969.

SEMESTER II

PEMAC19 - ELECTIVE II A: INTEGRAL EQUATIONS AND PARTIAL DIFFERENTIAL EQUATIONS

Objective:

To introduce the students the various solutions in Integral and Partial Differential Equations required for the study of Mathematics, Science and Engineering.

Unit I: Elliptic Differential Equations

Occurrence of the Laplace and Poisson equations - Boundary value problems - Some important mathematical tools - Properties of harmonic functions - Separation of variables (Chapter 2: Sections 2.1 –2.5 and related examples in 2.13)

Unit II: Parabolic Differential Equations

Occurrence of the diffusion equation - Boundary conditions - Elementary solutions of the diffusion equations - Dirac delta function - Separation of variables method (Chapter 3: Sections 3.1 – 3.5 and related examples in 3.9)

Unit III: Hyperbolic Differential Equations

Occurrence of the wave equation - Derivation of one dimensional wave equation - Solution of one dimensional wave equation by canonical equation - Initial value problem - D'Alembert's solution - Vibration string – Variable separable solution – Forced vibration – Solution of non homogeneous equation (Chapter 4: Sections 4.1– 4.6 and related examples in 4.13)

Unit IV: Classification of Integral Equations and Connection with DE.

Historical Introduction - Linear Integral equations - Special type of kernel - Square integrable functions and kernels - Singular integral equations - Non linear equations - Linear differential equations - Green's function (Chapter 1: Sections 1.1 – 1.6 and Chapter2: Sections 2.1 - 2.2) **Unit V: Integral equations of the convolution type and Integral equations with singular kernels**

Integral transforms - Fredholm equation of the first kind - Volterra equation of the first kind - Fredholm equation of the second kind - Stieltjes integral equation - Volterra equation of the second kind - Abel's integral equation - Fox's integral equation – Generalization to higher dimensions – Green's functions in two and three dimenstions (Chapter 3: Sections 3.1 - 3.6 and Chapter 5: Sections 5.1 and 5.2)

Text books:

1. Sankara Rao K - Introduction to Partial Differential Equations, 5th Edition - Prentice Hall of India, New Delhi, 2004. (for units I, II, III).
2. B.L. Moiseiwitsch - Integral Equation, 1st Edition - Longman Group limited, London, 1977. (for units IV and V).

Books for Reference:

1. Snedon I.N. - Elements of Partial Differential Equations, First edition - Tata McGraw Hill, New Delhi, 1957.
2. M.D. Raisingania - Advanced Differential Equations, 4th Edition, Tata McGraw Hill

Publishing Company, New Delhi, 2001.

3. Amarnath T - An Elementary Course in Partial Differential Equations, 2nd edition - Narosa Publishing House, 1997.

SEMESTER II
PEMAD19 - ELECTIVE II B: MATHEMATICAL MODELLING

Objective: This course aims at the study and to discuss the mathematical modeling through differential equations, systems of ordinary differential equations, difference equations, graphs, calculus of variations and dynamical programming.

Unit I: Mathematical Modelling through Differential Equations of First Order

Mathematical modeling through differential equations of First order – Linear growth and decay models – Nonlinear growth and decay models – Compartment models – Mathematical modeling in dynamics through ordinary differential equations of first order (Chapter 2:2.1-2.5)

Unit II: Mathematical Modelling through systems of Ordinary Differential Equations of the First Order

Mathematical modeling in population dynamics – Mathematical modeling of epidemics through systems of ordinary differential equations of first order - Mathematical models in medicine, Arms Race, Battles and international trade interms of systems of ordinary differential equations – Mathematical modeling in dynamics through systems of ordinary differential equations of first order. (Chapter 3: 3.1, 3.2, 3.5, 3.6)

Unit III: Mathematical Modelling through Difference Equations

The need for Mathematical modeling through difference equations; some simple models - Basic theory of linear difference equations with constant coefficient – Mathematical modeling through difference equations in Economics and finance – Mathematical modeling through difference equations in population dynamics and genetics – Mathematical modeling through difference equations in probability theory – Miscellaneous examples of mathematical modeling through difference equations. (Chapter 5: 5.1-5.6)

Unit IV: Mathematical Modelling through Graphs

Situations that can be modeled through graphs – Mathematical models in terms of directed graphs – Mathematical modeling in terms of signed graphs – Mathematical modeling in terms of weighted graphs. (Chapter 7: 7.1 – 7.4)

Unit V: Mathematical Modelling through Calculus of Variations and Dynamic Programming

Optimization principles and techniques – Mathematical modeling through calculus of variations – Mathematical modeling through dynamic programming (Chapter 9.1-9.3)

Text book:

Kapur J.N. – Mathematical Modelling – Wiley Eastern Limited,1st edition Reprint 2000.

Books for Reference:

1. James D. J. G and Macdonald J.J. - Case Studies in Mathematical Modelling - Stanly Thames, Cheltonham, 1981.
2. Kapur J. N. - Maximum Entropy Models, 1st edition, New age Publisher, 1990.
3. Cross M and Moscrcadini A. O - The Art of Mathematical Modelling - Ellis Harwood and John Wiley, 1985.
4. Dyson C, Elvery - Principles of Mathematical Modelling - Academic Press, NY, 2004.
5. Burghes D. N. - Modelling with Difference Equations - Ellis Harwood and John Wiley, 1980.

SEMESTER II

PIMAC19 - INDEPENDENT ELECTIVE – II A: FUNDAMENTALS OF RING AND FIELD THEORY

Objective:

To prepare the students to enhance the in-depth knowledge in Modern Algebra

Unit I: Ring Theory

Ring – Sub Ring – Types of Ring – Zero Divisors – Integral Domain – Unit of Ring – Boolean Ring – Characteristic of a Ring – Equivalence Relation on Ring. (Chapter 16: 16.1)

Unit II: Ring Theory (Contd…)

Ideals – Quotient Ring – Ring Homomorphism – Field of Quotients – Polynomial Rings – Some Definitions. (Chapter 16: 16.2)

Unit III: Ring Theory (Contd…)

Principle Ideal Domain (PID) – Euclidean Domain (ED) – Unique Factorization Domain (UFD) - Content of Polynomial – Primitive Polynomial – Irreducible Polynomial. (Chapter 16: 16.3-16.7)

Unit IV: Field Theory

Definition of Field – Some Definitions – Simple Extension – Algebraic Extension – Monic polynomial – minimal polynomial – Factor Theorem – Splitting Field. (Chapter 16: 16.8)

Unit V: Field Theory (Contd…)

Conjugate Elements – Separable Polynomial – Separable Element – Purely Inseparable Extension – Normal Extension – Galois Extension – Fundamental Theorem of Galois Theory. (Chapter 16: 16.9-16.10)

Book for Study:

1. R. Gupta's - Joint CSIR - UGC-NET Mathematical Sciences Previous Year's Solved Paper, 2014.

Book for Reference:

1. Dr. A. P. Singh - Modern Algebra - Infostudy Publication, 2018.

SEMESTER II

PIMAD19 - INDEPENDENT ELECTIVE – II B: FINANCIAL MATHEMATICS

Objective

To introduce mathematical models to enhance the understanding of Mathematics of Finance and financial markets

Unit I - Geometric Brownian motion

Geometric Brownian Motion - Geometric Brownian Motion as a Limit of Simpler Models - Brownian Motion - Simple Problems.(Chapter 3: 3.1 – 3.3)

Unit II - Interest Rates and Present Value Analysis

Interest Rates - Present Value Analysis - Rate of Return - Continuously Varying Interest Rates - Simple Problems. (Chapter 4: 4.1 – 4.4)

Unit III - Pricing Contracts via Arbitrage and the Arbitrage Theorem

An Example in Options Pricing - Other Examples of Pricing via Arbitrage - The Arbitrage theorem - The Multi-period Binomial Theorem - Proof of the Arbitrage Theorem - Simple Problems.(Chapter 5: 5.1 – 5.2, Chapter 6: 6.1 – 6.3)

Unit IV - The Black-Scholes Formula

The Black-Scholes Formula - Properties of Black-Scholes Option Cost - The Delta Hedging Arbitrage Strategy - Some deviations: The Black-Scholes Formula - The Partial Derivatives – Simple Problems.(Chapter 7: 7.1 – 7.5)

Unit V - Valuing by Expected Utility

Limitations of Arbitrage Pricing - Valuing Investments by Expected Utility - The Portfolio Selection Problem - Value at Risk and Conditional Value at Risk - The Capital Assets Pricing Model - Mean Variance Analysis of Risk-Neutral-Priced Call Options - Rates of Return - Simple Problems.(Chapter 9: 9.1 – 9.7)

Text book:

1. Sheldon M. Ross. An Elementary Introduction to Mathematical Finance, 2nd Edition, Cambridge University press, 2005.

Books for Reference:

1. Joseph. Stampfli and Victor Goodman, The Mathematics of Finance Modeling and Hedging, Thomson Publishers, 2001.
2. Steven Roman, Introduction to Mathematics of Finance, Springer, 2004.

SEMESTER III
PCMAI19 – TOPOLOGY

Objective:
To generalize the concepts that the students have learnt in Real analysis and to train the students to develop analytical thinking.

Unit I: Topological Spaces

Topological spaces – Basis for a topology – Ordered topology – Product topology on X x Y- Subspace topology – Closed sets and limit points.
(Chapter 2: Sections 12 - 17)

Unit II: Continuous Functions
Continuous Functions – Metric topology (Chapter 2: Sections 18 and 21)

Unit III: Connectedness
Connected spaces – Connected subspaces of the Real line – Components and local connectedness (Chapter 3: Sections 23 - 25)

Unit IV: Compactness
Compact spaces – Compact sets in the Real Line – Limit point compactness – Local compactness (Chapter 3: Sections 26 - 29)

Unit V: Countability and Separation Axioms

Countability Axioms –Separation Axioms – Normal spaces –Uryshon Lemma –Uryshon Metrization - The Tietze Extension Theorem - The Tychonoff Theorem(Chapter 4: Sections 30
- 35, Chapter 5: Section 37)

Textbook:

1. James R. Munkres – Topology, 2nd Edition – Prentice Hall of India Pvt. Ltd., New Delhi, 2003.

Books for Reference:

1. Simmons G.F. - Introduction to Topology and Modern Analysis - McGraw Hill International Student Editions, 1963.
2. James Dugunji - General Topology – Prentice Hall of India, New Delhi, 2nd edition,1975.
3. M. D. Raisinghania, R. S. Aggarwal, Topology, S. Chand & Company Ltd, NewDelhi, 1980.
4. S. Kumaresan, Topology of Metric Spaces, Narosa Publishing House, New Delhi, 2006.

SEMESTER III

PCMAJ19 - GRAPH THEORY

Objective:

To impart the concepts of Graph theory and it's relevant applications to the students.

Unit I: Graphs and Sub graphs

Graphs and Simple Graphs - Graph Isomorphism - Incidence and adjacency Matrices – Subgraphs - Vertex degrees - Paths and connection - Cycles - The shortest path problem. (Chapter1: Sections 1.1 – 1.8)

Unit II: Trees and Connectivity

Trees - Cut Edges and Bonds - Cut Vertices - Cayley's Formula - The Connector problem- Connectivity – Blocks (Chapter2: Sections 2.1 - 2.5 and Chapter3: Sections 3.1-3.2)

Unit III: Euler Tours and Hamilton Cycles

Euler Tours-Hamilton Cycles - The Chinese postman problem - The travelling salesman problem (Chapter 4: Sections 4.1 - 4.4)

Unit IV: Matchings, Independent sets and Cliques

Matchings - Matchings and coverings in bipartite graphs - Perfect matching - The personnel problem - The assignment problem - Independent Sets (Chapter5: Sections 5.1 - 5.5 and Chapter7: Section7.1)

Unit V: Vertex colouring and Planar Graphs

Chromatic Number- Brook's theorem- Chromatic Polynomials- Plane and planar graphs - Dual graphs - Euler's formula - The Five Colour theorem and the Four-Colour Conjecture (Chapter8: Section 8.1,8.2 and 8.4, Chapter9: Sections 9.1 - 9.3 and 9.6)

Textbook:

1. J. A. Bondy and U.S.R.Murty - Graph theory and Applications, Macmillan 5th edition 1982.

Books for Reference:

1. Douglas B. West - Introduction to Graph Theory, 2nd Edition – Urbana, 2006.
2. Harary - Graph Theory, 1st Edition – Narosa Publising House, 1988.
3. S.Arumugam and S. Ramachandran - Invitation to Graph Theory – SciTech Publications Pt. Ltd., 2001.

SEMESTER III

PCMAK19 - CALCULUS OF VARIATIONS

Objective:
To use the theory, methods and techniques to solve problems

Unit-I: **Variational Problems with Fixed Boundaries**
The Concept of Variation and Its Properties- Euler's Equation- Variational Problems for Functionals of the Form- Functionals Dependent On Higher-Order Derivatives- Functionals Dependent on Functions of Several Independent Variables- Variational Problems in Parametric Form (Chapter 1: Sections 1.1-1.6)

Unit-II: Variational Problems with Fixed Boundaries (Continued)

Some Applications to Problems of Mechanics- Variational Problems Leading to an Integral Equation or a Differential-Difference Equation- Theorem of du Bois-Reymond- Stochastic Calculus of Variations- Supplementary Remarks(Chapter 1:Sections 1.7-1.11)

Unit-III: Variational Problems with Moving Boundaries

Functional of the from – Variational Problem with a Movable Boundary for a Functional Dependent on Two Functions- One-Sided Variations- Reflection and Refraction of Extremals- Diffraction of Light Rays(Chapter 2: Sections 2.1-2.5)

Unit-IV: Sufficient Conditions for an Extremum

Field of Extremals- Jacobi Condition- Weirstrass Function- Legendre Condition- Second Variation- Canonical Equations and Variational Principles - Complementary Variational Principles- Poisson Bracket (Chapter 4: Sections 3.1-3.8)

Unit-V: Direct Methods in Variational Problems

Introduction to Direct Methods – Euler's Method of Finite Difference – Rayleigh-Ritz Method - Galerkin Method – Methods of Projection - Finite Element Method (Chapter 6: Sections 6.1 to 6.6)

Textbook:

1. A.S. Gupta- Calculus of Variations with Applications-10th Printing –PHI Learning Private Limited, 1997.

Books for Reference:

1. Gelfand, J.M. and Fomin S.V.- Calculus of Varians - Prentice hall - New Jessy- 1963.
2. Weinstock - Calculus of Variation - McGraw Hall, 1952.

SEMESTER III

PCMAL19 - DIFFERENCE EQUATIONS

Objective:

To introduce the method of solving Difference equations which has its applications in other disciplines.

Unit I: The Difference Calculus

Genesis of Difference Equations - Definitions - Derivation of Difference equations - Existence and Uniqueness theorem - Operators Δ and E - Elementary difference operators - Factorial polynomials. (Chapter 1: Section 1.1 – 1.7)

Unit II: First Order Difference Equations

Introduction - General linear equation - $y_{k+1} - y_k = (n+1)k^n$ - $y_{k+1} = R_k y_k$ - continued fractions - $y_{k+1} - Ky_k = P_k$ (Chapter 2, Section 2.1 – 2.6)

Unit III: Linear Difference Equations

Introduction - Linearly independent functions - Fundamental theorems for Homogeneous equations - Inhomogeneous equations - Second order equations - Strum – Liouville difference equations (Chapter 3, Section 3.1 – 3.6)

Unit IV: Linear Difference Equations with Constant Coefficients

Introduction - Homogeneous equations - Construction of a difference equation having specified solutions - Relationship between linear difference and differential equations - (Chapter 4, Section 4.1 – 4.4)

Unit V: Stability Theory

A norm of matrix- Notations of Stability- Stability of Linear Systems- Phase space anlaysis- Global Stability of Nonlinear equations- (Chapter 4, section 4.1-4.4, Chapter 5, section 5.4).

Textbooks:

1. Ronald E.Mickens - Difference Equations – Theory and Applications – Second Edition - Van Nostrand Reinhold Company - Newyork, 1990. (Unit- I to IV)
2. Saber N. Elaydi - An Introduction to Difference Equations - Springer Verlag, Third Edition, 2005. (Unit- V).

Books for Reference:

1. Walter G.Kelly Allan C. Peterson - Difference Equations - An Introduction with Applications - Second Edition – Academic Press - USA, 2001.
2. S. Goldberg, Introduction to Difference Equations, Dover Publications, 1986.
3. V. Lakshmikantham and Trigiante, Theory of Difference Equations Numerical Methods and Applications, Second Edition, Academic Press, New York, 1988.

SEMESTER III

PEMAE19 - ELECTIVE III A: OPERATIONS RESEARCH

Objective:

To impart more knowledge in the field of Operations Research which plays an important role in Business management.

Unit I: Advanced topics in Linear Programming

The Revised simplex method – Duality Theory and Its Applications – The Dual Simplex method (Chapter 4: Sections 4.1- 4.3)

Unit II: Queuing Models

Introduction - An Example - General Characteristics – Performance Measures - Relations Among the performance Measures - Markovian Queuing Models – The M/M/1models – Limited queue capacity – Multiple servers – An Example - Finite sources. (Chapter 7: Sections 7.1 - 7.11)

Unit III: Inventory Models

Introduction – Deterministic models – Probabilistic Models (Chapter 8: Sections 8.1 - 8.14)

Unit IV: Dynamic Programming

Basic concepts –The Development of Dynamic Programming – Illustrative examples – Continuous state Dynamic Programming (Chapter 10: 10.1 - 10.12 omit 10.6)

Unit V: Non Linear Programming

Basic concepts – Unconstrained Optimization – Constrained Optimization Problems with Equality constraint.
(Chapter 11: 11.1 - 11.11 omit 11.3 and 11.11)

Textbook:

1. Ravindran A. Phillips D. T and Solberg J. - Operations Research: Principles and Practice, 2nd Edition - John Wiley and Sons Private Limited, 1987.

Books for Reference:

1. Hiller F.S. and Liberman G.J. - Introduction to Operations Research, 2nd Edition - CBS Publishers and Distributors, 1999.
2. S. D. Sharma - Operations Research, 15th Edition, Kedarnath and Ramnath Co. Publishers, 2003.
3. Hamdy A. Taha - An Introduction to Operations Research, 6th Edition - Prentice Hall Private Limited, 1997.

SEMESTER III

PEMAF19 – ELECTIVE III B: INDUSTRIAL MATHEMATICS

Objective:

- To introduce mathematical models for population dynamics, Economics, Finance, Medicine, Genetics and Probability using Differential equations and Difference equations
- To introduce classical optimization and dynamic programming methods which are useful for Cargo – loading model, work force size model equipment replacement model and investment model.

Unit I: Mathematical Modelling Through ODE

Population growth models – Logistic law of population growth - Compartment models - Diffusion of glucose in blood – Motion of a rocket – Orthagonal trajectories.

Unit II: Modelling Through System of ODEs

Prey – Predator models – Multi – Species model - age- structured population model - Pharmakinetics model – Models in Economics – Diabetics model – Arms race model

Unit III: Modelling Though Difference Equations

Basic theory of lines difference equations – Harrod model – Cobweb model - Samuelson's intersection model - Acturial Science model – models for population dynamics and genetics – Markov chains – Gambler ruin problem.

Unit IV: Classical Optimization Theory

Unconstrained problem – Newton – Raphson method – Jacobian method – Lagrangian method – Kuhn – Tucker conditions for NLP.

Unit V – Nonlinear Programming and Dynamic Programming

Direct search method – Gradient method – Quadratic programming – deterministic dynamic programming – Non-deterministic dynamic programming.

Textbooks:

1. J. N. Kapur - Mathematical Modeling - Wiley Eastern Ltd., New Delhi, 1988(Unit I-IV).
2. Hamdy A. Taha - Operations Research - 6th Edition, Prentice Hall of India, New Delhi, 1997(Unit V).

Books for Reference:

1. Shair Ahmad & M.Rama Mohana Rao – Theory of Ordinary Differential Equations with Applications in Biology and Engineering - Affiliated East–West Press Private Limited, New Delhi, 1999.
2. Avriel M. - Nonlinear Programming: Analysis and Methods - Prentice Hall Inc, 1st Edition, 2003.

SEMESTER III

PIMAE19 - INDEPENDENT ELECTIVE – III A: SKILL ENHANCEMENT IN REAL AND COMPLEX ANALYSIS - I

Objective:

To prepare the students to develop the in-depth knowledge in Analysis

Unit I: Set theory and Real Number System

Elementary Set Theory – Finite Countable and Uncountable Sets – Real Number System as a Complete Ordered Field – Archimedean Property – Supremum – Infimum.(Chapter 1: 1.1- 1.6)

Unit II: Sequences and Series

Sequences and Series – Convergence – lim sup – lim inf – Bolzano Weierstrass Theorem – Heine Boral Theorem.(Chapter 2: 2.1-2.5)

Unit III: Limit, Continuity and Differentiability and Mean Value Theorem

Continuity – Uniform Continuity – Discontinuity – Types of Discontinuity – Differentiability – Mean Value Theorem. (Chapter 3: 3.1-3.4)

Unit IV: Complex Numbers and Analytic Function

Algebra of Complex Number – The Complex Plane – Polynomials – Power Series – Transcendental Functions Such as Exponential, Trignometric and Hyperolic Funcitons- Analytic Function.(Chapter 11: 11.1-11.5)

Unit V: Complex Integration and Calculus of Residues

Contour integral – Cauchys Theorem – Cauchys Integral Formulae – Liouvilles Theorem – Maximum Modulus Principle.(Chapter 12: 12.1-12.4)

Book for Study:

1. Pawan Sharma, Neha Sharma, Suraj Singh, Mathematical Sciences, UGC CSIR NET/SET (JRF & LS), Arihant Publications(India) Ltd, 2016.

SEMESTER III

PIMAF19 - INDEPENDENT ELECTIVE – III B: FUNDAMENTAL OF RESEARCH METHODOLOGY AND STATISTICS - I

Objective:

To provide a clear understanding of basic concepts needed to enter inside the research activity for application oriented subjects

Unit I: Perception of Research and Assortment of Problem

Meaning of Research – General Characteristics of Research – Specific Characteristics of Research – Objectives of Research – Classification of Research – Types of Research – Reflective Thinking – Scientific Thinking – Characteristic of a Good Researcher – Characteristic of a Problem.

Unit II: Appraise of Related literature and Foundation of Hypothesis

Meaning of review of Literature – objective of review of literature – Sources of review of Literature – How to conduct of the review of the literature – Meaning of hypothesis – Observation versus specific Land general hypothesis – Variables in a hypothesis – Formal conditions for Testing hypothesis.

Unit III: Research Planning and Sampling, Survey Method

Meaning of Research plan/ Design – Meaning and definitions of Sampling – Functions of Population and sampling – Types of sampling design – Scientific Method – Types of Survey Studies.

Unit IV: Historical Method and Philosophical Method

Approaches of Historical Research – Functional History of Education – Writing the Report – Meaning of Philosophy – Philosophy of education – Procedure of Philososphy research in social sciences.

Unit V: Experimental method and Case Study

Meaning and definition of experiment – the basic assumptions behind the experiment – Types of variables – Classification of experiment or experimental procedures – definition of case study – Types of Case study – Case study of group.

Book for Study:

1. Yogesh Kumar Singh - Fundamental of Research of Methodology and Statistics - New Age International Publishers, 2007.

SEMESTER IV

PCMAM19 - FUNCTIONAL ANALYSIS

Objective:

To introduce the main structure theorems of functional analysis and to study the concepts of Banach and Hilbert spaces.

Unit I: Banach Spaces

Definitions and some examples – Holder's inequality – Minkowski's inequality - Continuous Linear Transformations – Riesz representation theorem - Hahn Banach theorem – (Chapter 9: Sections 46 - 48)

Unit II: Banach Spaces (Contd…)

Natural embedding on N in N^{**} - The Open Mapping Theorem – Closed graph theorem - Conjugate of an Operator – The Uniform boundedness theorem (Chapter 9: Sections 49 - 51)

Unit III: Hilbert Spaces

Definition and some simple properties – Schwarz inequality - Parallelogram law - Orthogonal complements – Orthogonal Sets – Bessel's inequality – Parseval's equations – Gram-Schmidt Orthogonalization Process (Chapter 10: Sections 52-54)

Unit IV: Hilbert Spaces (Contd…)

The Conjugate spaces H* - The Adjoint of an Operator – Self adjoint operators (Chapter 10: Sections 55-57)

Unit V: Hilbert Spaces (Contd…)

Normal operators- Unitary operators – Projection operators - Definitions and Theorems (Chapter 10: 58 and 59)

Text book:

1. Simmons G.F - Introduction to Topology and Modern Analysis - McGraw Hill Kogakusha Ltd., International Student Edition - 1963.

Books for Reference:

1. Somasundaram D. – A first course in Functional Analysis –Narosa Publishing House Pvt. Ltd., 2006, Reprint 2008. (Unit III, IV and V)
2. Bose S.C - Introduction to Functional Analysis - MacMillan India Ltd, Delhi, 1992.
3. Walter Rudin - Functional Analysis, 2nd Edition - Tata McGraw Hill Publication Co., New Delhi, 1977.

SEMESTER IV

PCMAN19 – NUMERICAL ANALYSIS

Objective:

To help the students to develop the skills in solving the Numerical problems which are used many applications of Mathematics.

Unit I: Solution to Numerical, Algebraic and Transcendental Equations
Introduction- Bisection Method- Method of successive approximation, False position- Newton's Iteration Method – Convergence of Newton- Horners Method- Descartes Rule of Signs- Graeffe's Root Squaring Method (Chapter 3: 3.1 to 3.11)

Unit II: Solving Sets of Equations
The Elimination Method – The Gaussian Elimination and Gauss Jordan Method – Iterative Method (Chapter 4: 4.2- 4.10)

Unit III: Interpolation and Curve Fitting
Lagrangian Polynomials – Divided Differences – Evenly Spaced Data – Polynomial Approximation of Surfaces – Getting Derivatives and Integrals Numerically (Chapter 5: 5.2 - 5.5)

Unit IV: Numerical Solution of Ordinary Differential Equations
The Taylor's Series method - Runge – Kutta Methods – Milne's method – The Adam's Moulton Method (Chapter 11: 11.4-11.6 and 11.13 to 11.20)

Unit V: Numerical solution to Partial Differential Equations
Introduction – Difference Quotients – Geometrical Representation of Partial Difference Quotients – Classification of Partial Differential Equations – Elliptic Equations – Solution to Laplace's Equation by Liebmann's iteration process – Poisson's Equation and its solutions – Crank – Nicholson method – Hyperbolic equations (Chapter 12: 12.1-12.7, 12.8.2, 12.9)

Text book:
V.N. Vedamurthy N. Ch. S. N. Iyengar – Numerical Methods – Vikas Publishing Houe Pvt. Ltd, 2000.

Books for Reference:

1. Curtis F. Gerald, Partick . O. Wheatley – Applied Numerical Analysis, 5th Edition – Pearson Education, New Delhi, 2005.
2. R.L. Burden, J. Douglas Faires – Numerical Analysis – Thompson Books, USA, 2005.
3. S.S. Sastry – Introductory Methods of Numerical Analysis – Prentice Hall of India Pvt. Ltd., New Delhi, 2001.
4. M.K. Jain, S.R.K.Iyengar, R.K.Jain – Numerical Methods for Scientific and Engineering Computation, 3rd Edition – Wiley Eastern Ltd, New Delhi 1993.

SEMESTER IV
PCMAO19 – MATHEMATICAL STATISTICS

Objective:

To help the students solve statistical problems by means of probability theory which is used in all fields of scientific experimentation.

Unit I: Probability

The concept of a random variable-The distribution function-Random variables of the discrete type and the continuous type-Function of random variables-Multidimensional random variable - Marginal and conditional distributions - Independent random variables - Functions of Multi dimensional random variables (Chapter 2: Sections 2.1 to 2.9)

Unit II: Parameters of the Distribution of a Random Variable and Characteristic Functions

Expected values – Moments- The Chebyshev Inequality- Properties of Characteristic function - The characteristic function and moments - Semi-invariants - Determination of the distribution function by the characteristic function (Chapter 3: Sections 3.1 - 3.3 and Chapter 4: Sections 4.1 - 4.3 and 4.5)

Unit III: Limits Theorems

Preliminary remarks - Stochastic convergence - Bernoulli's law of large numbers - The convergence of a sequence of distribution functions - The Riemann - Stieltjes integral - The Levy- Cramer theorem - The de Moivre- Laplace theorem - The Lindeberg-Levy theorem - The Lapunov theorem. (Chapter 6: Sections 6.1 - 6.9)

Unit IV: Theory of Estimation

Theory of Estimation – Preliminary notions – consistent estimate- unbiased estimate – sufficiency – efficiency – asymptotically most efficient estimate – Methods of finding estimates (Chapter 13: Sections 13.1 to 13.7)

Unit V: Design of Experiments

One way Classification - Multiple classification - The power function and the OC function - Most powerful tests - Uniformly most powerful tests(Chapter 15: Sections 15.1 to 15.2, Chapter 16: 16.2-16.4)

Textbook:

1. Marek Fisz - Probability Theory and Mathematical Statistics, 3rd Edition- John Wiley and
   Sons Inc, 1963.

Books for Reference:

1. Suddhenda Biswas and G. L. Sriwastav – Mathematical Statistics – Narosa Publishing House, 2011.
2. Alexander M. Mood, Franklin A.Graybill and Duane C.Bose – Introduction to Theory of Statistics, 3rd Edition - Tata McGraw Hill, 1974.
3. P. Kandasamy, K. Thilagavathy and K. Gunavathy - Probability, Statistics and Queuing Theory, 2nd Edition - Sultan Chand and Sons, 2005.

SEMESTER IV

PEMAG19 – ELECTIVE IV A: OBJECT ORIENTED PROGRAMMING WITH C++

Objective:

To introduce the students to the concept of object oriented programming. There by reducing the design complexity and increasing the reusability of a component.

Unit I:

Principles of OOP – Basic concepts – Benefits – Applications – Introduction to C++ - Tokens
– Keywords – Identifiers – Variables – Operators – Expressions and Control Structures.

Unit II:

Classes and Objects – Constructors and Destructors – Operator overloading – Type conversions

Unit III:

Functions – Function prototyping – Parameter passing in function – Values returned by functions – Inline functions– Function overloading.

Unit IV:

Inheritance – Types – Virtual functions and polymorphism – Constructors in Inheritance – Mapping Console I/O operations

Unit V:

Files – File streams – File operations – File pointers – command line arguments

Text books:

1. Balagurusamy E. - Object Oriented Programming with C++ - Tata McGraw Hill Publication, 2001.
2. Robert Lafore - Object Oriented Programming in Microsoft C++ - Galgotia Publication, 1995.

Books for Reference:

1. Herbert Schildt - The Complete Reference C++, Edition III - Tata McGraw Hill Publication, 1999.
2. John R.Hubbard – Programming with C++, Edition II – Schaum's Outlines, Tata McGraw Hill Publication, 2006.
3. Yashawant P.Kanetkar – Let Us C++ - BPB Publication, 2005.
4. H.M. Deitel, P.J.Deitel – C++: How to Program, Edition III, Pearson Education Asia 2001.
5. Sourav Sahay – Object Oriented Programming with C++, Oxford University Press, 2006.

SEMESTER IV

PEMAH19 – ELECTIVE PRACTICAL: PROGRAMMING WITH C ++

1. Program to calculate the mean, variance and standard deviation of n numbers
2. Program to check whether the given number is prime or not
3. Program to find GCD and LCM of N numbers
4. Program to implement String Manipulation using Built in Functions
5. Program using inline functions
6. Program to generate Fibonacci series
7. Program to implement Function Overloading
8. Program to implement Constructors and Destructors
9. Program to implement Operator overloading
10. Program to generate random numbers (any one method)

SEMESTER IV

PEMAI19 - ELECTIVE IV B: PROGRAMMING WITH JAVA

Objective:
To learn a new platform independent language.

Unit I:

Basic Concepts of Object Oriented Programming – Benefits of OOP – Applications of OOP - Features of Java – Java Differs from C and C++ - Java environment – Java program structure – Tokens – Statements – Java programming style(Chapter 1:1.3 – 1.5, Chapter 2: 2.2-2.3 and 2.9, Chapter 3:3.5 – 3.7 and 3.12)

Unit II:
Constants – Variables – Data types – Declaration of variables – Giving values to variables – Scope of variables – Symbolic constants – Type casting – Getting values of variables – Standard default values – Operators: Arithmetic, relational, logical, assignment, increment and decrement, conditional bitwise and special – Arithmetic expressions – Evaluation of expressions – Operator precedence and associativity – Mathematical functions.(Chapter 4:4.2
– 4.11, Chapter 5: 5.2 – 5.11, 5.14 – 5.15)

Unit III:
Decision making statements: if, simple if, if … else, nesting of if … else, else if ladder, switch statements and conditional operator – Loop statements: while, do, for – jumps in loops, labeled loops.(Chapter 6: 6.2 – 6.9, Chapter 7: 7.2 – 7.6)

Unit IV:
Defining a class – Fields declaration – Methods declaration – Creating objects – Accessing class members – Constructors – Methods overloading – Static members – Nesting of methods - Inheritance – overriding methods – Final variables, methods and classes, Finalizer methods - Abstract methods and classes - Methods with varargs – Visibility control.(Chapter 8: 8.2 – 8.18)

Unit V:
One and two dimensional arrays – Strings – Vectors – Wrapper classes – Enumerated types – Annotations – Defining interfaces – Extending interfaces - implementing interfaces – Accessing interface variables.(Chapter 9: 9.2 – 9.9, Chapter 10: 10.2 – 10.5)

Text book:

1. E. Balagurusamy – Programming with Java – Tata McGraw Hill Publication, 3rd Edition, 2007.

Books for Reference:

1. K. Arnold and J. Gosling – The Java Programming Language – Ed. 2, Publication 2000.
2. Cays Horstmann and Gary Cornell – Core Java Volume II, Publications 2001.
3. Phil Hanna – JSP 2.0: The Complete Reference – TMH, Edition 2, Publications 2003

SEMESTER IV

PEMAJ19– ELECTIVE PRACTICAL: JAVA

1. Solution of linear equations
2. Number and sum of integers between two given integers which are divisible by a number
3. Multiplication table
4. Verifying whether a given number is a palindrome
5. Generation of Fibonacci Sequence
6. Sorting an array
7. Merging two sorted arrays
8. Product of two matrices
9. Transpose of a matrix
10. Replacing a substring with another

SEMESTER IV

PCMAP19 – PROJECT

It should be done individually under the guidance of one of the Faculty members. The Dissertation should be submitted before 31st March. The students should present their research work during the viva-voce.

SEMESTER IV

PIMAG19 - INDEPENDENT ELECTIVE – IV A: SKILL ENHANCEMENT IN REAL AND COMPLEX ANALYSIS - II

Objective:

To prepare the students to develop the in-depth knowledge in Analysis

Unit I: Functions of Several Variables

Functions of Several Variables – Directional Derivative – Partial Derivative – Derivative as a Linear Transformation. (Chapter 4: 4.1- 4.4)

Unit II: The Riemann Integral and Improper Integral

Riemann Sum and Riemann Integral - Improper Integral – Sequences and Series of Function
– Uniform Convergence.(Chapter 5: 5.1-5.2)

Unit III: Function of Bounded Variation, Lebesgue Measure and Metric Space

Function of Bounded Variation – Lebesgue Measure – Lebesgue Integral – Metric Space – Connectedness – Compactness – Normal Linear Space.(Chapter 7: 7.1-7.6)

Unit IV: Complex Integration and Calculus of Residues

Schwartz Lemma – Open Mapping Theorem – Taylor Series – Laurents Theorem Calculus of Residues.(Chapter 12: 12.5-12.7)

Unit V: Conformal Mapping

Conformal Mapping – Mobius Transformation.(Chapter 13: 13.1-13.2)

Book for Study:

1. Pawan Sharma, Neha Sharma, Suraj Singh, Mathematical Sciences, UGC CSIR NET/SET (JRF & LS), Arihant Publications(India) Ltd, 2016.

SEMESTER IV

PIMAH19 - INDEPENDENT ELECTIVE – IV B: FUNDAMENTAL OF RESEARCH METHODOLOGY AND STATISTICS - II

Objective:

To provide a clear understanding of basic concepts needed to enter inside the research activity for application oriented subjects

Unit I: Genetic method and Design of Experiments

Meaning of Genetic Research – Types of Genetic research – Problems of Genetic research – Diagnosis and Prognosis – Needs and Purpose of Experimental design – Types of basic experimental design.

Unit II: Tools of Research and collection of Data

Questionnaire – Preparing and administering the questionnaire – Characteristics of a Good questionnaire – Characteristic of a Good schedule – Need for data collection – Difference between facts and data – Characteristics of quantitative data.

Unit III: Analysis of data and Research Report

Need for analysis of data or Treatment of data – Statistical analysis of data – Planning for data analysis – Level of significance – The research report – General format of research report.

Unit IV: Action Research and Presentation of Statistical Data

Meaning of Action Research – Objective of educational research – Types of education research – Steps of research – Method of organizing and presenting data - The graphical presenting of ungrouped data.

Unit V: Measurement of Central Tendency and Measures of Variability

Arithmetic Mean – Median – Mode – Different measures of variability of dispersion – Standard deviation – Correlation.

Book for Study:

1. Yogesh Kumar Singh – Fundamental of Research of Methodology and Statistics – New Age International Publishers, 2006.

M.Sc. PHYSICS

(Effective for the students admitted from the Academic Year 2019-2020)

The Course of Study and the Scheme of Examinations

Sem	Code	Title of the Paper	Hours / Week	Exam		Credits	Marks
				Th	Pr		
I	PCPHA19	Mathematical Physics – I	6	3	-	5	40+60
	PCPHB19	Classical Mechanics	6	3	-	5	40+60
	PCPHC19	Statistical Mechanics	6	3	-	4	40+60
	PCPHG19	Practical I: General	3	-	-	-	-
	PCPHH19	Practical II: Electronics	3	-	-	-	-
	PEPHA19	Elective I A: Electronic Devices and Applications	6	3	-	4	40+60
	PEPHB19	Elective I B: Electronic Communication Systems.					
	PIPHA19	IEP: Physics For Set/Net	-	-	-	2	40+60
	PIPHB19	IEP: Astro Physics					
Total			**30**			**20**	**500**
II	PCPHD19	Mathematical Physics – II	6	3	-	5	40+60
	PCPHE19	Electromagnetic Theory	6	3	-	5	40+60
	PCPHF19	Quantum Mechanics – I	6	3	-	4	40+60
	PCPHG19	Practical I: General	3	-	4	4	40+60
	PCPHH19	Practical II: Electronics	3	-	4	4	40+60
	PEPHC19	Elective II A: Crystal Growth and Nano Science	4	3	-	4	40+60
	PEPHD19	Elective II B:.Electronic Instrumentation					
	PNHRA16	Human Rights	2	3	-	2	40+60
	PIPHC19	IEP: Physics For Set/Net - Paper II	-	-	-	2	40+60
	PIPHD19	IEP: Medical Physics and Instrumentation Techniques					
Total			**30**			**30**	**800**

Sem	Code	Title of the Paper	Hours/ Week	Exam		Credits	Marks
				Th	Pr		
III	PCPHI19	Spectroscopy	6	3	-	4	40+60
	PCPHJ19	Quantum Mechanics –II	6	3	-	4	40+60
	PCPHK19	Microprocessor and Micro-controller	6	3	-	4	40+60
	PCPHO19	Practical III: General	4	-	-	-	-
	PCPHP19	Practical IV: Microprocessor, Microcontroller & C-Programming	4	-	-	-	-
	PEPHE19	Elective III A: Numerical Methods and C Programming	4	3	-	4	40+60
	PEPHF19	Elective III B: Advanced Optics					
	PGTRA16	Teaching and Research Aptitude		3	-	3	40+60
	PIPHE19	IEP: Physics For Set/Net - Paper III	-	-	-	2	40+60
	PIPHF19	IEP: Numerical Methods & Research Methodology					
Total			**30**			**21**	**600**
IV	PCPHL19	Material Science and Laser Physics	6	3	-	5	40+60
	PCPHM19	Nuclear Physics and Particle Physics	6	3	-	4	40+60
	PCPHN19	Condensed Matter Physics	6	3	-	4	40+60
	PCPHO19	Practical III: General	4	-	3	4	40+60
	PCPHP19	Practical IV: Microprocessor, Microcontroller & C-Programming	4	-	3	4	40+60
	PEPHG19	Elective IV A: Fibre Optics and Non-Linear Optics	4	3	-	4	40+60
	PEPHH19	Elective IV B: Advanced Material Science					
	PIPHG19	IEP: Physics for Set/Net - Paper III	-	-	-	2	40+60
	PIPHH19	IEP**:** Advanced Nuclear Physics & Spectroscopy					
Total			**30**			**27**	**700**

Grand Total				**98**	**2600**

SEMESTER I

PCPHA19 - MATHEMATICAL PHYSICS - I

Objective:
To inculcate to the students the mathematical concepts for solving physical problems which arise in many branches of Physics.

Unit I: Vector Analysis
Vector Field - Orthogonal curvilinear co-ordinates – Spherical and cylindrical coordinate systems – expression for gradient, divergence, curl and Laplacian co-ordinates – Stoke's and Gauss theorems – simple applications of Stokes and Gauss theorem - Vector Space – Linear independence, basis and dimension – Inner product – Orthonormality and Completeness - Schwartz inequality – Orthonormal basis – Gram-Schmidt process.

Unit II: Matrix Theory
Introduction – Types of matrices – Determinants – Co-factors – Minor of a matrix – Characteristic equation of a matrix – Eigen values and eigen vectors – Theorems on eigen values and eigen vectors – Cayley-Hamilton's theorem – Inverse of a matrix – Diagonalization of matrices.

Unit III: Differential Equations
Ordinary differential equations – Wronskian method – Series solutions – Second order linear differential equations – Power series – Sturm – Liouville theory – Applications.

Unit IV: Special Functions
Series solutions – Generating functions – Rodrigues formula – Orthogonal properties for Bessel, Legendre and Hermite polynomials.
Recurrence relations:
(i) $xJ'_n(x) = nJ_n(x) - xJ_{n+1}(x)$

(ii) $xJ'_n(x) = -nJ_n(x) + xJ_{n-1}(x)$
(iii) $2J'_n(x) = J_{n-1}(x) - J_{n+1}(x)$

(iv) $nP_n(x) = (2n-1)xP_{n-1}(x) - (n-1)P_{n-2}(x)$

(v) $P'_{n+1}(x) - P'_{n-1}(x) = (2n+1)P_n(x)$

(vi) $H'_n(x) = 2nH_{n-1}(x)$
(vii) $2xH_n(x) = 2nH_{n-1}(x) + H_{n+1}(x)$

Unit V: Green's Function
Dirac-delta function – Green's function – One dimensional Green's function - Boundary conditions – Eigen function – Expansion of Green's function – Reciprocity theorem – Sturm-Liouville type equations in one dimension and their Green's functions.

Books for Study:

1. Sathyaprakash – Mathematical Physics – S.Chand & Sons, Reprint 2006.
2. B.D.Gupta – Mathematical Physics, 3rd Edition - Vikas Publishing House Pvt. Ltd., 2004.

3. E. Kreyszig - Advanced Engineering Mathematics, 8th Edition - Wiley, New York, 1999.
4. H.K. Dass – Mathematical Physics - S.Chand, Reprint 2007.

Books for Reference:

1. P.R. Halmos - Finite dimensional Vector Spaces, 2nd Edition - Affiliated East – West, New Delhi, 1965.
2. C.R. Wylie and LC. Barrett - Advanced Engineering Mathematics, 6th International Edition - McGraw Hill, New York, 1995.
3. P.K. Chakrabarti and S.N. Kundu - A Textbook of Mathematical Physics - New Central Book Agency, Kolkata, 1996.
4. A.K. Ghatak, I.C. Goyal and S.H. Chua - Mathematical Physics - Macmillan India, New Delhi, 2002.
5. M.D. Greenberg - Advanced Engineering Mathematics, 2nd Edition - International Ed., Prentice Hall International, New Jersey, 1998.
6. P.K. Chattopadhyay - Mathematical Physics - Wiley Esatern, Madras, 1990.
7. S. Lipschutz - Linear Algebra - Schaum's Series, McGraw Hill, New York, 1987.
8. G. Arfken and H.J. Weber - Mathematical Methods for Physics, 5th Edition - Harcourt (India), New Delhi, 2001.

SEMESTER I

PCPHB19 - CLASSICAL MECHANICS

Objectives:

- To make the students understand the different transformations that governs the classical mechanics.

Unit I: Rigid Body Dynamics

Introduction – Rectangular Cartesian system – Plane, Spherical and Cylindrical polar coordinates - Angular momentum, rotational kinetic energy and moment of inertia of a rigid body – Euler's angles – Euler's equations of motion –Torque free motion of a rigid body - Motion of a symmetrical top under the action of gravity.

Unit II: Lagrangian and Hamiltonian Formulations

Newton's equation and conservation laws for system of particles – Constraints – Generalized co-ordinates – Principle of Virtual work – D'Alembert's Principle – Lagrange's equation from D'Alembert's Principle – Procedure for formation of Lagrange's equation – Kinetic energy in generalized coordinates – Lagrange's equation from Hamilton's Principle - Hamilton's equations - Δ variations - Principle of least action – applications (Atwood's Machine, Compound pendulum and LC circuit)

Unit III: Canonical Transformations

Introduction – Canonical Transformations and their generators - Lagrange and Poisson Brackets notation – Problems on canonical transformation (Simple Harmonic Oscillator, proof of invariance of Poisson's Bracket under canonical transformations) - Infinitesimal contact transformation.

Unit IV: Hamilton–Jacobi Theory

Hamilton–Jacobi equations – Hamilton's Characteristic function – Physical Significance - Action Angle variables - Linear Harmonic Oscillator problem by Hamilton Jacobi method and Action angle variables - Hamilton Jacobi method and Motion of a particle in a plane under a central force - Application to Kepler's problem based on Hamilton Jacobi method and Action angle variables.

Unit V: Small oscillations

Introduction – General theory of small oscillations – Secular equations and eigen value equations – solution to eigen value equations – one dimensional oscillator – The Lagrangian of one dimensional oscillator and its solution – Two coupled oscillators – Lagrangian equation of two coupled oscillators and its solution – Example of two coupled oscillator: Two coupled pendulum – vibrations of linear triatomic molecule.

Books for Study:

1. Gupta Kumar and Sharma - Classical Mechanics, 2nd Edition - Pragati Prakasan, Meerut, 2006.
2. B.D. Gupta and Sathya Prakash - Classical Mechanics - Kedar Nath, Ram Nath, 2003.
3. J.C. Upadhyaya - Classical Mechanics - Himalaya Publishing House, Reprint 2003.

Books for Reference:

1. H. Goldstein - Classical Mechanics, 3rd Edition - C. Poole and J. Safko, Pearson Education, Asia, New Delhi, 2002.
2. S.N. Biswas - Classical Mechanics - Books and Allied Ltd., Kolkata, 1998.
3. K. Huang - Statistical Mechanics - Wiley Eastern Ltd., New Delhi, 1975.
4. B.K. Agarwal and M. Eisner - Statistical Mechanics, 2nd Edition - New Age International, New Delhi, 1998.
5. J.K.Bhattacharjee - Statistical Mechanics: An Introductory Text - Allied Publication, New Delhi, 1996.
6. L.D. Landau and E.M. Lifshitz – Mechanics - Pergomon Press, Oxford, 1969.
7. C.R.Mondal - Classical Mechanics - Prentice Hall of India, New Delhi, 2009.
8. L.P. Kadanoff - Statistical Physics: Statics, Dynamics and Renormalization - World Scientific, Singapore, 2001.
9. M. Glazer and J. Wark - Statistical Mechanics - Oxford University Press, 2001.

SEMESTER I

PCPHC19 - STATISTICAL MECHANICS

Unit I: Thermodynamics

Thermodynamic potentials, Phase equilibrium – Gibb's phase rule – Entropy of mixing and Gibb's paradox- Phase transition and Ehrenfest's Classification – Landau theory of Phase transition – Critical indices – Scale transformation and dimensional analysis.

Unit II: Ensembles

Phase space - Microcanonical ensembles - Trajectories and density of states Liouville's theorem - Canonical and grand canonical ensembles – Partition function – Calculation of statistical quantities - Energy and density fluctuations.

Unit III: Maxwell-Boltzmann statistics and Bose-Einstein statistics

Postulates of classical and quantum statistics – Density of matrix – Statistics of indistinguishable particles – Maxwell- Boltzmann distribution function – Broadening of spectral lines - Bose-Einstein statistics – Bose-Einstein distribution of gas – Equation of states – Bose - Einstein condensation – Landu's theory of Liquid Helium II – black body

radiation.

Unit IV: Fermi-Dirac statistics

Fermi-Dirac distribution – Equation of states – Free electron gas in metals – Heat capacity – Pauli's paramagnetism – Thermionic emission.

Unit V: Ising model and fluctuations

Ising model – Mean field theories of the Ising model in three, two and one dimension – Exact solutions in one dimension - Correlation of space-time dependent fluctuations – Fluctuations and transport phenomena – Brownian motion – Langevin theory – Fluctuation-dissipation theorem – The Fokker- Planck equation.

Books for study:

1. Gupta, Kumar and Sharma – Statistical Mechanics - Pragati Prakasan, 21st Ed., 2006
2. Sathya Prakash and J.P Agarwal - Statistical mechanics - Kedar Nath Ram Nath, 2005.
3. Sathya Prakash and T. P. Agarwal - Thermodynamics, statistical physics and kinetics
4. K. Srivastava and J. Ashok - Statistical mechanics - Prentice-Hall of India Pvt. Ltd., 2005.
5. Brij lal, Dr. N. Subrahmanyam, P.S. Hemne - Heat Thermodynamics and Statistical Physics -S.Chand.
6. Dr. D. Jayaraman, Dr. K. Ilangovan - Thermal Physics and Statistical Mechanics – Viswanathan(Publishers).

Books for reference:

1. Statistical mechanics and properties of matter – E.S.R. Gopal
2. Statistical physics – L.D. Landau and E. M. Lifshitz

SEMESTER I
PEPHA19 - ELECTIVE – I A: ELECTRONIC DEVICES AND APPLICATIONS

Objectives:

- To teach the students the methods of the fabrication of digital circuits and the devices used in the design of digital systems.
- To understand the principles of operational amplifier and its applications and digital communication.

Unit I: Fabrication of IC and Electronic Devices

Fabrication of IC – Monolithic integrated circuit fabrication – Intergrated circuit logic – DCTL – RCTL – DTL – TTL – Schottky TTL – ECL – I^2L – P and NMOS Logic – CMOS Logic – Tristate logic circuits.

Introduction – Construction – Working - Characteristics of JFET, UJT and SCR.

Applications – JFET as a Buffer amplifier, UJT as a relaxation oscillator and SCR for power control.

Unit II: Opto Electronic Devices

Light sources and Displays – Light emitting diodes – Surface emitting LED – Edge Emitting LED – Seven segment display – LDR – Diode – Basic parameters – Photo diodes – p-i-n Photo diode – Solar cells – Photo transistors – IR and UV detectors.

Unit III: 555 Timer and Applications

555 Timer – Description – Monostable operation – Frequency divider – Astable operation – Schimitt trigger – Phase Locked Loops – Basic principles – Analog phase detector – Voltage Controlled Oscillator – Voltage to Frequency conversion

Unity IV: Op-Amp Applications

Instrumentation amplifier – V to I and I to V converter – Op-amp circuits using diodes – Sample and Hold circuits – Log and Antilog amplifiers –Multiplier and Divider – Electronic analog Computation – Solution to simultaneous equations and differential equations - Schimitt Trigger – Astable, Monostable Multivibrator – square, Triangular and Saw tooth wave generators – RC Active filters – Low pass, High pass and Band pass filters.

Unit V: Digital Electronic Devices

Binary adder/subtractor – Multiplexer and Demultiplexer – Counters: Binary Counter – BCD Counter – Parallel Counters. D/A Converters: Binary Weighted Resistor method and R-2R Ladder method. A/D Converters: Counter type, Successive Approximation and Dual Slope method.

Books for Study:

1. V.Vijayendran - Introduction to Integrated Electronics, S.Viswanathan (Printers & Publishers), Pvt. Ltd., 2007.
2. Amar K.Ganguly - Optoelectronic Devices and Circuits - Narosa Publishing House, 2007.
3. D. Roy Choudhury - Linear Integrated Circuits - Wiley Eastern, New Delhi, 1991.
4. P. Bhattacharya - Semiconductor Optoelectronic Devices, 2nd Edition – Prentice Hall of India, New Delhi, 2002.
5. R.A. Gaekwad - Op-Amps and Integrated Circuits EEE, 1994.

Book for Reference:

1. R.F. Coughlin and F.F, Driscol - Op-Amp and Linear Integrated Circuits, Prentice Hall of India, New Delhi, 1996.
2. M.S.Tyagi - Introduction to Semiconductor Devices - Wiley, New York, 2014.
3. Deboo/ Burrous - Integrated circuits and Semiconductor Devices – Theory and Application, McGraw Hill, New Delhi, 1985.
4. Ramakant Gaekwad - Operational Amplifiers - Wiley Eastern, New Delhi, 1981.
5. S.M. Sze - Semiconductor Devices - Physics and Technology, Wiley, New York, 1985.
6. Millman and Halkias - Integrated Electronics – McGraw Hill, New Delhi.

SEMESTER I

PEPHB19 – ELECTIVE I B: ELECTRONICS COMMUNICATION SYSTEMS

Objectives:

- To make the students acquire knowledge about electronic communication systems.
- To impart to the students the basic understanding of wireless net-work system.

Unit I: Signal Encoding Techniques

Antennas: types - Propagation modes – Line of sight transmission - fading in the mobile environment – signal encoding techniques: criteria- ASK – FSK – BFSK – MFSK – PSK – BPSK – QPSK –multilevel PSK – AM modulation – Angle modulation – PCM – delta and adaptive delta modulation.

Unit II: Coding and Error Control
Error detection – Parity check – cycle redundancy check – block error correction codes – hamming code – cyclic codes – BCH code – reed – Solomon codes – block interleaving – convolution codes – decoding – turbo coding – automatic repeat request – flow control – error control

Unit III: Satellite Communication
Satellite parameters and configurations – Satellite orbits – GEO – MEO – LEO – frequency bands – transmission impairments – Satellite foot print – atmospheric attenuation – satellite network – configuration – capacity allocation – multiplexing : FDM and TDM.

Unit IV: Cellular Wireless Networks
Principles of cellular networks : Organization – frequency reuse – operation – mobile radio propagation effects – hand-off – power control – traffic engineering – first generation analog – AMPS – second generation – TDMA – mobile wireless TDMA design consideration – CDMA – mobile wireless CDMA design considerations – Soft handoff –IS 95 – Third generation systems – wireless local loop.

Unit V: Wireless LANS
Overview: Wireless LAN applications – wireless LAN requirements – wireless LAN technology – Infrared LANS – spread spectrum LANS – narrow band microwave LANS – IEEE 802 architecture – IEEE 802.11 architecture.

Books for Study and Reference:

1. William Stallings – Wireless Communications and Networks –Pearson Education, Asia, 2002.
2. Robert J. Schoenbeck - Electronic Communications, Modulation and Transmission – Prentice Hall of India, 1999.
3. P. Gnanasivam - Telecommunication Switching and Networks – Prentice Hall of India, 2004.

SEMESTER I

PIPHA19 – INDEPENDENT ELECTIVE I A: PHYSICS FOR SET/NET - PAPER I

Objective:

To impart knowledge about Classical Mechanics, Electronics and Statistical Mechanics for competitive Examinations.

Unit I: Classical Mechanics
Dynamical systems - Phase space dynamics – Euler's angles and Euler's equation of motion - Lagrangian and Hamiltonian formalism and equations of motion - Conservation laws and cyclic coordinates - Principle of least action – Poisson's Bracket - Canonical transformations - Hamilton Jacobi theory – Linear harmonic oscillator problem – Action angle variables - Small oscillations - Normal modes - Linear triatomic molecule. Classical statistics – Ensembles, Liouville's theorem - Quantum statistics - Maxwell-Boltzmann - Bose-Einstein - Fermi-Dirac.

Unit II: Electronics - I

Semiconductor devices – Diodes – Rectifiers – Filters - Transistors, FET, UJT - Optoelectronic devices - Solar cells, photo detectors - LEDs structure – Characteristics - Frequency dependence and applications. Op-Amp and their applications -

Unit III: Electronics – II

Amplifiers - Oscillators – Logic circuits & logic families - Flip flops - Registers - Counters and Comparator circuits - A/D and D/A converters - Op-Amp based instrumentation amplifier – Feedback - Filtering and noise reduction - Shielding and grounding - 555 timer – IC 565- Lock-in detector - Modulation techniques. Elementary ideas of Microprocessor and Microcontroller – Transducers – Temperature/ Pressure/Vacuum magnetic fields - Vibration - Optical detectors - Solar cells - Photo detectors - LED's - Digital techniques and applications.

Unit IV:

Thermodynamics:

Equation of state for various thermodynamics systems – laws of thermodynamics – thermodynamic potentials – phase equilibrium – Gibbs phase rule – phase transitions and Dia, para and ferromagnetism - Ehrenfest's classification.

Classical Statistical Mechanics:

Phase space, micro and macro states - Micro-canonical - Canonical and Grand canonical ensembles and partition function - Statistical ensemble – Statistical postulates – Probability calculations – Partition function and their properties – Calculation of statistical quantities – Langevin's theory of paramagnetism.

Unit V: Quantum Statistical Mechanics:

Postulates of Quantum statistical mechanics – Density operator and matrix – Properties of ideal Bose & Fermi gases - Bose-Einstein condensation - Cluster expansion for a classical gas – Virial equation of state - Ising model – One dimensional Ising model – Correlation of space – Time dependent fluctuations – Brownian motion – Black body radiation and Plank's radiation law.

Books for study:

1. J.C. Upadhyaya – Classical Mechanics, Himalaya Publishing house, Reprint 2017.
2. J.D. Jackson – Classical Electrodynamics, Willey Eastern Ltd., New Delhi, 1975.
3. R.A. Gaekwad – Op-Amps and Integrated circuits – EEE, 2012.
4. D. Roy Choudary and Shail B. Jain – Integrated Circuits – New Age International Publishers 2011.
5. V. K. Mehta and Rohit Mehta– Principles of Electronics – S. Chand & Co., New Delhi, Reprint 2014.
6. SathyaPrakash – Statistical Mechanics (1994) – Kedar, Meerut, 1994.
7. F. Reif – Fundamentals of Statistical and Thermal Physics – McGraw Hill, Auckland 1965.
8. S.K. Sinha -Introduction to Statistical Mechanics – Alpha Science International,2005

Books for reference:

1. H. Goldstein – Classical mechanics, 3rd Ed., C. Poole and J. Safko, Pearson Education, Asia, New Delhi, 2015.
2. S.M. Sze – Semiconductor Devices: Physics and Technology – Wiley, New York, 1985.
3. Sathyaprakash – Statistical Mechanics, Kedar Publications, Meerut, 2017.

4. R.K. Pathria, Paul D.Beale,– Statistical Mechanics – Butterworth Heinemann, UK, 1996

SEMESTER I
PIPHB19 - INDEPENDENT ELECTIVE I B: ASTROPHYSICS

Objectives:

- To make the students acquire the knowledge about the universe
- To provide a clear understanding of Astro Physics

Unit I: Solar system

Basic ideas of the Solar system - Geo-centric theory – Helio-centric theory –Kepler's laws of gravitation – Newton's law of gravitation – Physical processes in the solar system - dynamics of the solar system -physics of planetary atmospheres - individual planets; comets, asteroids, and other constituents of the solar system - extra-solar planets - formation of the solar system, stars, and planets.

Unit II: The Sun

The sun – A typical star - Helioseismology - Temperature distribution near the photosphere – Limb darkening - Chromospheres – Spicules, plages and filaments - Solar granulation — Solar corona – Prominences - Solar flares - Radio emission from the sun – Solar wind – Pyrheliometer.

Unit III: The Stars

Stars – General Distances to stars - Stellar masses and radii – Measuring of masses and stellar radii - Colour index of stars – Stellar Evolution – Birth of a star – Maturity – Ageing of stars – Death of a star –Types of Stars – Binary, multiple , variable, erupting and exploding stars – Interstellar medium: Nebulae – Novae – Super Novae – White Dwarfs - Electrons in white Dwarfs – Neutron stars– Pulsars – Quasars – Black holes.

Unit IV: The Galaxy

The Galaxy - Hubble's law – Schematic representation of the general structure of galaxy – The nucleus, the galactic disk and the galactic halo – Dark matter - Milky way - Hubble classification of galaxies-Spiral galaxies - Elliptical galaxies - Irregular galaxies - Dwarf galaxies - Masses of galaxies - Rotation curves of galaxy – the general rotation law.

Unit V: Cosmic Rays and Instrumentation

Cosmic rays - Discovery of Cosmic rays – Latitude effect – Azimuth effect – Altitude effect – longitude effect – Primary cosmic rays – Secondary rays – Detection methods - Cosmic ray showers – Vanallen Belts - Astronomical Instruments: Reflecting and refracting telescopes – Radio telescopes – Hubble space telescope (HST).

Books for study:

1. Baidyananth Basu – An Introduction to Astro Physics – Prentice Hall of India, 2004.

2. K.S.Krishnaswamy – Astro Physics: A Modern Perspective – Reprint, New Age International Pvt.Ltd., New Delhi, 2002.
3. G.K.Sasidharan – The Great Universe – S.Chand & amp; Company Ltd., New Delhi – 2008.
4. R.Murugeshan & Kiruthiga Sivaprasath - Modern Physics – S.Chand & amp; Co. Publication – 2007.

Books for Reference:

1. V.B.Bhatia – Textbook of Astronomy and Astro Physics with Elements of Cosmology – Narosa Publishing House, New Delhi, 1998.
2. R.R.Danial – Concepts of Space Science – University Press, Reprint 2002.
3. K.Cosmic Kapoor – Space Book – Lotus Press, 2005

SEMESTER II

PCPHD19 - MATHEMATICAL PHYSICS - II

Objective:
To inculcate to the students the mathematical concepts for solving physical problems which arise in many branches of Physics.

Unit I: Complex Variables
Analytic functions – Cauchy-Riemann conditions – Single and multi-valued functions - Cauchy's integral theorem and formula – Taylor's theorem and Laurent's theorem – Poles and Residues – Cauchy's residue theorem – Application to evaluation of definite integrals of round unit circle and an infinite semi-circle.

Unit II: Tensors
Introduction – Transition of coordinates - Einstein's summation convention – Contravariant, co-variant and mixed tensors – Rank of a tensor – Tensors of higher ranks - Kronecker delta symbol – Invariant tensors - Algebraic operations of tensors – Outer product, Contraction, Inner product and Quotient law - Symmetric and anti-symmetric tensors - Levi civita symbol - Basic idea of Christoffel's 3-index symbols – Covariant derivative of a tensor - Reciprocal tensors – Relative and absolute tensors –

Unit III: Integral Transforms
Laplace transforms and inverse Laplace transforms – solution of linear differential equations with constant co-efficients – evaluation of integrals – Fourier transforms – Fourier sine and cosine transforms – convolution theorem – simple applications.

Unit IV: Probability Theory
Probability densities and probability distributions – Binomial, Poisson's and Normal distributions – Moments and generating functions – Discrete distributions – Casual and uniform distribution – Cauchy continuous distribution.

Unit V: Group Theory
Definition of groups, subgroups and conjugate classes – Invariant subgroup – Homomorphism and isomorphism between groups – Point groups - Representation of a group – Reducible and irreducible representations – Schur's lemma – Great orthogonality theorem - Character table - Construction of character table for C_{3V} and C_{4V} group –

Continuous and Lie groups – Symmetry group of Schrodinger equation – Two dimensional Rotation group $R^{+}(2)$ – Three dimensional Rotation group R+(3).

Books for Study:

1. Sathyaprakash – Mathematical Physics – S.Chand & Sons, Reprint 2006.
2. B.D.Gupta – Mathematical Physics, 3rd Edition - Vikas Publishing House Pvt. Ltd., 2004.
3. E. Kreyszig - Advanced Engineering Mathematics, 8th Edition - Wiley, New York, 1999.
4. H.K. Dass – Mathematical Physics - S.Chand, Reprint 2007.

Books for Reference:

1. M. Hamermesh - Group Theory and Its Application to Physics: Problems - Addision Wesley, London, 1962.
2. C.R. Wylie and LC. Barrett - Advanced Engineering Mathematics, 6th Edition, International Edition, McGraw Hill, New York, 1995.
3. P.K. Chakrabarti and S.N. Kundu - A Textbook of Mathematical Physics - New Central Book Agency, Kolkata, 1996.
4. A.K. Ghatak, I.C. Goyal and S.H. Chua - Mathematical Physics - Macmillan India, New Delhi, 2002.
5. M.D. Greenberg - Advanced Engineering Mathematics, 2nd International Edition - Prentice Hall International, New Jersey, 1998.
6. P.K. Chattopadhyay - Mathematical Physics - Wiley Esatern, Madras, 1990.
7. F.A. Cotton - Chemical Applications of Group Theory - Wiley Eastern, New Delhi, 1987.
8. A.W. Joshi - Elements of Group Theory for Physicists -(Wiley Eastern, New Delhi, 1971.
9. G. Arfken and H.J. Weber - Mathematical Methods for Physics, 5th Edition - Harcourt (India), New Delhi, 2001.

SEMESTER II
PCPHE19 - ELECTROMAGNETIC THEORY

Objectives:

- To make the students understand the principles and theory of electrostatics, magneto statics.
- To familiarize the students with electromagnetic waves and its applications.

Unit I: Electrostatics

Electrostatic potential – Poisson's equation – Laplace's equation – Solution of Laplace's equation in spherical, cylindrical and Cartesian coordinates – Polarization vector – Electric field at external and internal points due to polarization – Displacement vector – Polar & non-polar molecules – Forces on dielectrics – Conducting sphere in a uniform field - Dielectric sphere in a uniform field.

Unit II: Magnetostatics

Magnetic field of steady current – Magnetic vector potential – Application to a long current carrying wire – Ampere's law – Lorentz force – Line integral of a vector potential over a closed curve – Lorentz condition – Magnetic scalar potential – Application to a circular coil – Magnetic shielding – Energy in a magnetic field.

Unit III: Maxwell's Equations

Faraday's laws of induction – Maxwell's displacement current – Maxwell's equations – Derivation - Vector and Scalar potentials – Wave equation in general - Plane wave solution for free space – Gauge invariance – Coulomb and Lorentz gauge – Conservation laws for a systems of charges and electromagnetic fields – Equation of Continuity – Momentum in EM Fields – Poynting theorem.

Unit IV: Application of Maxwell's Equations

Fields and radiation of localized sources – Oscillating electric dipole – Radiation from an oscillating electric dipole – Poynting vector and radiated power – Radiation resistance – Radiation from a linear antenna – Antenna arrays – Radiation pressure - Electromagnetic oscillators.

Unit V: Wave Propagation

Propagation of electromagnetic waves in isotropic and anisotropic dielectrics – Propagation in conducting media – Calculation of Phase Velocity – Refractive Index – Skin depth - Linear and circular polarization – Reflection and refraction at a plane interface – Propagation of waves in a rectangular wave guide – TE Waves – TM Waves - Cavity resonator – TE Mode – TM Mode - Faraday and Kerr effects.

Books for Study:

1. Chopra, Agarwal - Electromagnetic Theory, 5th Edition - K. Nath & Co, Meerut, 2014.
2. Sathya Praksah - Electromagnetic Theory and Electrodynamics – Kedarnath Ramnath & Co., 2006.
3. Gupta, Kumar, Singh – Electrodynamics - Pragati Prakashan, Meerut, 2003.

Books for Reference:

1. J.D. Jackson - Classical Electrodynamics - Willey Eastern Ltd., New Delhi, 1975.
2. D.J.Griffiths - Introduction to Electrodynamics, 3rd Edition - Prentice Hall of India, New Delhi, 2002.
3. J.R.Rertz, F.J. Milford and R.W. Christy - Foundations of Electromagnetic Theory, 3rd Edition - Narosha Publication, New Delhi, 1986.
4. W. Panofsky and M. Phillips - Classical Electricity and Magnetism - Addison Wesley, London, 1962.
5. J.D. Kraus and D.A. Fleisch - Electromagnetic with Applications, 2nd Edition - WCB McGraw Hill, New York, 1999.
6. B. Chakraborty - Principles of Electrodynamics -Books and All Kolkara, 2002.
7. R.P. Feynman, R.B. Leighton and M. Sands - The Feynman Lectures on Physics Vol. 2, Narosha Publication, New Delhi,1998.

SEMESTER II
PCPHF19 - QUANTUM MECHANICS - I

Objectives:

- To make the students understand the inadequacy of classical mechanics and the origin of quantum mechanics and its operators.
- To impart knowledge about the postulates of quantum mechanics and its applications.

Unit I: Basic Formalism

Introduction to quantum mechanics - Wave function for a free particle – Physical significance of wave function – Postulates of quantum mechanics – Time dependent and time independent forms of Schrodinger equation – Definition of eigen values and eigen functions – Operator formalism - Definition of Linear operators, Self adjoint operator, Hermitian operator - Derivation of operators for momentum and total energy - Derivation of Expectation Value of a normalized wave function – Ehrenfest's Theorem – Definition of orthonormality - Schroedinger equation in spherical polar coordinates .

Unit II: Applications

Ladder operators - Simple harmonic oscillator – Rigid rotator with free axis (three dimensions) – Step potential – Particle in a Periodic potential (Kronig-Penny model) – Particle in a Spherical well - Particle in a Spherically symmetric potential - Operator and eigen values of orbital angular momentum – Reduction of two body problem – Hydrogen atom.

Unit III: General Formalism

Dirac's notation and Hilbert space – Time evolution operator - Representation theory - Schroedinger, Heisenberg and Interaction Pictures - Coordinate and momentum representations – Derivation of operators for position, momentum and probability density in Momentum representation – Symmetry principles and conservation laws.

Unit IV: Approximation Methods

Time-independent perturbation theory – Derivation of first order, second order perturbation equations - First order correction to energy and wave function for Non degenerate energy levels – First order correction to energy for Degenerate levels – Applications - Ground state of anharmonic oscillator - Stark effect in Hydrogen – Variation method – Principle - Application to ground state of Helium atom – WKB Approximation – Derivation of general solution - Validity of WKB approximation – Classical turning point – Connection formula - WKB quantization rule – Application to Simple Harmonic Oscillator.

Unit V: Angular Momentum and Identical Particles

Commutation rules for orbital angular momentum operators – Eigen values of J^2 and J_Z . Matrix representation of J^2 and J_Z – Construction of total angular momentum matrices for different values of j - Spin angular momentum and spin vectors – Pauli's spin matrices - Addition of two angular momenta – Clebsch–Gordan coefficients - Computation of CG coefficients – Symmetric and anti symmetric wave functions.

Books for Study:

1. P.M. Mathews and K. Venkatesan - A Textbook of Quantum Mechanics - Tata McGraw Hill, New Delhi, 1976.
2. L.I. Schiff - Quantum Mechanics, 3rd Edition - International Student Edition, McGraw Hill Kogakusha, Tokyo, 1968.
3. V. Devanathan - Quantum Mechanics - Narosa Publishing House, New Delhi, 2005.
4. V.K. Thankappan - Quantum Mechanics, 2nd Edition - Wiley Eastern Ltd., New Delhi, 1985.

Book for Reference:

1. E. Merzbacher - Quantum Mechanics, 2nd Edition - John Wiley and Sons, New York, 1970.

2. P.A.M. Dirac - The Principles of Quantum Mechanics - Oxford University Press, London, 1973.
3. L.D. Landau and E.M. Lifshitz - Quantum Mechanics - Pergomon Press, Oxford, 1976.

SEMESTER II

PEPHC19 – ELECTIVE II A: CRYSTAL GROWTH AND NANO SCIENCE

Objective:
To provide the students knowledge on crystal growth techniques and nano science for pursuing research.

Unit I: Nucleation and Growth

Nucleation – Different kinds of nucleation - Concept of formation of critical nucleus – Classical theory of nucleation - Spherical and cylindrical nucleus – Crystal System and Symmetry

Unit II: Growth Techniques

Solution Growth Technique: Low temperature solution growth: Solution - Solubility and super solubility – Expression of super saturation – Miers T-C diagram - Constant temperature bath and crystallizer – Seed preparation and mounting - Slow cooling and solvent evaporation methods - Gel Growth Technique: Principle – Various types – Structure of gel – Importance of gel – Experimental procedure –Chemical reaction method – Single and double diffusion method — Advantages of gel method - Melt technique: Bridgman technique - Basic process –Vertical Bridgman technique –Crystal Pulling technique - Czochralski technique – Experimental arrangement – Growth process.

Unit III: Characterization Techniques

X – Ray Diffraction (XRD) – Powder and single crystal - Fourier transform Infrared analysis (FT-IR) – FT –Raman Elemental analysis – Elemental dispersive X-ray analysis (EDAX) - Scanning Electron Microscopy (SEM) – Transmission electron microscopy – UV-Vis-NIR Spectrometer – Etching (Chemical) – Vickers Micro hardness – TGA – DTA – PL studies.

Unit IV: Basics of Nano Technology

History of Nano technology – concept of Nano technology and Nano machines – Atomic structure molecules and phases – Molecular and atomic sizes – Surfaces and dimensional space – Top down and bottom up approach in synthesis – Nano scale formation - Strong intermolecular forces – Covalent and coulomb interactions – Weak inter molecular forces – Vander Waal forces – Repulsive forces - hydrogen bonding, Hydrophobic and hydrophilic interactions.

Unit V: Fabrication Techniques and Properties of Nano-Structure

Vacuum Techniques: Thermal evaporation – Sputter deposition – Chemical vapour deposition – Nanolithography techniques: Photo electron beam, ion beam –X -Ray

lithography - Quantum dots and Quantum wires – Size dependent variation in magnetic, electronic transport properties.

Books for Study:

1. P. Santhana Ragavan and P. Ramasamy - Crystal Growth Processes and Methods - KRU Publications, Kumbakonam, 2001.

2. Charles P.Poole, Frank J.Owens - Introduction to Nanotechnology - Wiley-Interscience, 2003.

Books for Reference:

1. J.C. Brice - Crystal Growth Processes - John Wiley and Sons, New York, 1986.

SEMESTER II

PEPHD19 - ELECTIVE II B: ELECTRONIC INSTUMENTATION

Objectives:

- To gain knowledge about electronic equipments.
- To give to the students an application oriented paper.

Unit I: Transducers

Classification of Transducers- Principle, Construction and working of Thermistor, LVDT, Electrical strain gauges and capacitive transducers - Measurement of non-electrical quantities – Strain, Displacement - Temperature, Pressure and Force.

Unit II: Digital Instrumentation

Principle, block diagram and working of Digital frequency counter, digital multimeter, digital pH meter, digital conductivity meter and digital storage oscilloscope.

Unit III: Analytical Instrumentation

Principle, block diagram, description, working and applications of UV-VIS Spectrometer, IR Spectrometer, Flame Emission Spectrometer and ICP-AES Spectrometer – Basic concepts of Gas and Liquid Chromatography.

Unit IV: Bio-Medical Instrumentation

Physiological transducers to measure blood pressure, body temperature - Sources of Bio-electric potentials – resting potential, action potential, Bio-potential electrodes - Principle, block diagram and operation of ECG and EEG – Recorders.

Unit V: Computer Peripherals

Printers – Printer mechanism – Classification. Dot matrix, Ink-Jet and Laser Printers - Basic concepts of key board and mouse - Mass storage – floppy disk – Hard Disk – Optical disk (CD).

Books for Study:

1. Dr. Rajendra Prasad - Electronic Measurements and Instrumentation - Khanna Publications, 2012.
2. S. Ramambhadran – Elements of Electronic Measurements and Instruments - Khanna Publications, 1999.

Books for Reference

1. S.M. Dhir – Applied Electronics and Instrumentation - Khanna Publishers, 1999.

2. Khandpur - Handbook of Biomedical Instrumentation – McGraw Hill Publications, 2014.

SEMESTER – II

PIPHC19 - INDEPENDENT ELECTIVE II A: PHYSICS FOR SET/NET - PAPER II

Objective:

To impart knowledge about Mathematical Physics and Electromagnetic Theory for competitive Examinations.

Unit I: Mathematical Physics-I

Vector field- Gradient – Divergence - Curl and Laplacian in orthogonal curvilinear – Spherical and cylindrical coordinate systems - Gauss-divergence and Stoke's theorem. Matrices - Types of Matrices – Diagonal matrix - Cayley-Hamilton theorem - Eigen values and Eigen vectors.

Unit II: Mathematical Physics-II Special functions

Bessel, Legendre, Laguerre and Hermite polynomials – Recurrence relations – Orthogonality formulae – Rodrigue's formula - Green's function – Partial differential equations - Laplace, wave and heat equations in two and three dimensions.

Unit III: Mathematical Physics-III

Elements of complex analysis - Analytic functions - Taylor and Laurent's series – Poles - Residues and evaluation of integrals - Elementary ideas of Tensors - Laplace and Fourier Transforms - Fourier series - Elementary probability theory – Binomial - Poisson and Normal distributions. Introductory group theory – groups and subgroups - Abelian and cyclic groups - Point groups (C_{2v}& C_{3v}) - reducible and irreducible representations and its theorems.

Unit IV: Electromagnetic Theory- I

Electro statics – Gauss law and its applications - Poisson's and Laplace equations - Boundary value problems. Magnetostatics – Biot-Savart law - Ampere's theorem - Lorentz force - Maxwell's equations in free space and linear isotropic media - Boundary conditions on the fields. Gauge invariance.

Unit V:Electromagnetic Theory - II

Wave Propagation - Electromagnetic waves in free space - Dielectrics and conductors - Rectangular wave guides - Cavity resonator - Dispersion relations in plasma – Lorentz invariance of Maxwell's equations - Transmission lines and waveguides - Scalar and vector potentials - Oscillating electric dipole - Pointing vector and radiated power - Radiation from moving charges and dipoles and retarded potentials.

Books for study

1) Sathyaprakash – Mathematical Physics, S. Chand & Sons, Reprint 2018.
2) H.K. Dass – Mathematical Physics, S.Chand, Reprint 2017.
3) Chopra Agarwal – Electromagnetic theory – K. Nath& Co. 2008
4) Sathyaprakash-electromagnetic theory.

Books for reference

1) E. Kreyszig – Advanced Engineering Mathematics, 8th Ed., Wiley, New York, 1999.
2) D.J.Griffiths – Introduction to Electrodynamics, 3rdEd.,Prentice Hall of India, New Delhi, 2012.

SEMESTER II
PIPHD19 - INDEPENDENT ELECTIVE II B: MEDICAL PHYSICS AND INSTRUMENTATION TECHNIQUES

Objective:

To give a perspective about the concepts of physics involved in human body.

Unit I: Effects of Pressure on Human System

Measurement of pressure in the human body – pressure inside the skull – transillumination – eye pressure – tonometers – ophthalmoscopy - pressure in the digestive system – urinary bladder – pressure in the skeletal system – stress and strain – strain gage – transducers for biomedical applications.

Unit II: Physics of lungs and breathing

The airways – interaction of the blood and the lungs – measurement of pulmonary volume – volume relationships of the lungs – physics of alveoli – breathing mechanism – pulmonary flow – pulmonary diffusion – airway resistance – measurement of airway resistance – work done in breathing – measurement of gaseous exchange and diffusion – respiratory therapy equipment – physics of some common long disease.

Unit III: Physics of cardiovascular systems

The heart and cardiovascular system - oxygen and CO_2 exchange – work done by heart – pressure across the blood vessel – characteristics of blood flow – heart sounds – blood pressure measurement – indirect measurements - direct measurements – precutaneous insertion – catheterization implantation of transducer – measurement of blood flow and cardiac output – elements of intensive care monitoring – pacemakers – defibrillators.

Unit IV: Application of electricity and magnetism in medicine

The nervous system and neurons – source of bioelectric potentials – testing and action potentials- propagation of action potentials – electrodes – theory – biopotential electrodes electromyogram - electrocardiogram - electroencephalogram – magneto cardiogram – thermography and skin temperature measurements – applications of high and frequency electricity in medicine.

Unit V: Medical Imaging Techniques

X-rays and radio isotopes – instrumentation – X-rays in diagnosis – medical application of radioisotopes – radiation therapy – principles of ultrasonic measurement – ultrasonic diagnosis – Magnetic Resonance Imaging (MRI) – Computerized Axial Tomography

scanner (CAT) – Positron Emission Tomography (PET) imaging – physiological effects of electric current – shock hazards – methods of accident prevention.

Books for study:

1) J.R. Cameron and James G. Skofronick - Medical Physics – John Wiley & Sons Inc. 1978.
2) A.C. Damask – Medical Physics Vol I & II – Academic press 1978, 1981.
3) John G. Webster – Bioinstrumentation – John Wiley & Sons, Inc. 2003.
4) Leslie Cromwell, Fred. J. Weibell Erich A. Pfeiffer, Biomedical Instrumentation and Measurements, Prentice Hall of India Pvt., Ltd., 2007.
5) M. Arumugam – Biomedical Instrumentation – Anuradha publications, 2007.

Books for reference:

1) W. Hoppe et al.- Biophysics – Springer – Verlag 1983.
2) A.J. Vander, J.H. Sherman and D.S. Lucian – Human Physiology, McGraw – Hill (International Ed.,), 1986.

SEMESTER II
PCPHG19 - PRACTICAL – I: GENERAL EXPERIMENTS
(Any 15 experiments)

1. Cornu's method - Young's modulus by elliptical fringes.
2. Cornu's method - Young's modulus by hyperbolic fringes.
3. Determination of Stefan's constant.
4. Band gap energy – using point contact diode
5. Hartmann's formula - Determination of wavelength of spectral lines in mercury spectrum.
6. Determination of Rydberg's constant - Hydrogen spectrum.
7. Solar spectrum - Hartmann's interpolation formula.
8. Co-efficient of linear expansion - Air wedge method.
9. Viscosity of liquid - Meyer's disc.
10. F.P.Etalon – using Spectrometer.
11. Specific charge of an electron –Magnetron method.
12. Energy gap of a Semi conductor - Four Probe method.
13. Edser and Butler fringes - Thickness of air film.
14. Spectrometer - Charge of an electron.
15. Spectrometer - Polarisability of liquids by finding the refractive indices at different wavelengths.
16. Permittivity of a liquid using RFO.
17. B-H loop using Anchor ring.
18. Determination of strain hardening co-efficient.
19. Determination of Audio frequencies – Bridge method.
20. Specific heat of a liquid – Ferguson's method.
21. Measurement of Numerical aperture (NA) of a telecommunication graded index optic fiber.
22. Fiber attenuation of the given optical fiber.
23. Biprism - Wavelength of monochromatic source – using optic bench.
24. Biprism - Wavelength of monochromatic source – using Spectrometer.
25. Determination of specific rotatory power of a liquid using polarimeter.

SEMESTER II

PCPHH19 - PRACTICAL – II: ELECTRONICS EXPERIMENTS
(Any 18 experiments)

1. Characteristics of SCR and Triac.
2. Study of Rectifiers using C, L-C and Pi filters.
3. Construction of Half adder and Full Adder using IC – 7400.
4. Construction of Half Subtractor and Full Subtractor using IC 7400.
5. Study of Voltage – Current characteristics of UJT & UJT as a Relaxation Oscillator.
6. FET as amplifier – frequency response, input impedance and output impedance.
7. Study of V-I Characteristics of J-FET as a VVR (Voltage Variable Resistor).
8. Voltage follower - (Inverting) summing, difference, average amplifier using Op-amp – IC 741.
9. Solving simultaneous equations using Op-amp – IC 741.
10. Square wave Generator, Triangular wave Generator, Saw tooth wave Generator - using Op-amp – IC 741.
11. Digital to Analog Conversion – Binary Weighted Resistor Method using Op-amp –IC 741.
12. Design of first order Low pass & High pass Butterworth Filter using Op-amp – IC 741.
13. Construction of Astable multivibrator using Timer 555.
14. Construction of Asynchronous Counters using IC-7476/ 7473.
15. Construction of Synchronous Counters using IC-7476/7473.
16. Study of Multiplexer or Data selector and De - Multiplexer – IC -74157.
17. Construction of Phase Shift Oscillator using Op-amp – IC 741.
18. Construction of Wien Bridge Oscillator using Op-amp – IC 741.
19. Arithmetic operations (Adder/Subtractor) Using IC 7483.
20. Modulus counter using IC 7490 & display IC 7447

SEMESTER III
PCPHI19 – SPECTROSCOPY

Objective:

To impart to the students the knowledge about micro wave, infrared, Raman, NMR, NQR, ESR & Massobauer spectroscopy and its techniques.

Unit I: Microwave Spectroscopy

Pure rotational spectra of diatomic molecules – Polyatomic molecules – Study of linear molecules and symmetric top molecules – Hyperfine structure and quadruple moment of linear molecules – Experimental techniques – Molecular structure determination – Stark effect –Applications to chemical analysis.

Unit II: Infrared Spectroscopy

Vibrational spectroscopy of diatomic and simple polyatomic molecules – Harmonic Oscillator – Anharmonic Oscillator – Rotational vibrators – Normal modes of vibration of polyatomic molecules – Inversion spectrum of ammonia – Experimental techniques - Infrared spectro- photometer – Reflectance spectroscopy – Applications of infrared spectroscopy.

Unit III: Raman Spectroscopy

Classical and quantum theory of Raman Scattering – Raman effect and molecular structure – Raman effect and crystal structure – Raman effect in relation to inorganic, organic and physical chemistry – Experimental techniques – Coherent and Stokes Raman Spectroscopy – Applications of infrared and Raman spectroscopy in molecular structural confirmation of water and CO_2 molecules.

Unit IV: NMR and NQR Techniques

Theory of NMR – Bloch equations – Steady state solution of Bloch equations – Theory of chemical shifts – Experimental methods – Single coil and double coil methods – Pulse Method – High resolution method – Applications of NMR to quantitative measurements - Quadruple Hamiltonian of NQR – Nuclear quadruple energy levels for axial and non-axial symmetry – Experimental techniques and applications.

Unit V: ESR and Mossbauer Spectroscopy

Quantum mechanical treatment of ESR – Nuclear interaction and hyperfine structure – Relaxation effects – Basic principles of spectrograph – Applications of ESR method - Mossbauer effect – Recoilless emission and absorption – Mossbauer spectrum – Experimental methods – Mossbauer spectrometer – Hyperfine interactions – Chemical Isomer shift – Magnetic hyperfine interactions – Electric quadruple interactions – Simple biological applications.

Books for Study:

1. B.K. Sharma – Spectroscopy - GOEL Publishing House, Meerut, 2005.
2. Gupta Kumar Sharma - Elements of Spectroscopy - Pragati Prakashan, Meerut 2006.
3. G. Aruldas - Molecular Structure and Spectroscopy - Prentice Hall of India Pvt. Ltd., New Delhi, 2001.
4. D.N. Satyanarayana - Vibrational Spectroscopy and Applications, New Age International Publications, New Delhi, 2004.

Books for Reference:

1. C.N. Banwell and E.M. Mc Cash - Fundamentals of Molecular Spectroscopy, 4th Edition - Tata McGraw Hill Publications, New Delhi, 1994.
2. Atta Ur Rahman - Nuclear Magnetic Resonance - Spinger Verlag, New York, 1986.
3. Towne and Schawlow - Microwave Spectroscopy - McGraw-Hill, 1995.
4. Raymond Chang - Basic Principles of Spectroscopy -McGraw Hill, Kogakusha, Tokyo, 1980.
5. D.A. Lang - Raman Spectroscopy – McGraw Hill International, N.Y., 1977.
6. D.D. Jyaji and M.D. Yadav – Spectroscopy - Amol Publications, 1991.

SEMESTER III
PCPHJ19 - QUANTUM MECHANICS - II

Objective:
To impart knowledge about theories related to quantum mechanics

Unit I: Scattering Theory
The scattering problem – Scattering amplitude – Scattering cross sections – Relationship between scattering amplitude and differential scattering cross section - Partial wave analysis – Optical theorem - Scattering by an attractive square well potential – Breit Wigner formula - Scattering length - Born approximation and its validity – Scattering by screened coulomb potential - Transformation from centre of mass to laboratory frame - Relationship between the cross sections and kinetic energy in centre of mass and laboratory systems.

Unit II: Perturbation Theory
Time dependent perturbation theory – Constant perturbation - Harmonic perturbation – Transition to a discrete state – Transition to a continuous state (Fermi's-Golden rule) – Selection rules for dipole transition – Adiabatic approximation – Sudden approximation — Semi classical treatment of an atom with electromagnetic radiation - Density matrix – Spin density matrix - magnetic resonance .

Unit III: Relativistic Quantum Mechanism
Klein-Gordon equation – Failures – Dirac's equation – Dirac matrices – Traces - Plane wave solutions – Interpretation of negative energy state –- Antiparticles – Spin of electron – Magnetic moment of an electron due to spin – Particle in a coulomb field

Unit IV: Dirac Equation
Covariant form of Dirac equation – Separation of the equation and the Hydrogen atom problem – Invariance of Dirac equation under Lorentz transformation – T-Transformation for the Dirac equation in the presence of electromagnetic field – Projection operators for energy and spin

Unit V: Quantization of Fields
Introduction – Lagrangian and Hamiltonian formulations of field - Classical field equations interms of Lagrangian density and Hamiltonian – Quantization of Schrödinger field - Second quantization of Kelin-Gordon field – Quantization of Dirac field - Quantization of electromagnetic field - Creation and annihilation operators.

Books for Study:

1. G. Aruldhas - Quantum Mechanics - Prentice-Hall of India, New Delhi, 2002.
2. V. Devanathan - Quantum Mechanics - Narosa Publishing House, New Delhi, 2005.
3. P.M. Mathews and K. Venkatesan - A Textbook of Quantum Mechanics - Tata McGraw Hill, New Delhi, 1976 .

Books for Reference:

1. V.K. Thankappan - Quantum Mechanics, 2nd Edition - Wiley Eastern Ltd., New Delhi, 1985
2. L.D. Landau and E.M. Lifshitz - Quantum Mechanics, Pergomon Press, London, 1958.
3. J.S. Bell, Gottfried and M. Veltman - The Foundations of Quantum Mechanics - World Scientific, 2001.

4. Claude Itzykson and Isau Bernard Zuber - Quantum Field Theory – McGraw Hill International Edition, 1987.
5. Leslie E. Vallentine - Quantum Mechanics: A Modern Development - World Scientific Publications Pvt. Ltd, Singapore, 1998.
6. L.I. Schiff - Quantum Mechanics, 3rd Edition, International Student Edition, McGraw Hill, Kogakusha, Tokyo, 1968.
7. E. Merzbacher - Quantum Mechanics, 2nd Edition - John Wiley and Sons, New York, 1970.
8. P.A. M. Dirac - The Principles of Quantum Mechanics - Oxford University Press, London, 1973.
9. B.K. Agarwal - Quantum Mechanics and Field Theory - Lokbharti Publications, India, 1976.
10. Amitabha Lahiri and B.G. Pal - A First Book of Quantum Field Theory - Narosa Publications, New Delhi, 2005.

SEMESTER III

PCPHK19 - MICROPROCESSOR AND MICRO-CONTROLLER

Objectives:

- To make the students understand the concepts that are involved in the microprocessor – 8085.
- To make the students understand about the instruction sets, timings, memory and I/O interfaces.

Unit I: 8085 Microprocessor and Memory interfacing

Introduction- Pin out configuration- Architecture- Buses – Address bus, data bus, multiplexing address/data bus- Machine and instruction cycle- timing diagrams — Interrupts of the 8085 Microprocessor –Maskable and non maskable interrupts - RIM and SIM interrupt instructions – ROM and RAM memory - Memory interface: 2K X 8, 4K x 8 ROM and RAM interface

Unit II: Instruction set and programming of 8085

Classification of instructions and format – 8 - bit data transfer, Arithmetic and Logic - Logical rotate and compare instructions – Branch instructions – Stack and subroutine instructions – Special and machine control instructions -– Addressing modes – Assembly language programming: Picking up Largest / smallest number – Arranging an array in ascending / descending order – Code conversion - 8 bit code conversion: Binary to BCD and BCD to Binary, Binary to ASCII, ASCII to Binary and ASCII to BCD and BCD to ASCII.

Unit III: 8085 Peripheral Interfacing

Pin out configuration- Internal Architecture, and interfacing of 8255 – ADC interface – DAC interface – Hex keyboard interface – Dynamic message display interface - Stepper motor interface – Traffic regulation interface.

Unit IV: Microcontroller 8051

Introduction to Microcontroller 8051 - Pin configuration and Architecture - Internal registers – Memory organizations - Instruction set - Addressing modes – Assembly Language Programming – Addition and Subtraction -Multiplication and Division - Arranging an array in ascending/ descending order -Sorting out the maxima and minima.

Unit V: Memory and I/O Interfacing with 8051

Memory Interface - Counters and timers – Serial data input / output interrupts – I/O port Interface – Interfacing 8051 with ADC – DAC - LED Display - Hex Keyboard interfacing.

Books for Study:

1. R.S. Gaonkar - Microprocessor Architecture, Programming and Application with the 8085, 3rd Edition - Penram International Publishing, Mumbai, 1997.
2. V.Vijayendran - Fundamentals of Microprocessor 8085 - Architecture, Programming and interfacing - Viswanathan Publication, Chennai, 2002.
3. N. Nagoor Kanni – Microprocessor and Microcontroller -
4. Muhammed Ali Mazidi and Janice Gillespie Mazidi - The 8051 Microcontroller and Embedded Systems, Fourth Indian Reprint - Pearson Education, 2004.
5. Kenneth J. Ayala – The 8051 Micro Controller Architecture, Programming and Applications, 3rd Edition – West Publishing Company, 1991.

Books for Reference:

1. B. Ram - Fundamentals of Microprocessors and Microcomputers - Dhanpat Rai Publications, New Delhi, 2005.
2. R. Thiagarajan, S. Dhanasekaran and S.Dhanapal - Microprocessor and its Applications, New Age International, New Delhi, 2010.
3. John B. Peatman - Design with PIC Microcontrollers, 7th Indian Reprint - Pearson Education, 2004.
4. Raj Kamal - Introduction to Embedded Systems - TMS, 2002.

SEMESTER III

PEPHE19 - ELECTIVE III A. NUMERICAL METHODS AND C PROGRAMMING

Objective:

To prepare the students for research and to impart to them the various methods for pursuing their research in the respective fields.

Unit I: Solution of Equations and Interpolation

Methods of false position – Newton's method – Fixed point - Iteration method. - Interpolation - Lagrangian polynomials – divided differences – Newton's forward and backward difference formulae.

Unit II: Numerical Differentiation, Integration and Differentiation Equations

Derivatives – Newton's forward / backward interpolation and Stirling formula, Numerical integration by Trapezoidal Solutions of equations – Simple iterative methods – Newton method – Numerical Integration – Simpsons 1/3 and 3/8 rules – Solution to first order differential equations: Taylor series method – Euler and modified Euler methods – Runge-kutta method.

Unit III: Programming in C

Introduction – Basic structure of C Programming – Character set – Key words – Identifiers – Variables – Assigning values to variables – Symbolic constant

Unit IV: Operators, Arrays and Strings

Operators – Arithmetic, relational, logical, assignment, increment, decrement conditional and special type conversion in Expressions – Arrays – Multi dimentional arreys – Initialising two dimensional arrays – Initializing string variables – Reading and writing Strings on the Arithmetic operations on strings.

Unit V: Simple Programmes

User defined functions – their needs – Multi function programme – Return values and their types – Calling functions – Categories of functions – Multiplication – Diagonalisation and inversion – Solution and C programming – Lagrangian interpolation – Simpson's rule – Euler method- Runge – Kutta method.

Books for Study and Reference:

1. E.Balagurusamy - Computing Fundamentals and Programming, ANSI C, 3rd Edition – Tata McGraw Hill Education, Ltd., 2014.
2. G.Balaji - Numerical Methods, 9th Edition - G.Balaji Publishers, Chennai, 2008.
3. S.Kalavathy, M.Joice Punitha - Numerical Methods, 2nd Edition – Vijay Nicole imprints Pvt. Ltd., 2010.

SEMESTER III
PEPHF19 – ELECTIVE – III B: ADVANCED OPTICS

Objective:

To provide the students knowledge on optics for higher studies.

Unit I: Basic Laser theory:

Historical background of laser – Einstein coefficients and stimulated light amplification – population inversion - creation of population inversion in three level and four level lasers.

Unit II: Basic laser systems:

Gas Lasers - CO_2 laser - solid state laser – Nd:YAG Laser – Liquid laser – Dye laser- semiconductor laser.

Unit III: Laser Beam Propagation

Laser beam propagation – properties of Gaussian beam – resonator – stability – various types of stability – resonator for high gain and high energy lasers – Gaussian beam focusing – fiber optics.

Unit IV: Fiber optics:

Optical fiber waveguides principles – acceptance angle - types of fibers – step index – graded index – single mode – multi mode – step index multi mode fiber - graded index multi mode fiber - attenuation in fiber – couplers and connectors.

Unit V: Non-linear optics:

Introduction – origin of non-linearity – susceptibility tensor – phase matching – second harmonic generation – Kurtz powder method of finding SHG - Z-scan technique – frequency mixing processes – Applications of Non-linear optical materials.

Book for study

1. Murugeshan and Kiruthiga Sivarprasath – Modern Physics , 17th Revised Edition- S. Chand & Co.Pvt Ltd., New Delhi, 2017
2. K. Thyagarajan, and A.K. Ghatak – Laser Theory and Applications – Macmillan India Ltd, 1997.
3. B.B. Laud – Lasers and Non Linear Optics – Wiley Eastern Ltd., 1991.
4. R.L. Sautherland – Handbook of Non Linear Optics

Books for Reference:

1. Ajoy Ghatak and K. Thyagaran – Introduction to Fiber Optics – Cambridge University Press, 6th Ed.,2006.
2. Robert W Boyd – Non linear Fiber Optics, 2nd Ed., Elsevier, 2006.
3. K.R. Nambiar – Laser Principles, Types and Applications – New Age International, 2004.

SEMESTER III

PIPHE19 - INDEPENDENT ELECTIVE III A: PHYSICS FOR SET/NET-PAPER III

Objective:

To impart knowledge about Quantum Mechanics, Atomic & Molecular Physics and Spectroscopy for competitive Examinations.

Unit I: Quantum Mechanics I

Wave- particle duality - Schrodinger Equation - Time dependent and Time independent- Expectation value - Uncertainty principle - Ladder operators - Eigen value problems particle in a box – Harmonic oscillator - Spherical well - Tunnelling through a barrier - Hydrogen atom, Coordinate and Momentum representations. Approximation methods – Time independent perturbation theory - Hydrogen variation method - WKB method. Angular momentum operators - CG coefficients - Pauli's spin matrices.

Unit II: Quantum Mechanics II

Scattering theory – Scattering amplitude - Cross sections - Partial wave analysis - Effective range theory - Optical theorem. Time dependent perturbation theory – Transition probabilities - Fermi's Golden rule and selection rules for dipole radiations - Klein-Gordan equation - Dirac equation - Plane wave solution - Negative energy states – Antiparticles - Properties of Gamma matrices. Quantization of fields – Semi classical theory of radiation – Creation - Destruction and Number operators.

Unit III: Atomic and molecular physics -I

Quantum states of an electron in an atom - Electron spin - Spectrum of helium and alkali atom. –Relativistic corrections for energy levels of hydrogen atom - Hyperfine structure and isotopic shift - Width of spectrum lines - LS & JJ couplings - Zeeman, Paschen - Bach & Stark effects. Electron spin resonance - Nuclear magnetic resonance - Chemical shift - Frank-Condon principle.

Unit IV: Atomic and molecular physics -II

Born-Oppenheimer approximation - Electronic, rotational, vibrational and Raman spectra of diatomic molecules, selection rules - Lasers: spontaneous and stimulated emission, Einstein A & B coefficients. Optical pumping – Population Inversion - Rate equation - Modes of resonators and Coherence length.

Unit V: Spectroscopy

Rotational spectra of diatomic - Polyatomic and symmetric top molecules - IR of diatomic and simple polyatomic molecules - Harmonic/anharmonic oscillator - Normal modes of vibrations - Raman scattering - Raman Effect in inorganic - Organic and physical chemistry. NMR – chemical shift - Single coil and double coil methods - NQR – Nuclear quadrapole energy levels for axial/non-axial symmetry - ESR – Nuclear interaction and hyperfine structure. Mossbauer Effect – Hyperfine/electric quadrapole interactions.

Book for study

1) G. Aruldhas – Quantum mechanics, PHI Learning, 2008.
2) Gupta Kumar Sharma – Quantum Mechanics Jai Prakash Nath Publications, 2012.
3) Devanathan – Quantum Mechanics
4) B.K. Sharma – Spectroscopy – Goel publishing House Krishna Prakashan Media Pvt., Ltd., 2017.
5) G. Aruldas – Molecular structure and Spectroscopy, Prentice Hall of India Pvt., Ltd., New Delhi, 2016.

Book for Reference

1) Mathews Venkatesan – Quantum Mechanics
2) C.N. Banwell and E.M. Mc Cash – Fundamentals of Molecular Spectroscopy, Tata McGraw Hill Publications, Reprint 2017.

SEMESTER III
PIPHF19 - INDEPENDENT ELECTIVE III B: NUMERICAL METHODS & RESEARCH METHODOLOGY

Objective:

To impart knowledge about Numerical methods and to prepare the students for higher studies.

Unit I: Solution of Equations and Numerical Integrations

Fixed point iteration method - Newton's Raphson method – Solutions of simultaneous equation - Numerical integration using Trapezoidal, Simpson's 1/3 and 3/8 rule

Unit II: Numerical Differentiations

Solutions of equations – Numerical Differentiation - Numerical solution of first order differential equations - Runge Kutta method –Taylor series method – Euler's and modified Euler's method.

Unit III: Research Methodology – An Introduction

Meaning of research - Objectives of research - motivation of research - Types, approaches and significance - Methods versus methodology - Research in scientific methods - Research process - Criteria for good research - Problem encountered by research in India- Funding agencies

Unit IV: Research Design

Identification of the problem – Literature Survey – Reference Collection – Necessity and techniques involved in defining the problem - Research design - Needs and features of good design - Different research design - Basic principles of experimental designs.

Unit-V: Research Communication

Meaning of research report - Logical format for writing thesis and paper - Essential of scientific report: abstract, introduction, review of literature, materials and methods and discussion - The use of quotation - footnotes - tables and figures - referencing - appendixes - revising the paper or thesis – Oral power point presentation – Poster preparation - editing and evaluating and the final product - proof reading - the final types copy.

Books for Study:

1) Dr. G. Balaji - Numerical Methods 15th edition – G.Balaji Publishers-2017
2) E. Balagurusamy - Numeric Methods - Tata Mc Graw Hill.
3) C.R. Kothari and Gaurav Garg - Research Methodology, Methods and Techniques – New age International Publishers, III Edition. 2014
4) Santosh Gupta - Research Methodology Methods and Statistical Techniques
5) Rajammal et al., -A hand Book of Methodology of Research - Sri Ramakrishna Mission Vidyalaya Press, Coimbatore.

Books for Reference:

1) C.Hawkins & M Sorgi - Research Ed Norosa Publishing House, New Delhi – 2000
2) Robert Ross - Research: An introduction - - Harper and Row Publications.
3) P. Saravanavel - Research methodology - - Kitlab Mahal, Sixth Edition.
4) R.A. Day - How to write and publish a scientific paper - Cambridge University Press.
5) Anderson - Thesis and Assignment writing - - Wiley Eastern Ltd.

SEMESTER IV

PCPHL19 - MATERIAL SCIENCE AND LASER PHYSICS

Objectives:

- To impart knowledge about phase diagram and defects in crystals
- To acquire knowledge about polymer and ceramics.
- To understand the principle and working of lasers

Unit I: Phase Diagram

Phase diagram – Basic principles – Simple binary systems – Solid solutions – Eutectic systems- Application - Solid solution – Interstitial and substitution solid solutions – Hume – Rothery electron compounds – Long range order theory of Bragg and Williams – Super lattices – Interstitial phase – Intermetallic compounds - Elementary Ideas of corrosion – Oxidation – Creep and fracture

Unit II: Defects

Point defects – Scottky and Frenkel defects – Number of defects as a function of temperature – Diffusion in metals – Diffusion and Ionic conductivity in Ionic crystals - Dislocations – Edge and screw dislocations – Burgers vector – Plastic deformation – Slip – Motion of dislocations under uniform Shear Stress - Stress fields around dislocations – Density – Work hardening – Effect of grain size on dislocation motion –Effect of solute atoms on dislocation motion.

Unit III: Optical Properties, Dielectric Properties and Ferro Electrics

Color centers – Photo conductivity – Electronic transitions in Photo conductors – Trap, capture, recombination centers – Luminescence - Excitation and emission Decay mechanisms Thallium activated alkali halides – Sulfide phosphorous - Ferroelectrics – Ferro electricity – General properties – Dipole theory – Ionic displacements and the behaviour of $BaTiO_3$ – Spontaneous polarization of $BaTiO_3$ – Thermodynamics of Ferro electric transitions.

Unit IV: Elastic Behaviour, Polymer and Ceramics

An elastic and visco elastic behaviour - Atomic model of elastic behaviour - rubber like elasticity - An elastic deformation - Relaxation process - Model for visco elastic behaviour - Polymers - Polymerization mechanism - Polymer structures - Deformation of polymers - Behaviour of polymers - Ceramics - Ceramic phases - Structure - classes - Effect of structure on the behaviour of ceramic phases - composites.

Unit V: Laser Physics

Introduction – Interaction of radiation with matter - Spontaneous and stimulated emission – Conditions for oscillation to occur – Frequency of oscillation of the system – Einstein co-efficient – Population inversion - Laser pumping Rate equations - Three level laser - Four level Laser – Nd:YAG Laser – He-Ne Laser - Optical resonator – Types and modes of resonator – Oscillation - Threshold condition – The confocal resonant cavity – Theory – Spot size and beam divergence - quality factor (Q) of an optical cavity.

Books for Study:

1. G.K. Narula, K.S. Narula and V.K. Gupta - Material Science, TMH, New Delhi, 1995.
2. A.J. Dekker - Solid State Physics - McMillan Co., 1981.
3. V.Ragavan - Material Science and Engineering, 4th Edition - Prentice Hall of India, New Delhi, 2003.

4. M. Arumugam - Materials Science, 3rd Edition - Anuradha Agencies, 2002.

Books for Reference:

1. Lawrence H. Vlack - Elements of Materials Science and Engineering, 6th Edition - Reprint,
Addison-Wesley, 1998.
2. H. Iabch and H. Luth - Solid State Physics: An introduction to Principles of Material Science, 2nd Edition, Springer, 2001.
3. B.B. Laud - Lasers and Non linear optics, Wiley Eastern Ltd, 1991.
4. Verdayan J.J. - Laser Electronics - Prentice-Hall India, New Delhi, 1993.
5. Allen and Jones - Principles of Gas Lasers - Butterworths, London, 1967.
6. K.R. Nambiar - Laser Principles, Types and Application - New Age International, 2004.
7. K. Thyagarajan and A.K. Ghatak - Laser Theory and Applications - Macmillan India Ltd., 1997.

SEMESTER IV
PCPHM19 – NUCLEAR AND PARTICLE PHYSICS

Objectives:

- To understand the nuclear reactions and nuclear models.
- To impart knowledge about elementary particles.

Unit I: Nuclear Interactions

Nuclear forces – Two body problem – Ground state of deuteron - Magnetic moment – Quadrapole moment – Tensor forces –Meson theory of nuclear forces – Yukawa potential – Nucleon – Nucleon scattering – Low energy n-p Scattering - Effective range theory – Spin dependence, Charge independence and charge symmetry of nuclear forces – Isospin formalism.

Unit II: Nuclear Reactions

Types of reactions and conservation laws – Energetic of nuclear reactions –Dynamics of nuclear reactions – Q-value equation – Scattering and reaction cross sections – Compound nucleus reactions –Scattering matrix – Reciprocity theorem – Breit – Wigner one level formula – Resonance scattering – Continuum theory – Optical model.

Unit III: Nuclear Models

Liquid drop model – Semi empirical mass formula of Weizsacker – Nuclear stability- Mass parabolas – Bohr-Wheeler theory of fission – Shell model – Spin-orbit coupling – Magic numbers – Angular momenta and parities of nuclear ground states – Collective model of Bohr and Mottelson-Nilsson Model – Oblate and prolate deformations of Nucleus.

Unit IV: Nuclear Decay

Beta decay – Fermi theory of beta decay - Fermi – Curie Plot – Fermi and Gamow- Tellar selection rules – Allowed and forbidden decays – Decay rates – Theory of neutrino – Helicity of neutrino - Theory of electron capture – Non conservation of parity – Gamma decay – Multipole transitions in nuclei – Internal conversion – Nuclear isomerism.

Unit V: Elementary Particle Physics

Types of interaction between elementary particles – Hadrons and leptons – Symmetries and conservation laws – Elementary ideas of CP and CPT invariance – Classification of hadrons – SU(2) and SU(3) multiplets – Quark model - Gell-Mann-Okubo mass formula for octet and decupled hadrons – Charm, bottom and top quarks

Books for Study:

1. M.L. Pandya and R.P.S. Yadav - Elements of Nuclear Physics, 7th Edition, Kedar Nath Ram Nath, Delhi, 1995.
2. D.C.Tayal – Nuclear Physics – Himalaya Publishing House, 2006.
3. V.Devanathan – Nuclear Physics, 2nd Edition – Narosa Publication, 2011..

Books for Reference:

1. K. S. Krane - Introductory Nuclear Physics - Wiley, New York, 1987.
2. D. Griffiths - Introduction to Elementary Particle Physics - Harper & Row, New York, 1987.
3. R. R. Roy and B.P. Nigam - Nuclear Physics - New age Intl. New Delhi, 1983.
4. H. A. Enge - Introduction to Nuclear Physics - Addison-Wesley, Tokyo, 1983.
5. Y. R. Waghmare - Introductory Nuclear Physics - Oxford-IBH, New Delhi, 1981.
6. Ghoshal - Atomic and Nuclear Physics, Vol. 2 – S Chand & Co. Ltd., 2000.
7. J. M. Longo - Elementary particles, McGraw Hill, New York, 1971.
8. R. D. Evans - Atomic Nucleus – McGraw Hill, New York, 1955.
9. Kaplan - Nuclear Physics - Narosa, New Delhi, 1989.
10. B. L. Cohen - Concepts of Nuclear Physics - TMH, New Delhi, 1971.
11. M. K. Pal - Theory of Nuclear Structure - Affl. East-West, Chennai, 1982.
12. W. E. Burcham and M. Jobes - Nuclear and Particle Physics - Addison-Wesley, Tokyo, 1995.

SEMESTER IV
PCPHN19 - CONDENSED MATTER PHYSICS

Objectives:

- To know about the crystal structure bonding in crystals and theories of metals and semi conductors.
- To understand the Physics behind super conducting materials.

Unit I: Crystal Physics

Types of lattices – Miller indices – Simple crystal structures-crystal diffraction – Bragg's law – reciprocal lattice [Sc,bcc, fcc] – Laue equation - structural factor – Atomic form factor – Types of crystal binding – Cohesive energy of ionic crystals – Madelung constant – types of crystal bonding (general ideas).

Unit II: Lattice Dynamics

Monoatomic lattices – lattices with two atoms per primitive cell – First Brillouin zone – group and phase velocities - Quantization of lattice vibrations – Phonon momentum – Inelastic scattering by phonons – Debye's theory of lattice heat capacity – Einstein's model and Debye's model of specific heat – Thermal expansion – Thermal conductivity – Umklapp processes.

Unit III: Theory of Metals and Semiconductors

Free electrons gas in three dimensions – Electronics heat capacity – Wiedmann Franz law – Hall effect – Band theory of metals and semiconductors – Bloch theorem – Kronig-Penny model – Semiconductors – Intrinsic carrier concentration – Mobility – Impurity conductivity – Fermi surfaces and construction – Experimental methods in Fermi surface studies – De Haas Van Alphen effect.

Unit IV: Magnetism

Elementary ideas of dia, Para and Ferro magnetism – quantum theory of paramagetism – Rare earth ion – Hund's rule – Quenching of orbital angular momentum – Adiabatic demagnetization – Quantum theory of ferromagnetism – Curie point Exchange integral – Heisenberg's interpretation of Weiss field – Ferromagnetism domains – Bloch Wall – Spin waves quantization – Magnos – thermal excitation of magnons – Curie temperature and susceptibility of ferrimagnetisms – Theory anti ferromagnetism – Neel temperature.

Unit V: Super Conductivity

Experimental facts – occurrence – Effect of magnetic fields – Meissner effect - Entropy and heat capacity – Energy gap – Microwave and infrared properties – Type I and type II Super conductors – Theoretical explanation – Thermodynamics of Super conducting transition – London equation – Coherence length – Theory – Single particle tunneling – Josephson tunneling – DC and AC Josephson's effect – High temperature super conductors – SQUIDS.

Books for Study:

1. S.O Pillai - Solid State Physics, 7th Edition - New Age International, Delhi, 2015.
2. Guptha Kumar – Solid State Physics, 9th Edition - K.Nath & Co. Education, 2006.
3. K.Ilangovan - Solid State Physics - MJP Publications, Chennai, 2013.

Books for Reference:

1. A.J. Dekkar - Solid State Physics - Macmillan India, New Delhi, 2007.
2. H.M. Rosenberg - The Solid State Physics, 3rd Edition - Oxford University, Oxford. 1993.
3. S.L. Altman - Band Theory of Metals: The Elements – Pergamon Press Ltd., Oxford, 1970.
4. J.M. Ziman - Principles of the Theory of Solid - Cambridge University Press, London, 1971.
5. C. Kittel - Introduction to Solid State Physics, 7th Edition - New York, 1996.
6. M.Ali Omar - Elementary Solid State Physics: Principles, Applications - Addison-Wesley, London, 1974.
7. H.P. Myers - Introductory Solid State Physics, 2nd Edition – V K Taylor Francis Ltd., 1998.

SEMESTER IV

PEPHG19 - ELECTIVE IVA: FIBER OPTICS AND NON-LINER OPTICS

Objectives:

To make the students understand the concepts of fiber optics, Non linear optics and their applications

Unit I: Optical fiber waveguides and sources

Ray theory transmission: Total internal reflection, acceptance angle, numerical aperture and skew rays - evanescent field and Goos- Haechen shift – Sources: LED – structure , principle – modulation band width – transient response, Laser - Laser diode structure, Threshold conditions for laser oscillation – modulation of laser diode – mode locking laser source linearity and reliability.

Unit II: Types of Optical Fibers

Glass and plastic fibers - Step index – single mode – multimode - Graded index fibers – wave propagation – Fiber modes – Single and multimode fibres – Step index single mode fiber – step index multimode fiber – Graded index multi-mode fiber – Fiber bandwidth – Fiber loss – Attenuation coefficient – Material absorption

Unit III: Fabrication and Connection of OPTICAL FIBERS

Glass fibers - Preparation of optical fibers – Liquid-phase (melting) technique – fiber drawing - Vapour-phase deposition techniques – outside vapour phase deposition – modified chemical vapour deposition – plasma activated chemical vapour deposition - characteristics of single-mode, multimode, plastic-clad and all-plastic fibers.

Unit IV: Transmission Characteristics

Stability of Fiber Transmission Characteristics: Micro bending and hydrogen absorption – fiber alignment and joint loss – fiber splices – Fiber connectors: cylindrical ferrule expanded beam connectors - GRIN rod lenses - Fiber couplers: Three and four port couplers - star couplers.

Unit V: Nonlinear Optics and Solitons

Refractive index – frequency dependent and intensity dependent refractive index - Wave propagation in an anisotropic crystal – Polarization response of materials to light – Second harmonic generation – Sum and difference frequency generation – Phase matching –four wave mixing - Concept of solitons – formation of solitons – kdV equation - Nonlinear Schrödinger equation for solitons – soliton switching – soliton laser- advantages of soliton based communication.

Books for Study:

1. Ajoy Ghatak and K. Thyagarajan - Introduction to Fiber Optics, 6th Edition - Cambridge University Press, 2006.
2. John M. Senior - Optical Fiber Communications: Principles and Practice, 2nd Edition – PHI, 2011.

Books for Reference:

1. Gerd Keiser - Optical Fiber Communications, 4th Edition – McGraw Hill, 2012.
2. B.B. Laud - Lasers and Non-Linear Optics - New Age International, New Delhi, 2011.
3. Akira Hasegawa and Yujiodama - Solitons in Optical Communications - Oxford Press, 1995.
4. Robert W Boyd - Nonlinear Fiber Optics, 2nd Edition – Elsevier, 2006.

5. Govind P. Agrawal - Fiber Optic Communication Systems - John Wiley, 2003.
6. M Remoissenet - Waves Called Solitons: Concepts and Experiments, Springer Verlag, 1992.
7. B.B. Laud - Lasers and Nonlinear Optics, 2nd Edition - New Age International (P) Ltd., New Delhi, 1991.

SEMESTER IV
PEPHH19 – ELECTIVE IV B: ADVANCED MATERIAL SCIENCE

Objective:
To impart knowledge about crystallography and wide knowledge about properties of materials.

Unit I: Applied Crystallography in Material Science:
Crystal systems, unit cells. Indices of lattice directions and planes - co-ordinates of position in the unit cell - Crystal geometry. Symmetry classes and point groups, space groups. Glide planes and screw axes, space group notations, equivalent points. Systematic absences - Determination of crystal symmetry from systematic absences.

Unit II: Magnetism:
Principles of magnetic measurements – basic ideas of measuring M, chi, and Tc – Magneto thermal effect – magneto resistance – magneto optical phenomena – magnetic acoustic effect – magneto optic recording – importance of magnetic anisotropy.

Unit III: Superconductivity:
Introduction – critical parameters – anomalous characteristics – isotope effect, Meissner effect – type I and II superconductors – BCS theory – Josephson junctions and tunnelling – SQUID – High temperature superconductors, crystallographic and structural properties of high temperature superconductors – dependence of Tc on crystal structures – applications.

Unit IV: Laser Theory and Applications:
Einstein's coefficient – Threshold condition for laser action - resonant cavities, spot size – types of resonator, quality factor of an optical resonator. Welding, drilling and hardening - advantages and uses of laser in material processing – applications.

Unit V: Technological materials
Metallic glasses – preparation properties and applications – SMART materials – Piezoelectric,magnetostrictive, electrostrictive materials, CCD device materials - applications – solar cell materials (single crystalline, amorphous and thin films). Introduction to nano phase materials and its properties.

Books for study:

1) V. Raghavan – Material science and Engineering, Prentice Hall , 2003
2) C. Kittel – Introduction to Solid State Physics – Wiley and Sons Ltd., New York. 2015.
3) M. Tinkham – Introduction to superconductivity – Rhinehard and Winton New York, 1996
4) Charles P.Poole – Introduction to Nanotechnology - Wiley inter science, 2003
5) M.N. Avadhanulu – An introduction to lasers, theory & applications – S. Chand & Co. New Delhi. 2001.

6) B.D. Cullity – Introduction to magnetic materials – Addison – Wesley,1972.

Books for reference:

1) M. Ali Omar – Elementary Solid State Physics - Revised Printing Pearson Edn., 2000.
2) A. J. Dekker – Solid state Physics – Prentice Hall, 1957.
3) Oshea and Co. – An Introduction to lasers and their applications – Addison Wesley, 1969.
4) C.N.R. Rao- Chemistry of High temperature superconductors – World Scientific, 1991.
5) C.R.M. Grovenor and Co. Microelectronic materials – Adam hilger, Philadephia, 1989.

SEMESTER IV

PIPHG19 - INDEPENDENT ELECTIVE IV A: PHYSICS FOR SET/ NET - PAPER IV

Objective:

To impart knowledge about Nuclear & Particle physics, Numerical Methods and Condensed Matter Physics for Competitive Examinations

Unit I: Nuclear and Particle Physics - I

Basic nuclear properties – size, shape and charge distribution - Spin and parity - Binding energy - Ground state of deuteron - Nuclear reactions – Types of reactions - Conservation laws - Q-value equation - Nuclear models - Liquid drop - Semi empirical mass formula - Shell model, Magic numbers - Angular momentum and parity - Collective model.

Unit II: Nuclear and Particle Physics - II

Nuclear decay – alpha - beta and gamma decays - Selection rules. Elementary particles – Symmetries - Conservation laws - CPT invariance - Quark model – Baryons and mesons – Fission and Fusion – Nuclear reactions – Elementary particles and their quantum numbers.

Unit III: Numerical Methods

Numerical methods – Regular falsi - Newton's method – Lagrangian Interpolation - Newton's divided difference method - Trapezoidal - Simpson's rule - Solution of differential equations by Runge-Kutta method.

Unit IV: Condensed Matter Physics

Bravais lattices - Reciprocal lattices and Brillouin zones - Crystal diffraction - Bragg's law - Crystal diffraction techniques. Bonding of solids - Lattice specific heat - Phonons - Einstein's and Debye's theory of specific heat - Free electron gas - Hall effect - Bloch theorem - Kronig Penny Model - Semiconductors. Elementary ideas of dia, para and ferro magnetism.

Unit V: Superconductors

Superconductors - Properties of superconductor - Type I and II Superconductors - Josephson Effect - London equation - BCS theory - High temperature superconductors and applications.

Book for Study

1) M.L. Pandya and R.P.S. Yadav – Elements of Nuclear Physics, KedarNath Ram Nath, Delhi, 2005.
2) D. C. Dayal – Nuclear Physics University of Chicago Press Chicago.; Revised Edition, 6th Printing edition (1956)

3) D. Griffiths – Introduction to Elementary Particle Physics, Harper & Row, New York, 1987
4) S.O. Pillai – Solid State Physics, New Age International Publishers, New Delhi, 2017.
5) Gupta Kumar Sharma – Solid state Physics
6) C. Kittel – Introduction to Solid State Physics, Wiley & Sons Ltd., New York. 2012.
7) Dr. SurekhaTomar - Competitive Exams for CSIR – UGC NET/JRF/SET – Upkar's publications.
8) M.K. Venkataraman. - Introduction to Numerical Methods

Book for reference

1. K.S. Krane – Introductory Nuclear Physics , Wiley, New York, 1987.
2. J.K. Bhattacharjee – Statistical Mechanics an Introductory text – Allied Publishers Ltd.,New Delhi, 1996.
3. Charles Kittel, Elementary Statistical Physics – Dover Publications, Inc, New York, 2004.
4. M. Glazer and J. Wark – Statistical Mechanics - Oxford University Press.
5. C. Kalidas, M.V.Sangaranarayanan - Non – Equilibrium Thermodynamics – Macmllan India, New Delhi.

SEMESTER IV

PIPHH19 - INDEPENDENT ELECTIVE IV B: ADVANCED NUCLEAR PHYSICS & SPECTROSCOPY

Objective:

To impart knowledge about nuclear detectors and particle accelerators, basic aspects of astrophysics and applications of nuclear physics. Beside this, students will be exposed to UV spectroscopy, atomic absorption and emission spectroscopic techniques.

Unit I : Nuclear Detectors and particle accelerators

Interaction of radiation with matter - Ge and Si solid state detectors - Calorimeters and their use for measuring jet energies. Scintillation and Cerenkov counters - Qualitative ideas, Hybrid detectors. Particle accelerators – Pelletron - Synchrotron - Synchrocyclotron - Colliding beam accelerators - Large Hadron Collider.

Unit II: Nuclear Astrophysics

Cosmic rays: Origin of cosmic rays - Nature of primary cosmic rays and its energy distribution - Geomagnetic and Latitude effect - East-west asymmetry - Origin of secondary rays - Collision with electrons - Thermonuclear fusion - Stellar nucleo-synthesis - Energy production in stars - PP chain - CNO cycle.

Unit III: Applications of Nuclear Physics

Rutherford Backscattering Spectroscopy as a tool for depth profiling - Nuclear Fission Reactors – Neutron Activation Analysis – Proton Induced X-ray Emission for trace element analysis - Radioactive dating - Mossbauer Effect - Applications in medicine.

Unit IV: UV Spectroscopy

Energy levels - Molecular orbital's theory and UV spectra – Franck Condon Principle – Transition Probability - Measurement of spectrum – Types of transition in Organic molecules – Types of absorption bands – Transition in metal complexes – Selection rules – Electronic spectra in poly atomic molecules – Chromospheres concept – Application of UV Spectroscopy.

Unit V: Atomic absorption and Emission Spectroscopy

Principle of AAS - Measurement of atomic absorption – Instrumentation – Single beam Spectrophotometer – Applications of AAS - Atomic Emission Spectroscopy – Principle of AES - Advantages – Instrumentation - Laser beam – Applications of AES – Difference between AAS and AES.

Books for Study:

1. G. Aruldhas - Molecular Structure and Spectroscopy - Prentice Hall of India Pvt. Ltd., New Delhi, 2001.
2. H.Kaur - Spectroscopy, 5th Edition - A PragatiPrakashan, 2009
3. P. S. Sindhu - Molecular Spectroscopy - Tata McGraw Hill, New Delhi, 1990.
4. Krane K.S. Nuclear Physics, Wiley India Pvt. Ltd., (2008).
5. Lilley J.S., Nuclear physics principles and applications John Wiley & sons Ltd., (2007).

Books for Reference:

1. Raymond Chang - Basic Principles of Spectroscopy – McGraw Hill Kogakusha, 1980.
2. G. W. King - Spectroscopy and Molecular Structure - HoitRinchart and WinstenInc, London, 1964
4. Concepts of Modern Physics: A.Beiser.
5. Subatomic Physics, Frauenfelder and Henley. (Prentice-Hall)
6. De Soete, D. R. Gijbelsa n d J. Hoste, Neutron Activation Analysis. John Wiley and Son s: New York, NY.(1972).
7. L. C. Feldmen and j. W. Mayer, fundamentals of surface and thin film s analysis, North Holland, Elsevier, 1986.
8. W. R. Leo, Techniques for Nuclear and Particle Physics Experiments, Narosa Publishing House, Indi, 1995.
9. G. F.Knoll, Radiation Detection and Measurement, John, Wiley & Sons, Inc, 2000.

SEMESTER IV

PCPHO19 – PRACTICAL III: ADVANCED GENERAL EXPERIMENTS

(Any 15 experiments)

1. G.M. Counter - characteristics, Inverse square law.
2. G.M. Counter - Absorption co-efficient.
3. Determination of Carrier Concentration – Hall Effect.
4. Determination of Volume Susceptibility of a liquid by Quincke's method.
5. Determination of Mass Susceptibility of a liquid by Guoy's method.
6. Michelson Interferometer -Wavelength and separation of wavelengths.
7. Michelson Interferometer - Thickness of mica sheet.
8. F.P. Etalon using Michelson set up.
9. Determination of Wave length of Laser Beam.
10. Ultrasonic Interferometer - Velocity and Compressibility of a liquid.
11. Ultrasonic Diffraction - Velocity and Compressibility of a liquid.
12. Determination of Planck's constant.
13. B-H curve using CRO.
14. Salt Analysis using Spectrograph - CDS
15. Dielectric constant of liquids and solids by capacitance method.
16. Determination of coefficient of coupling by AC bridge method.
17. Impedance measurement using LCR bridge.
18. Four probe method – Determination of conductivity of thin films.
19. Determination of dielectric loss using CRO.
20. Laser diode characteristics.

SEMESTER IV

PCPHP19 – PRACTICAL – IV: MICROPROCESSOR, MICROCONTROLLER AND C PROGRAMMING

(Any 20 experiments)

Microprocessor 8085 Programmes

1. Addition & subtraction and Multiplication & Division of 8-bit hexadecimal numbers.
2. Square and Square Root of 8-bit hexadecimal numbers.
3. Picking up Largest and Smallest number in an array of 8-bit hexadecimal numbers.
4. Arranging an array of 8-bit hexadecimal numbers in Ascending and Descending orders.
5. Code Conversion of Binary to BCD and BCD to Binary, Binary to ASCII and ASCII to Binary and BCD to ASCII and ASCII to BCD.
6. 8-Bit and 16-Bit BCD Addition.
7. Addition of Array of 8-Bit Numbers.
8. Digital Clock Program for 12 / 24 Hours.
9. Analog to Digital Conversion and ADC Interface.
10. Digital to Analog Conversion – Wave form Generator – DAC Interface.
11. Keyboard Display Interface.
12. Stepper Motor Interface.
13. Traffic regulation interface
14. Dynamic message display
15. 8255 I/O Display interface

Microprocessor 8086 Programmes

16. 16-Bit Addition & subtraction and Multiplication & division.
17. 16-Bit Ascending and descending order.
18. Computation of LCM.
19. Factorial of a number.

Microcontroller 8051 Experiments

20. 8-Bit Addition and Subtraction
21. 8-Bit Multiplication and Division.
22. Sorting in ascending and descending order.
23. Sorting out the maxima and minima.

Computation Methods – C Programming

24. Lagrange interpolation with algorithm, flow chart with program and its output
25. Numerical integration by Simpson's rule with algorithm and flowchart with program and its output.
26. Numerical solution of ordinary first order differential equation -Euler's method with algorithm, flowchart and its output.
27. Numerical solution of ordinary first order differential equations by the Runge- kutta method, with algorithm, flow chart with program and its output
28. Curve fitting - Least square fitting with algorithm, flowchart and its output.

Pattern Of Question Paper

CONTINUOUS ASSESMENT

Time: 2 hours **Maximum Marks: 50**

SECTION A – (2 x 3 = 6 Marks)
Answer ALL the questions.

SECTION B – (2 x 7 = 14 Marks)
Answer ALL the questions. (either or type)

SECTION C – (2 x 15 = 30 Marks)
Answer any **TWO** questions out of Three

SEMESTER EXAMINATIONS

TIME: 3 hours **Maximum Marks: 100**

SECTION A – (5 x 3 Marks = 15 Marks)
Answer **ALL** the Questions.

SECTION B – (5 x 8 Marks = 40 Marks)
Answer **ALL** the Questions (Either or type)

SECTION C – (3 x 15 Marks = 45 Marks)
Answer any **THREE** questions out of Five.

Internal Marks	40 (CA 35 + IC 5)
Semester Marks	60 S

SELF STUDY PAPER
QUESTION PATTERN

CONTINUOUS ASSESMENT

TIME: 2 hours **Maximum Marks: 50**

SECTION A – (20 x 1 = 20 Marks)
Answer **ALL** the questions – Multiple choice questions

SECTION B – (15 x 2 = 30 Marks)
Answer **FIFTEEN** out of 18 questions.

SEMESTER EXAMINATIONS
(Theory Papers)

Section – A (20 x 1mark = 20 marks)
Multiple choice questions
Answer **ALL** the Questions (20/20)
Section – B (10 x 3 marks = 30 marks)
Answer any **TEN** Questions out of 12. (10/12)

Section - C (5 x 10 marks = 50 marks)
Answer any **FIVE** questions out of eight. (5/8)

(SET/NET Papers)
Section – A (50 x 1mark = 50 marks)
Multiple choice questions

Answer **ALL t**he Questions (50/50)
Section – B (25 x 2 marks = 50 marks)
Multiple choice questions
Answer any **TWENTY-FIVE** problems out of 30. (25/30)
Credits : 2 Extra credits per paper

M.Sc. ZOOLOGY

(With effect from the Academic Year 2019 - 2020)

SEMESTER II
PCZOG19 - PRACTICAL I

Major: Dissections:

1. Invertebrata: Digestive system - Prawn, Cockroach and Sepia
   Nervous system – Prawn, Cockroach and sepia

2. Chordata: Cranial nerves of Shark
   Arterial system of Shark

3. Minor: Mounting:
   Appendages of Prawn
   Sting apparatus of Honey Bee
   Mouth parts - House fly, Mosquito, Cockroach, Honey bee

4. Study of museum specimen and slides relevant to - Structural modifications of chordates - Hippocampus, Acipenser and Ambystoma.
   Adaptive features for their mode of life - Echeneis, Hyla, and Draco.

5. Molecular Biology and Genetics:
   Giant Chromosome - Polytene Chromosome
   a) Chironomous Larva – Slide
   b) Lampbrush Chromosome – Chart

6. Karyotyping using human metaphase chromosome plates, Identification of syndromes
   (i) Down (ii) Klinefelter's (iii) Turner

7. Study on Inborn errors of metabolism- Chromosome Charts.
   Lipid metabolism – Tay - Sachs and Niemann - Pick
   Protein metabolism – PKU and Alkaptonuria
   Carbohydrate metabolism – Galactosemia and Pompe's disease

8. Visit to a Molecular Biology laboratory.

9. Biotechnology and Microbiology:
   a) Aspergillus, Rhizopus, Pseudomonas, Basillus
   b) Salmonella, Lactobacillus, Saccharomyces cerevisiae
   c) GM Papaya, GM Tomato, Bt Cotton, Bt Brinjal
   d) Hybridoma Technology
   e) Transgenic Animals – Fish, Goat

SEMESTER I

PIZOA19 – INDEPENDENT ELECTIVE I A: PET KEEPING

Objectives

- To gain an extensive foundation for a career in the pet industry.
- To develop a career or business working with animals in breeding and supplying pets, or supplying services or products to pet owners.

Unit I

Animal care: laws and licenses. Animal charities and societies (RSPCA, WSPA, Blue cross) - pet care needs (feeding, watering, shelter, containment, fencing, caging, protection)- maintaining health and hygiene.

Unit II

Dogs: Selection – Pedigree - breeds, Training – positive reinforcement for puppies. Adult training; Reappraise basic training; teaching old dogs new tricks; illness- first aid on spot diagnosis- vomiting and diarrhea, poisoning, cuts, grazes, wounds and burns; Breaks and fractures; shock.

Unit III

Cat: Breeds (long haired, semi long haired, short haired, oriental); allergies-containment; Breeding; New born kittens- care for sick cat (signs of illness, temperature, common ailments, skin disorders -ticks.

Unit IV

Birds: Selection: Breeds (canaries, finches, budgerigars, small parrots); containment (Aviaries, selection, design); size - management - feeding - watering- Grooming (wing trim, beak trim, nail trim) - caring for the sick bird- signs of illness- common ailments.

Unit V

Selection - Types of fish (tropical, marine, cold water) - costs, size, equipment -tanks, ponds, pumps, aquarium, night lights - water quality - changing water- feed (pelleted, live feed) – illness (fungal, bacterial parasites).

References

1. Shane Bateman, The First aid companion for dogs & cats. Rodale books, 2001.
2. Alan Edwards, The ultimate Encyclopedia of cats, cat breeds & cat care. South Water, 2012.
3. Sheldon L. Gerstenfeld, V.M.D, The Bird Care Book, Da Capo Lifelong books, 1989.
4. David E. Boruchowitz, The simple Guide to freshwater Aquariums. TFH publications, inc. 2001.
5. Gary A Gallerstein, D.V.M . The complete Pet Bird owner's Handbook. Avian Publications, 2003.
6. Gary Richter M.S - The Ultimate Pet Health Guide - Hay House Inc, 2017.

SEMESTER I

PIZOB19– INDEPENDENT ELECTIVE I B: BIOPHYSICS

Objectives

- To impart knowledge on the basic principles of biophysics.
- To employ different advanced Methodologies in Research.

Unit I

Basic concepts of biophysics- Atoms, Atoms and elements, Molecules and components, Structure of atoms, isotopes, hydrogen ion concentration, mole and mole concept, Normality, buffers, stability, redox potential and examples of redox potential in biological systems.

Unit II

Thermodynamics of biological system- first and second law of thermodynamics, activation energy biological system as open non equilibrium system, concepts of energy unavailable energy and entropy, enthalpy negative entropy application of biological system thermodynamics of active and passive transport.

Unit III

Membrane conductivity- active transport mechanism factors-biological significance-characterization- biological importance and techniques used in diffusion, Osmosis, emulsions, Colloids, dialysis, velocity and surface tension.

Unit IV

Principle and application of sensors, Laser beam in Biomedical field –applications of Lasers in therapies and diagnosis. Magnetic Resonance Imaging (MRI), Computer Topography (CT)scan, Ultrasound in interaction with tissues and application in therapeutics. Electrocardiogram (ECG), Electroencephalogram (EEG), Electromyograph (EMG) - Flow Cytometry and cell sorting, Autoradiography –types and techniques used and Evaluation of radiogram.

Unit V

Chromatography-Adsorption, Partition, Principle, Experimental set up, Methodology and Applications of Gel-Permeation Chromatography, Gas Liquid Chromatography - Electrophoresis principle, factors affecting the migration of substances and supporting media immuno electrophoresis, Agarose Gel electrophoresis, Slab Gel electrophoresis. Spectroscopy – Atomic Emission Spectroscopy Atomic Absorption Spectroscopy and Electron Spin Spectroscopy.

References

1. Skoog, D.A *et.,al.*, Principles of Instrumental Analysis., 5th edition. Saunders College Publication,1998.
2. Daniel M., Basic Biophysics for Biologist. Agro Botanical Publishers, India 1989.
3. De Robertis E.D.P and De Robertis E.M.F., Cell and Molecular Biology, VIII Edition Lippincott Williams and Wilkins Philadelphia, 2006.
4. Khandpur, R S., Handbook of Biomedical Instrumentation, McGraw Hill Publishing Co.Ltd. 2003.
5. Palanichamy S and Shunmugavelu M., Principles of Biophysics. Palani Paramount Publication 1996.
6. Subramanian M A., Biophysics- Principles and Techniques. MJP Publishers Chennai.
7. Thiravia Raj., Biophysics. Saras Publication. 1995.
8. Vatsala Piramal Biophysics. Dominant Publishers and Distributors 2006.

SEMESTER II

PIZOC19 – INDEPENDENT ELECTIVE II A: ANIMAL HUSBANDARY

Objectives

- To know about the care and management of livestock.
- To learn the correct method of feeding, breeding, housing and health care of livestock.

Unit I: Cattle Industry In South India

Cattle – importance, classification, population and food supply, suitable environment, rainfall and soil; suitability for tracts and farming types; grazing conditions, communal, forest and private grazing; fodder cultivation; cattle rearing.

Unit II: Important Breeds Of Cattle In South India

Breed characters: Kangayam, Ogole, Mysore and Alambadi breeds, Barghur cattle, Jellicut animals, Tanjore polled cattle, Buffaloes.

Unit III: Methods Of Breeding

In – breeding, line – breeding, out – crossing with other species and breeds, grading – up, selection – individuality, parentage, offspring influence; improvement of cattle in south India, hurdles in grading – up.

Unit IV: Principles Of Feeding

Use of food, nutrients, nutritive ratio, starch equivalent, energy value, feeding standard, rations, roughages and concentrates, schedule of rations, some feeding hints; composition of feeding stuffs, digestibility coefficient of important feeds.

Unit: V: Management Of Cattle

Housing, providing drinking water, grooming and washing, providing exercise, care for sick animals, training young stock.

References

1. G.C.Bannerjee, A textbook of Animal Husbandary, Oxford publications 2018.
2. O.P.Mishra, Textbook of Veterinary sciences and Animal Husbandary, Write and Print publication 2017.
3. D.N. Pandey, Animal Husbandary and veterinary science, Jai Prakash publication, 2018.
4. F.J. Bolger, Animal Husbandary (rural studies), Little Hampton book service Ltd, 1965.
5. K.C. Mahanta, Textbook of Animal Husbandary, Asia publishing house, 1977.

SEMESTER II

PIZOD19 – INDEPENDENT ELECTIVE I B: ECO ENERGETICS AND ECOLOGICAL METHODS

Objectives

- To promote environment friendly, and sustainable model of energy
- To promote the concept of energy efficiency
- To understand the soil population estimation by using techniques
- To understand the methods of wildlife population estimation
- To gain the knowledge about zooplankton and phytoplankton.

Unit I

Concept of ecosystem- Define terms – ecosystem, habitat, ecological niche, Energy flow in an ecosystem – model of energy flow- types of food chains, food webs. Efficiency of energy transfer between trophic levels, ecological pyramids, Law of thermodynamics.

Unit II

Primary productivity and Secondary productivity, fundamentals of productivity, aspects of productivity, productivity rate, ecological efficiency, methods of measurement - harvest method, oxygen method, pH method. Disappearance of raw materials.

Unit III

Population Estimates by Sampling a Unit of Soil or Litter Habitat: Extraction Techniques; Bulk staining, Mechanical methods of extraction, Dry sieving, Wet sieving, soil arthropod collection- Tullgren funnel series. Soil washing and flotation.

Unit IV

Wildlife Population Estimates by Census and Distance Measuring Techniques; Census methods, Point and line survey methods, Indices of abundance using transects, Methods based on flushing, Line transect methods: the Fourier series estimator, Point transects.

Unit V

Planktons- types, characters and ecology, A Method of Collection, Preservation and morphological Identification of Marine and fresh water Phytoplankton and Zooplankton.

References

1. P.S. Verma and V.K. Agarwal, Environmental Biology (principle of ecology), S. Chand, 2000.
2. Eugene; Odum, Howard Odum, Fundamentals of ecology, W.B Saunders Co,1961
3. P.B. Nagaraj and D. Venkatesh, Basic Thermodynamics Paperback, New age international publishers, 2005.
4. O.L. Lange P.S Nobel C.B Osmond and H. Ziegler, Physiological plant ecology, Springer, 2011
5. Arvind Kumar, Ecology of Plankton, Daya Publishing House, 2008
   Giri Kattel, Zooplankton and phytoplankton,Nova Science Publisher, Inc. 2011.

SEMESTER III

PIZOE19 – INDEPENDENT ELECTIVE III A: RADIATION BIOLOGY

Objective

- To understand the radiation protection.
- To learn about the application of radiation in treatments.

Unit I

Definition, scope and significance of radiation biology. General classification of radiation. Ionizing radiation, linear energy transfer, radiation dose and units. Principles of radiation dosimetry, direct and indirect effects.

Unit II

Radiations lesions in DNA, radiobiological effect on cell. Radiation sensitizers and protectors. Effect of Radiation on Human Health. Long term radiation risks from low radiations doses. Radiation induced cancer. Radiation effects in the developing embryo and fetus, radiation induced heritable diseases.

Unit III

Radiation Quantities Exposure, Absorbed Dose, Equivalent Dose, Effective Dose. Cellular Response to Radiation Indirect and direct action, Time scale of radiation effects. DNA damage and chromosomal aberrations. Radioprotectors and Radiosensitizers.

Unit IV

Radiation Carcinogenesis. Risk estimates for radiation-induced cancer. Radiation-induced sterility. Hereditary effects of radiation.

Unit V

Whole-Body Radiation Effects Acute radiation syndrome. Treatment of radiation accident victims. Radiation Protection. Radio therapy. Precautions and safety measures in handling radioisotopes.

References

1. Gopal B. Saha, Physics and Radiobiology of Nuclear Medicine III edition. Springer, 2006.
2. H. C. Jain, Radiation and Man. National Book Trust, India. 1994.
3. Steve Forshier, Essentials of Radiation Biology and Protection –II edition
4. J. Kiefer, Life Sciences and Radiation. Springer, 2004.
5. A. H. W. Nias, An Introduction to Radiobiology, 2nd edition (1998), Wiley Blackwell, ISBN13: 978-0471975908.
6. Fliedner, T. M., Friesecke, I. & Beyrer, K., Radiation Biology 3.1. 2001.

7. Medical management of radiation accidents– manual on the acute radiation syndrome.British Institute of Radiology Supplement.
8. Hall, E. J, Giaccia A. J.. Radiobiology for the radiologist, Philadelphia, Pa: Lippincott Williams & Wilkins. 2006
9. INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION,: Low dose extrapolation of radiation-related cancer risk, ICRP publication. 2006.
10. Sureka C.S, Armpilia C - Radiation Biology for Medical Physicists. CRC Press – ISBN-10, 1498765890, ISBN - 13, 978-1498765893, 2017.

SEMESTER III

PIZOF19 – INDEPENDENT ELECTIVE IIIB: DAIRYING

Objectives

- To learn the techniques of improved milk production.
- To know the preservation and processing of milk.

Unit I

Development of dairying, cattle population and production of milk, dietary requirements of milk, milk intake and income levels, milk production-cost relationship; utilisation of milk.

Unit II

Lactation, milk as food, udder, secretion of milk, let-down of milk, factors affecting secretion-individuality, feeding, environment and maintenance; properties of milk, composition of milk-proteins, fat, lactose, ash, water, and vitamins.

Unit III

Variations in composition-period preceding milking, time of milking, portion of milk tested, stage of lactation, age of cow, and feed; food value of milk; enzymes in milk; colostrums, pre-milking, slimy or ropy milk.

Unit IV

Entry of bacteria into milk, water-supply, attendants, unhealthy animals; types of bacteria in milk; effects of bacteria on milk; reducing number of bacteria in milk, dairy utensils, cleaning and sterilising utensils and equipment.

Unit V

Pasteurisation of milk in Western countries and India; holder method of pasteurisation, H.T.S.T. method, pasteurising bottled milk, cooling after pasteurisation, homogenisation, grading milk.

References

1. Agrawal ,V .K Economics of milk industry in India. New Delhi: Commonwealth Publishers, 1990.

2. Owe, L. T. and Goldie, J. M., The Student's Handbook of Milk and Milk Products. Worcestershire, Little bury and Company, 1947.
3. H. L. Rangappa, K. S. and Achayya, K. T., Chemistry and Manufacture of Indian Dairy Products. The Bangalore Printing and Publishing Co., Ltd., Bangalore. 1948.
4. Report on the Marketing of Milk in the Indian Union, lndia Government Publication, New Delhi, 1950
5. Roger Blowey FRCVS - The Veterinary Book for Dairy Farmers 4th. Old pond publishing ltd. ISBN: 9781908397775. 2016.

SEMESTER IV

PIZOG19 – INDEPENDENT ELECTIVE IV A: BIOSYSTEMATICS

Objectives

- To understand biological characteristics.
- To learn diversity and evolutionary relationship among the organisms.
- To apply phylogeny classification at species level and infra species level.

Unit I

Introduction and basic concept of biosystematics and taxonomy - Rise of Taxonomy - Problems, aims and tasks in taxonomy - Taxonomy as a profession - Importance and application of biosystematics in biology – Chemotaxonomy – Cytotaxonomy – Attributes of Taxonomy.

Unit II

Types of biological classification (Essentialism, Nominalism, Empirism, Cladism and evolutionary classification) - Newer Trends in Taxonomy : Morphological approach, Immature stages and embryological approach, Ecological Approach, Behavioural Approach, Cytological and Biochemical Approaches, Numerical taxonomy and Differential systematics.

Unit III

Zoological Classification Kinds of classification, phyletic lineages, components of classification - Hierarchy of categories - Species concepts : Typological species concept, Nominalistic species concept, Biological species concept, Evolutionary species concept, Recognition species concept. Kinds of species : Polytypic & monotypic species, subspecies, infraspecific groups, super species, other kind of species.

Unit IV

Taxonomic procedures, Taxonomic collection, Curetting of animals and Process of Identification. Preservation of specimens, Taxonomic Keys - Types, merits and demerits,

International code of Zoological Nomenclature (ICZN), Interpretation of rules of nomenclature.

Unit V

Taxonomic Records and Publications Taxonomic keys, Taxonomic characters description, Taxonomic paper, Zoological Records, Directories, Abstracts, Review.

References

1. Kapoor V.C, Theory and practice of animal taxonomy, Oxford and IBH, New Delhi, 2010.
2. Ashok Verma, Principles of Animal Taxonomy, Narosa Publishing house, New Delhi, 2015.
3. George Gaylord Simpson, Principles of animal taxonomy, Columbia University Press, New York, 1990.
4. Quicke, D. L. J, Principles and Techniques of contemporary Taxonomy, Blackie Academic Professional, 2008.
5. Quentin. T. Wheeler, The New Taxonomy, The Systematics Association Special Volume Series, 76. (ed.) CPR Press, 2008.
6. Theodore Horace Savory, Animal Taxonomy, University of Michigan, Heinemann, 1970.
7. Dr.R.C.Tripathi, Biosystematics & Taxonomym, University Book House, Jaipur, 2005.
8. G.G. Simpson, Principle of Animal Taxonomy**:** Oxford & IBH Publishing Co., 1962.

SEMESTER IV

PIZOH19 – INDEPENDENT ELECTIVE IV B: GENERAL PSYCHOLOGY

Objectives

- To understand, predict and control behavior.
- To learn the causes of abnormal behavior.
- To minimize the intensity of real life problems.

Unit I

Psychology –Meaning- Scope- Branches- Application of Psychology in Family, Education, Health, Self Development -Research in Psychology, Research challenges.

Unit II

The Concept of Self – Personality – Definition- Structure of personality- Dynamic Nature of Personality, Personality development- Theories of Personality- Personality Evaluation.

Unit III

Social Psychology – Aim – Scope- Methods- Nature and Need of Social Behavior, Sequence of social development- Infancy, Childhood, Social maturity, Social Norm, Role and Status- Social Interaction- Socialization.

Unit IV

Psychopathology- Abnormal behavior – Models- Diagnosing and Classifying disorders- Neuroses- Psychoses- Schizophrenia- Personality disorders, Prevalence of Mental disorders .

Unit V

Forensic Psychology- Family Court- Civil Court- Criminal Court. Child Abuse Evaluations, Termination of parental rights, Adoption Readiness Evaluation, Personal Injury Evaluations, Psychological factors in physical trauma, Sexual Harassment.

References

1. Ernest R Hilgard, Richard C Atkinson and Rita L Atkinson – Introduction to Psychology 6th Edition- Oxford & IBH Publishing Co. Pvt. Ltd. 1975
2. Chaube S.P. Social Psychology- Second Revised Edition- Lakshmi Narain Agarwal Educational Publishers, Agra. 1995
3. Robert S. Feldman – Psychology and Your Life- Tata McGraw Hill Education Pvt. Ltd. New Delhi- 2012
4. Lester D Crow and Alice Crow- Child Development and Adjustment- Surjeet Publication-2008
5. Saundra K Ciccarelli, Noland White J. – Psychology- Pearson 5th Ed. 2017
   Kaila H. L. – Introduction to Psychology – AITBS Publishers- Ind

SEMESTER IV

PIZOI19 – INDEPENDENT ELECTIVE IV C: ANIMAL CARE

Objectives

- To impart special knowledge on animals and their relationship.
- To learn to examine sick animals, and understand how diagnostic procedures are applied for determining diseases.
- To learn about animal psychology; innate behaviour and survival.

Unit I

Animal feeding: Types of feeder; nutritional requirements; vitamins, minerals; choosing and preparing food; quantity and timing of feeding.

Unit II

Animal accommodation: Housing requirements; Bedding materials; Fixtures and fittings; cleaning and maintaining; Waste disposal.

Unit III

Animal health: Disease prevention; Common diseases of dogs, cats and rabbits; Endoparasites and ectoparasites; signs of ill health; first aid procedures and remedies.

Unit IV

Handling, restraining and moving animals: Need for handle, restrain and move animals; personal protective equipment; handling and restraint equipment; reducing stress.

Unit V

Animal behaviour; Normal behaviour; Emotions; abnormal behaviour; stereotypic behaviour; observing behaviour; methods and recording; avoiding/ reducing abnormal behaviour; Environmental enrichment; Animal Ethics.

References

1. Staff of ACS distance education. Animal feed and nutrition- ISBN NO: 979-0-9942948.
2. Dr. Pitcarins, Complete guide to natural health for dogs and cat. Published by Rodale books 2005.
3. Carol Ekarius - Animal Housing, Storey Books Publisher, 2004
4. Martin Goldstein, The Nature of Animal Healing. Published by Ballantine books, 1999
5. D. Broom, Domestic animal behavior and welfare published by CABI, 2007.
6. James yeates - Companion Animal Care and welfare - ISBN: 9781118688793- Wiley Black well, 2019.

AUXILIUM COLLEGE (Autonomous) Vellore – 6

NCC - SEMESTER I

USNCA119 - SKILL BASE ELECTIVE - ORGANISATIONAL TRAINING

UNIT I (NCC Organization)

Aims and objectives of NCC - Cardinal points of NCC-Organization of NCC – Structure – NCC staff – Training in NCC and the NCC song – incentives to cadets – incentives by the Central Government and State Government – Duties , Responsibilities and conduct by NCC cadets – NCC camps: Reece, selection of camp site, camp hygiene , camp appointments

UNIT II (**Foot Drill Basics)**

Aims and objectives of learning the drill commands and its importance- General word of commands - Attentions-Stand at ease - Turning and inclining at the Halt – Sizing, Forming up in Three Ranks, Numbering and close order march and Dressing – Saluting at the Halt, Getting on Parade, Falling out and Dismissing- Arms Drill – Ceremonial Drill

UNIT III (Physical and Mental Hygiene)

Structure and Functioning of the Human body – introduction – Skeletal and Muscular system – Classification - Personal Hygiene – introduction – important Component of Food hygiene – Sanitation – Sources of Refuse – Disposal of waste Products – Physical and Mental Hygiene

UNIT IV (First-Aid)

Infectious and Contagious Diseases – Introduction – Classification – Preventive Measures - First aid in Common Medical Emergencies – injuries to internal organs – Reasoning and treatment – Burns and Scalds – Snake, Scorpion and Dog Bite – Foreign Bodies – Asphyxia – First aid in case of Electric Shocks – Insensibility or Unconsciousness – Artificial Respiration – First aid for different type of fractures.

UNIT V (Adventure Training)

Introduction – Para Sailing – Parasailing Gear – Types – Safety Tips – Slithering – General information – Equipment – uses and techniques – Rock climbing – Cycling and Trekking – Trekking Gear and Tips – Safety Measures. **(Practicals - Drill Movements)**

Text book:

Study material will be provided

Book for Reference:

1) Pamphlets issued by the Ministry of Defense
2) DG NCC training directive.

SEMESTER II

USNCB219 - NATIONAL INTEGRATION AND TRAINING

UNIT I (National Integration)

Introduction – Importance – Necessity of National Integration – factors affecting National Integration – Measures - Relevance of NCC in National integration – slogans of National integration – images – Role of NCC in Nation Building – NCC and National Integration.

UNIT II (Constitutions of India)

Introduction – Preamble – fundamental rights and duties – Directive Principles of State policy – National Flag, National Emblem, National Anthem and National Song
Unity in Diversity – Introduction – Fundamental of unity in diversity - Heritage of India – Festivals of India – Freedom struggle and Nationalist Movement in India – End of rule of East India Company – Nationalist Movements in India.

UNIT III (Disaster Management)

Disaster Management – introduction – National Disaster Management Authority – Organisation of NDMA – Structure – National Disaster Response Force – Types of Disasters – Classification – Essential services and their Maintenance – Role of NCC cadets in Maintaining Essential Services – Traffic Control during Natural Disasters under police supervision – Assistance during Natural Disasters – Effects - Do's and Don'ts for NCC cadets performing disaster Management duties.

UNIT IV(Civil Defence)

Civil defence – Introduction – Civil defence organisation – Civil Defence services and their duties Fire fighting – Introduction – Causes and Prevention of Fire – Mode of Spread – Fire fighting extinguisher – Fire fighting Parties – Fire fighting Equipments.

UNIT V (Foot Drill II)

Marching-length of pace and time in marching in quick time and halt-slow march and halt-side pace-pace forward and to the rear-Turning on the march and wheeling-saluting on the march-Marching time-forward march and halt in quick march-Changing step-Strength of Samman guard – Guard of Honour. **(Practicals – Arms Drill**).

Text book:

Study material will be provided.

Book for Reference:

1) Pamphlets issued by the Ministry of Defence.
2) DG NCC training directive.

SEMESTER III

USNCC319 - DEFENSIVE MECHANISM

UNIT I (Basics of Weapon Training)

Characteristics of .22 Rifle – introduction - Stripping, Assembling, Cleaning and Sight Setting – Loading, Cocking and Unloading - Lying Position and Hold – Trigger Control and Firing a Shot – Range Procedure and Safety Precautions – Theory of Group and Snap Shooting – Short Range Firing (.22 Rifle), Aiming and alteration of sight - Characteristics of 7.62mm SLR and 5.56mm INSAS – Technical Data of infantry weapons

UNIT II (Drill with Arms, Ceremonial Drill)

Attention and stand at ease and stand easy-getting on parade with rifle and dressing with rifle and dressing at the order-dismissing and falling out, ground/take up arms-present from the order and vice versa-general saluting at the shoulder at the Halt and on the March -short and long trail from the order and vice versa- Examine Arms.

UNIT III (Home Nursing)

Home Nursing – Introduction – Qualities of a Good Nurse – The Roller Bandage and its application – Sick room: Preparation, Cleaning, Lighting and ventilation – Pulse, Respiration and Temperature taking and recording – Observation of the sick: signs and symptoms to be noted – Feeding a helpless patient – Medicines and their administration – Fever, infection, disinfection and specific infectious diseases – Operation: After care, Dressing of Wounds – Poisons and First Aid

UNIT IV (Yoga)

Introduction – Definition – Purpose – Potential Benefits – Potential Problems - Types of Asana The concept of yoga – meaning and definition of Yoga- Scope of yoga – Aims and objective of yoga – Types of Yoga Asanas (Suryanamarkas (12ways) – Vajara Asanas)

UNIT V (Obstacle Training)

Obstacle Training – Introduction – Obstacle Course – Straight balance, clear jump, Gate vault, Zig- zag balance, high wall, double ditch, right hand vault, left hand vault, ramp – Safety Measures – Benefits. **(Practicals – Obstacle Training)**

Text book:

Study material will be provided

Book for Reference:

1) Pamphlets issued by the Ministry of Defence
2) DG NCC training directive.

SEMESTER IV

USNCD419 - ELEMENTS OF TRAINING SKILLS

UNIT I (Communication Skill)

Communication skills – introduction – understanding basics of Communication – different ways of Communication – Components of Effective Communication – Common barriers to effective Communication – types – Measures
Decision making and Problem solving – Practicing decision making and Problem solving – coping with stress and emotions – stress management techniques – understanding emotions and feelings

Unit II (Leadership Skill)

Leadership Traits – introduction – Types – important Leadership Traits – Indicators of Good Leadership – Development of the indicators of Good Leadership – Leadership and Motivation – Factors – Case studies – Moral values and Character Traits – Honour Code Concept - Leadership case studies.

Unit III (Motivational Skill)

Motivation - discipline and duty of a good citizen – leadership Traits – Personality / Character Development – Types of Leadership – Values/ Code of Ethics – Perception – Communication Including Inter-Personal – Effect of Leadership with Historical Examples – Customs of Services – Importance of Group / Team Work

UNIT IV (Personality Development skill)

Personality Development – introduction – Life skill vs other skill – concept of Life skill – use of core skills in daily life – Factors influencing Personality – Self awareness
Empathy – introduction – Empathy, Sympathy and Altruism – importance of Empathizing with others – Critical and Creative thinking – Characteristics of the creative person

UNIT V: (Interview Skill)

Change your Mindset – introduction – how to change your mindset – Time Management – Essentials – Time wasters – Principles – Social skills , Etiquettes and Manners – Types – how to improve your social skills – Importance of Group/ team work - Types and characteristics of Groups – interview skills – Career counseling and counselor – Need and its importance. **(Practical – Posture and Weapon Training)**

Text book:

Study material will be provided

Book for Reference:

1) Pamphlets issued by the Ministry of Defense
2) DG NCC training directive.

SEMESTER V

UGNCA519 - TECHINQUES AND SERVICE ACTIVITIES

UNIT I (Map Reading Techniques)

Introduction to Map - Conventional signs – Scales and grid systems - Methods of Expressing a Scale – Topographical Forms – Technical Terms – Relief, Contour and Gradients - Cardinal points and Types of North – Magnetic Variation - Types of Bearing and uses of Service Protector – Prismatic Compass – Types - Setting a map – Finding own position- Map to Ground and Ground to Map – Night March.

UNIT II (Communication)

Communication – Introduction – Importance – Methods of Communication – Types of Communications – Advantages and Disadvantages – Communication Media – RS ANPRC-25 – Characteristic of Walkie Talkie – Line Communication – Functions – Latest trends and Developments – Advantages and Disadvantages – Types of Satellites

UNIT III (Social Service Activities)

Basic of social service – introduction – Methods – Types - weaker sections in the society and their needs – Classes of Society – Needs of the weaker sections – Contribution of NCC cadets – Rural Development Programmes – its need – objectives – Important Rural Development Programmes - NGOs and their role and contribution – List of Top ten NGO's in India.

Social evils – drug abuse – family planning – corruption – counter terrorism – eradication of illiteracy – Aids awareness programme – cancer awareness programme.

UNIT IV (Law and Acts)

Right to Information Act – introduction – Right to information Act 2005 – Scope – Important Provisions of the Act

Right to Education Act – Definition – Highlights of RTE Act

Protection of Children and POSCO Act – Definition – Punishment under the Act – Methods for Reporting and Recording –

UNIT V(Civil Responsibilities)

Civic Responsibilities – introduction – importance – characteristics of responsible citizen – Swatchh Bharat Abhiyan – Contribution of youth towards social welfare – Role of NCC – Social Security schemes – Types – Benefits – New social Security schemes of Government – Governments New Development initiatives – Aadhar, Digital India , BHIM Act, Make in India , Start up India, Skill India , Mudra Bank. **(Practical – Map Reading)**

Text book:
Study material will be provided
Book for Reference:
1) Pamphlets issued by the Ministry of Defense
2) DG NCC training directive.

SEMESTER VI

UGNCB619 - SPECIALIZED SUBJECT IN ARMY

UNIT I (Military History)

Introduction – Importance of Studying Military History - Biography of Field Marshal, K.M.KCARIAPPA, SAM MANEKSHA - Indian Army War Heroes PVC – Study of Battles of Indo- Pak War1965,1971 and Kargil 1999.

UNIT II (Armed Forces)

Basic organization of Armed Forces – Basic organization of Army – Task and role of fighting Arms, Supporting Arms – Commands of Army, Navy and Air Force – Supporting Services of Army - Task and role of supporting Arms and Services – Badges and Ranks – Honours and Awards - concept of Combined Defence services.

UNIT III (Environment and Ecology)

Natural Resources – Introduction – Basic information and its Types –Conservation and Management of Natural Resources – Need – Methods – Water Conservation and Rain water Harvesting – Practices for water conservation – Rain water Harvesting – Types – Waste Management – Type of Waste – Disposal and Management of Waste – Energy Conservation – Reason for increase in energy conservation – Measures.

UNIT IV(Field Craft and Battle Craft)

Introduction – Field Craft – Description of Ground – Indication of Ground – Observation and Concealment – Fundamental of Correct use of Cover - Judging distance - Introduction – Over estimation and under estimation - Indication and recognition of targets – Movements with and without Arms- Battle Craft – Field Signal – Section Formation – Fire and Movement- Section Battle Drill- Fire Control orders – Types and Conduct of Patrols.

UNIT V (Counter Terrorism)

Counter Terrorism – Introduction – Terrorism and Terrorist methods – History of Terrorism in india – Types – Funding – Types of Terrorist Act – Counter Terrorism measures.

Posture Training – Aims and Principles – Analysis – Causes – Balanced alignment and Exercise – Balanced Diet – Correct Standing and Exercises – Correct walking and Exercises. **(Practicals- Self Defence)**

Text book:

Study material will be provided.

Book for Reference:

1) Pamphlets issued by the Ministry of Defense.
2) DG NCC training directive.

AUXILIUM COLLEGE (Autonomous) Vellore – 632006.

CERTIFICATION COURSE

HUMAN RESOURCE MANAGEMENT AND DEVELOPMENT

(With effect from the Academic Year 2019-20)

Semester System with credits

REGULATIONS

1. **Eligibility for Admission**

Any candidate of the second and third year degree course

2. **Duration of the Course**

One Academic Year comprising of ninety working days spread over two semesters. The Year will be divided into two semesters of forty five days each with 225 hours of which 100 hours of practical in each semester.

3. **Course of Study**

The Course of study will be under the Semester Pattern with credits according to the syllabus prescribed from time to time. The course consists of Core Subjects and Practical. A pass in all subjects is a must for the award of the degree.

4. **Course of Study and Scheme of Examination**

Sem	Paper Code	Title of the Paper	Hours	Exam Hours	Credits	Marks
1	CGHDA19	Human Resources Management	3	3	5	100
	CGHDB19	Human Resources Development	3	3	5	100
	CGHDC19	Practical I: Field Work	-	Viva	5	100
2	CGHDD19	Human Resource in Organisation	3	3	5	100
	CEHDE19	Elective I -Dimensions of Human Resource Management	3	3	5	100
	CEHDF19	Elective II –Techniques of Human Resource Management				
	CGHDG19	Practical II: Project	-	Viva	5	100
Total					**30**	**600**

5. **Requirements to take the Examination**

- A candidate will be permitted to take the examination of any Semester provided they secure 75 percent attendance.
- The candidate must complete the Course of Study prescribed.

- The Candidate must successfully complete the field work and the project as prescribed.

6. **Field Work**

Field work will consist of 50 hours in the First Semester. It will include observational visits and practical work in various organizations to gain knowledge regarding human resources management procedures. It will be done individually and in groups consisting of 5 hours per week.

7. **Project Report**

The Project Report will be in the Second Semester and will consist of Data Collection, Analysis and Presentation of a Project Report. Topics will be selected by the candidate and approved by the Faculty.

8. **Restrictions to take the Examination**

Any candidate with arrears shall have the option to write the arrear paper along with subsequent regular semester papers within two years of joining the course.

9. **Medium of instruction and examination**

The Medium of instruction and examination shall be in English.

10. **Minimum Pass Marks**

A candidate shall be declared to have passed a paper if a student obtains not less than forty percent marks.

11. **Classification of successful candidates**

A Candidate who passes all the examination in the first attempt securing 60 percent will be declared to have passed with the First Class.

12. **Pattern of Question Paper**

Section A	20 Questions (Short Answer) No Choice	20 X 2 = 40 Marks
Section B	5 Questions (Out of 8) Brief Answers (300 Words)	5 X 6 = 30 Marks
Section C	2 Questions (Out of 4) Long Answers(1000 Words)	2 X 15 = 30 Marks

SEMESTER I

CGHDA19 – HUMAN RESOURCES MANAGEMENT

Objectives:

To enhance the knowledge of the students on various human resource activities in an organisation

Unit 1: Introduction to Human Resource Management

Human Resource Management – Meaning – Definition – Need – HR policy – Role of HR Department – Role of HR Manager – Importance of HRM – Challenges of HRM – Evolution and growth of HRM in India.

Unit II: Recruitment and Selection

Recruitment – Meaning and Definition – Process –Principles and Objectives of Recruitment – Sources of Recruitment – Merits and demerits of various sources of recruitment

Selection – Meaning and Definition – Selection Process Selection Tests – Meaning – Types – Testing Guidelines – Interview – Definition – Types – Steps in interview process – Guidelines for Effective interviewing.

Unit III: Placement and Training

Placement – Meaning – Principles and problems – Induction – Definition – Process – Training – Meaning – Definition – Importance – Need – Process of training and development – Training methods – Assessing the effectiveness of training programs.

Unit IV: Career Development

Career Development – Meaning – Elements – Requirements of Effective Career Planning and development – Career planning methods – Types of career development programs – Career development cycle.

Unit V: Promotion and Retrenchment

Promotion – Need – Criteria – Types. Transfer – Need – Types – Demotion – Suspension – Types of separation – Lay off and retrenchment.

Books for Study and Reference:

1. Balaji C. D. – Organisational Behaviour – Margham Publications, Chennai – Reprint 2018
2. Balaji C. D. – Human Resource Management – Margham Publications, Chennai – Print 2016
3. Dr. N. Premavathy – Principles of Management – Sri Vishnu Publication, Chennai Print 2008
4. Sundar K and Srinivasan J. – Human Resource Development – Margham Publications, Chennai, Print 2011
5. Jayashankar N – Human Resource Management – Margham Publications, Chennai, Print 2008

SEMESTER I

CGHDB19 – HUMAN RESOURCES DEVELOPMENT

Objectives:

To enable the students to enrich their knowledge on the development aspects of employees in an organisation

Unit I: Human Resource Information System

Human Resource Information System– Meaning – Definition – Advantages and disadvantages – Process –Human Resource Audit – Meaning – Objectives – Process – Types – Audit Report

Unit II: Performance Appraisal

Performance Appraisal – Meaning – Definition – Features – Methods – Advantages – Problems – Overcoming obstacles – Steps in effective performance appraisal.

Unit III: Motivation

Motivation – Meaning – Definition – Characteristics – Theories of Motivation – Maslow, Mc Gregor, Herzberg

Unit IV: Morale and Job satisfaction

Morale – Meaning – Definition – Factors influencing Morale – Negative impact – Steps – Measurement of Morale
Job satisfaction – Determinants – Steps to improve job satisfaction

Unit V: Compensation Management

Wage and Salary administration – Factors – Process – Incentives and Fringe benefits – Meaning – Essentials – Types – Advantages of fringe benefits.

Books for Study and Reference:

1. Balaji C. D. – Organisational Behaviour– Margham Publications, Chennai – Reprint 2018
2. Balaji C. D. –Human Resource Management– Margham Publications, Chennai – Print 2016
3. Dr. N. Premavathy – Principles of Management – Sri Vishnu Publication, Chennai Print 2008
4. Sundar K and Srinivasan J. – Human Resource Development – Margham Publications, Chennai, Print 2011
5. Jayashankar N – Human Resource Management – Margham Publications, Chennai, Print 2008

SEMESTER II

CGHDD19 – HUMAN RESOURCES IN ORGANISATION

Objectives:

To study the various factors influencing the behaviour of the employees in an organisation

Unit I: Organisational Behaviour

Organisational Behaviour – Definitions – Evolution – Approaches – Four models – Challenges in Organisational Behaviour

Unit II: Organisational Development

Organisational Development – Definitions – Features and characteristics – Process – Merits – Limitations of Organisational Development

Unit III: Organisational Climate

Organisational climate –Features – Characteristics of good climate – Importance – Factors that contribute of good organisational climate – Benefits – Organisational Effectiveness – Definitions – Variables in effectiveness – Factors – Approaches – Outcomes

Unit IV: Grievance and Redressal

Grievance – Meaning – Definition – Characteristics – Methods – Benefits of Grievance Redressal Procedure – Features of Sound Grievance Procedure – Guidelines for better handling of Grievances

Unit V: Quality of Work Life

Quality of Work Life – Meaning – Issues – Measurement of QWL – Benefits of QWL to Management

Books for Study and Reference:

1. Balaji C.D. – Organisational Behaviour – Margham Publications, Chennai – Reprint 2018
2. Balaji C.D. – Human Resource Management – Margham Publications, Chennai – Print 2016
3. Shashi K. Gupta and Rosy Joshi – Human Resource Management – Kalyani Publishers, Chennai, Print 2010
4. Sundar K. and Srinivasan J. – Human Resource Development – Margham Publications, Chennai, Print 2011
5. Subba Rao P. – Personnel and Human Resource Management – Himalaya Publishing House, Mumbai, Print 2012

SEMESTER II
CEHDE19 – DIMENSIONS OF HUMAN RESOURCE MANAGEMENT

Objectives:

To enlighten the students with various dimensions in employees' participation in management to achieve the organisational goals

Unit I: Workers' Participation Management

Meaning –Characteristics of WPM –Objectives and factors influencing WPM – Forms of WPM– Essential requisites of effective WPM

Unit II: Conflict and Stress Management

Conflict – Meaning – Definition – Sources – Types – Process – Conflict Management – Stress – Meaning – Features – Causes – Consequences – Management of Stress.

Unit III: Change Management

Organisational Change – Meaning – Need – Reason for Change – Types of Changes – Force-field Analysis – Lewin's Change Model – Resistance to Change – Managing resistance to Change

Unit IV: Behaviour Management

Individual behaviour – Personal – Environmental – Psychological and Organisational Factors – Group and Group behaviour – Meaning – Nature – Characteristics – Types of groups – Factors influencing groups.

Unit V: Leadership

Leadership – Meaning – Definition – Qualities of a leader – Kinds of Leadership Styles – Theories of Leadership

Books for Study and Reference:

1. Balaji C. D. – Organisational Behaviour – Margham Publications, Chennai – Reprint 2018
2. Balaji C. D. – Human Resource Management – Margham Publications, Chennai – Print 2016
3. Shashi K Gupta and Rosy Joshi – Human Resource Management – Kalyani Publishers, Chennai, Print 2012
4. Sundar K and Srinivasan J. – Human Resource Development – Margham Publications, Chennai, Print 2015
5. Jayashankar N – Human Resource Management – Margham Publications, Chennai, Print 2016
6. Subba Rao P. – Personnel and Human Resource Management – Himalaya Publishing House, Mumbai, Print 2013

SEMESTER II

CEHDF19 – TECHNIQUES OF HUMAN RESOURCE MANAGEMENT

Objectives:
To help the students understand the latest techniques of Human Resource Management

Unit I: Management by Objectives

Management by Objectives – Definitions – Features – The steps involved merits and limitations of MBO – Indian organisation – Effective implementation – Management by exception.

Unit II: Team building

Team building – Definitions – Characteristics of an effective team – Team building – Principles – Stages – Factors contributing to effective team building

Unit III: Transactional Analysis

Transactional Analysis – Ego states – Parent ego – Child ego – Usefulness of transactional analysis – Johari Window – Life positions – Psychological strokes. Mentoring – Definitions – Role of a mentor – Characteristics of a good mentor – Mentoring vs. Coaching – Benefits of Mentoring

Unit IV: Communication

Communication – Introduction – Definitions – Elements – Process – Essentials – Principles– Effective communication – Barriers– Steps to overcome barriers – Types – Internal communication in companies.

Unit V: E-Human Resource Management

E-Human Resource Management – Introduction – Objectives – Working area – E- Job design, Job Analysis, Recruitment, Selection, Placement, Training, Performance Management, HR Records – Advantages and disadvantages of E- Human Resource Management.

Books for study and reference:

1. Balaji C. D. – Organisational Behaviour – Margham Publications, Chennai – Reprint 2018
2. Shashi K Gupta and Rosy Joshi – Human Resource Management – Kalyani Publishers, Chennai, Print 2012
3. Sundar K and Srinivasan J. – Human Resource Development – Margham Publications, Chennai, Print 2015
4. Jayashankar N – Human Resource Management – Margham Publications, Chennai, Print 2016
5. Subba Rao P. – Personnel and Human Resource Management – Himalaya Publishing House, Mumbai, Print 2013