SEMESTER I & II

PCPHH20 - ELECTRONICS LAB

Year: I **Sem:** I & II	**Course Code:** PCPHH20	**Title of the Course:** Electronics Lab	**Course Type:** Lab	**Course Category:** Core	**H/W** 3	**Credits** 4	**Marks** 100

Course Objectives

1. Students will learn and understand the Basics of digital electronics.
2. To analyze logic processes and implement logical operations using combinational logic circuits.
3. To understand concepts of sequential circuits and to analyze sequential systems.
4. To analyze the different RC and LC oscillator circuits to determine the frequency of oscillation

Course Outcomes (CO)

The learners will be able to

1. Identify the various digital ICs and understand their operation.
2. Develop a digital logic and apply it to solve real life problems.
3. Analyze, design and implement combinational logic circuits.
4. Analyze, design and implement sequential logic circuits.
5. Design the different oscillator circuits for various frequencies.

CO	**PSO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	H	M	M	H	M	M
CO2	H	M	M	H	H	H
CO3	H	L	H	M	L	M
CO4	H	L	H	M	M	H
CO5	H	L	H	M	L	M

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	M	H	H	H	H
CO5	M	M	M	M	M	H

(Low - L, Medium – M, High - H)

Course Syllabus

(Any 18 experiments)

List of experiments (K1 - K6):

1. V-I Characteristics of SCR and TRIAC.
2. Study of Rectifiers using C, L-C and Pi filters.
3. Study of Voltage - Current characteristics of UJT & UJT as a Relaxation Oscillator.
4. FET as amplifier - frequency response, input impedance and output impedance.
5. Study of V-I Characteristics of J-FET as a VVR (Voltage Variable Resistor).
6. Study of V-I Characteristics of MOSFET.
7. Op-amp - Voltage follower (Inverting) summing, difference, average amplifier- differentiator and integrator.
8. Op-amp - Solving simultaneous equations.
9. Op-amp - Design of square wave generator, triangular wave generator and saw tooth wave generator.
10. Op-amp - 4 bit D/A converter - Binary Weighted Resistor method and R-2R ladder method
11. Op-amp - Design of active Low pass, High pass, Band Pass and band rejector filter.
12. Op-amp - Study of attenuation characteristics and design of Phase Shift Oscillator.
13. Op-amp –Study of attenuation characteristics and design of Wien Bridge Oscillator.
14. IC 555 - Construction of Monostable Multivibrator, Frequency Divider
15. IC 555 -Design of Schmitt Trigger and hysteresis.
16. IC 555 - Construction of Astablemultivibrator and Voltage controlled Oscillator
17. Design of Synchronous and Asynchronous Counters using IC-7476/ 7473.
18. Construction of 4 bit Shift Register - Ring Counter and Johnson Counter - IC7476
19. Study of i) Multiplexer and using IC 74150
    ii) De-Multiplexer using IC 74154
20. Arithmetic operations (Adder/Subtractor) Using IC 7483.
21. Modulus counter using IC7490 and display using IC7447.
22. Phase locked loops using IC 555.
23. Binary adder abdSubtractor using EX-OR and NAND gates.

SEMESTER III

PCPHK20 – MICROPROCESSORAND MICRO-CONTROLLER

Year: II **Sem:** III	**Course Code:** PCPHK20	**Title of the Course:** Microprocessor and Microcontroller	**Course Type:** Theory	**Course Category:** Core	**H/W** 5	**Credits** 4	**Marks** 100

Course Objectives

1. To make the students understand the concepts that are involved in the Microprocessor 8085 and Microcontroller 8051.
2. To make the students understand instruction sets, addressing modes, timings, memory and I/O interfaces.

Course Outcomes (CO)

The learners will be able to

1. Describe Hardware, different bus cycles and memory interface to 8085 Microprocessor.
2. Develop programs using 8085 Microprocessor Instruction set and addressing modes.
3. Describe and perform different types of peripheral interfaces to 8085 Microprocessor.
4. Explain hardware, instruction set and addressing modes of Microcontroller 8051 and develop programming for basic operations.
5. Describe and perform different types of external interfaces to 8051 Microcontroller.

CO	**PSO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	H	L	L	M	M	M
CO2	H	H	L	M	M	M
CO3	H	M	L	M	M	M
CO4	H	M	L	M	M	M
CO5	H	M	L	M	M	M

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	H	M	L	M	M	M
CO2	H	H	H	M	M	M
CO3	H	H	L	M	M	M
CO4	H	H	H	M	M	M
CO5	H	M	L	M	M	M

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I: 8085 Microprocessor- Architecture, Instruction set and Programming (12 Hours)

1.1 Architecture- Functional pin diagram (K2)
1.2 Buses - Address bus, data bus, multiplexing address/data bus (K2)
1.3 Instruction format–instruction fetch and execution–Machine and instruction cycle- T state- (K2)
1.4 Addressing modes- Instruction set - data transfer group- arithmetic/logic group (K2)
1.5 Branch group - stack and I/O control instruction (K2)
1.6 Programming: Picking up Largest / smallest number - Arranging an array in ascending / descending order - Code conversion: Binary to BCD and BCD to Binary, Binary to ASCII, ASCII to Binary and ASCII to BCD and BCD to ASCII (K3, K6)

Unit II: 8085 Microprocessor- Memory and I/O interfacing (12 Hours)

2.1 ROM and RAM memory - Memory interface: 2K X 8, 4K x 8 ROM and RAM interface(K2)
2.2 8255 Programmable interface I/O –functional Pin configuration- Internal Architecture (K2)
2.3 Interfacing of 8255 (K2)
2.4 ADC interface - DAC interface - wave form generator (K2, K3, K6)
2.5 Hex keyboard interface - 4 step Stepper motor interface (K2, K3, K6)
2.6 Traffic regulation interface (K2, K3, K6)

Unit III: 8051 Microcontroller-Architecture, Instruction set and Programming (12 Hours)

3.1 Introduction to Microcontroller –8051 Functional pin diagram (K2)
3.2 Architecture - Internal registers (K2)
3.3 Special function registers -Memory organizations (K2)
3.4 Instruction set - Addressing modes (K2)
3.5 Programming - Addition and Subtraction -Multiplication and Division (K3, K6)
3.6 Arranging an array in ascending/ descending order -Sorting out the maxima and minima (K3, K6)

Unit IV: 8051 Microcontroller - Memory and I/O interfacing (12 Hours)

4.1 8051 Input/output Ports (K2, K3)
4.2 8051 Interrupts (K2, K3)
4.3 Interface 8051 to external memory and I/O devices using its I/O ports (K2, K3)
4.4 Counters and Timers –Serial communication using MAX232 (K2, K3)
4.5 Interfacing 8051 with ADC –DAC (K2, K3, K6)
4.6 LED Display - Hex Keyboard (K2, K3, K6)

Unit V: Sensor Based Embedded Controller &IoT Applications (12 Hours)

5.1 Working principle of Sensors/Transducers: Light sensor LDR, Heat sensor LM35, IR Transmitter/ Receiver module (K2)
5.2 Embedded system concept–Architecture & salient features of ATmega328 (K2)
5.3 Programming & compiling with IDE software - Motor driver IC LM339 (K2, K3)
5.4 Blue tooth controller HC05 for wireless communication (K2, K3)

5.5 IoT applications for automation : Light activated Morning alarm - Darkness activated Garden Lights - Heat activated Fire alarm (K3, K6)
5.6 Intruder alarm using IR - Android mobile touch key pad controlled Robot car (K3, K6)

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. NagoorKanni- Microprocessor and Microcontroller –2nd Edition - Tata McGraw Hill EducationPvt. Ltd., New Delhi, 2017.
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 – DhanpatRaiPublications, 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

PEPHE20 - NUMERICAL METHODS AND C-PROGRAMMING

Year: II **Sem:** III	**Course Code:** PEPHE20	**Title of the Course:** Numerical Methods and C-Programming	**Course Type:** Theory	**Course Category:** Core Elective	**H/W** 5	**Credits** 4	**Marks** 100

Course Objectives

1. To impart the knowledge of numerical methods for solving problems arise in physics
2. To equip the students with the skill of C language.

Course Outcomes (CO)

The learners will be able to

1. Understand and apply numerical concepts to solve equations and find missing values for any physical problems
2. Solve ordinary differential equations using numerical techniques
3. Understand the basic concepts of C Language
4. Understand and use various operators and arrays in C Language
5. Develop simple programs using C language along with computational tools

CO	**PSO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	H	H	H	M	L	L
CO2	H	H	H	M	L	L
CO3	H	L	L	M	M	M
CO4	H	L	L	H	M	M
CO5	H	M	M	H	M	M

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	H	H	H	M	L	L
CO2	H	H	H	M	M	M
CO3	H	H	L	M	M	M
CO4	H	H	M	L	L	L
CO5	H	H	M	M	M	M

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I: Solution of Equations and Interpolation (14 Hours)

1.1 Methods of false position (K2, K3, K4, K5)
1.2 Newton's method (K2, K3, K4, K5)
1.3 Fixed point - Iteration method (K2, K3, K4, K5)
1.4 Interpolation - Lagrangian polynomials (K2, K3, K4, K5)
1.5 divided differences (K2, K3, K4, K5)
1.6 Newton's forward and backward difference formulae (K2, K3, K4, K5)

Unit II: Numerical Differentiation, Integration and Differentiation Equations(16 Hours)

2.1 Derivatives - Newton's forward / backward interpolation and Stirling formula (K2, K3, K4, K5)
2.2 Numerical integration by Trapezoidal Solutions of equations (K2, K3, K4, K5)
2.3 Simple iterative methods - Newton method (K2, K3, K4, K5)
2.4 Numerical Integration - Simpsons 1/3 and 3/8 rules (K2, K3, K4, K5)
2.5 Solution to first order differential equations: Taylor series method (K2, K3, K4, K5)
2.6 Euler and modified Euler methods - Runge-kutta method (K2, K3, K4, K5)

Unit III: Programming in C (13 Hours)

3.1 Introduction - Basic structure of C Programming (K1, K2)
3.2 Character set - Key words (K1, K2)
3.3 Identifiers (K1, K2)
3.4 Variables (K1, K2)
3.5 Assigning values to variables (K1, K2)
3.6 Symbolic constant (K1, K2)

Unit IV: Operators, Arrays and Strings (14 Hours)

4.1 Operators - Arithmetic, relational, logical, assignment, increment (K1, K2)
4.2 Decrement conditional and special type conversion in Expressions (K1, K2)
4.3 Arrays - Multi dimensional arrays(K1, K2)
4.4 Initializing two dimensional arrays (K1, K2)
4.5 Initializing string variables (K1, K2)
4.6 Reading and writing Strings on the Arithmetic operations on strings (K1, K2)

Unit V: Simple Programmes (15 Hours)

5.1 User defined functions - their needs - Multi function programme (K3, K6)
5.2 Return values and their types - Calling functions (K3, K5, K6)
5.3 Categories of functions - Multiplication (K3, K5, K6)
5.4 Diagonalization and inversion - Solution and C programming (K3, K5, K6)
5.5 Lagrangian interpolation - Simpson's rule (K3, K5, K6)
5.6 Euler method- Runge- Kutta method (K3, K5, K6)

Books for Study:

1. T. Veerarajan and T. Ramachandran, Numerical Methods with Programming in C, Second Edition, Tata McGraw Hill, 2007
2. E. Balagurusamy - Computing Fundamentals and Programming, ANSI C, 3rd Edition - Tata McGraw Hill Education, Ltd., 2014.
3. G. Balaji - Numerical Methods, 9th Edition - G. Balaji Publishers, Chennai, 2008.

Books for Reference:

1. S. Kalavathy, M. JoicePunitha - Numerical Methods, 2nd Edition - Vijay Nicole imprints Pvt. Ltd.,2010.
2. Kandasamy P., K. Thilagavathy and K. Gunavathy, Numerical Methods, S. Chand Co. Ltd., New Delhi, 2003.
3. A. Singaravelu, Numerical Methods, Meenakshi Agency, 2016.

SEMESTER IV

PCPHO20- PRACTICAL III: ADVANCED GENERAL EXPERIMENTS

Year: II **Sem:** IV	**Course Code:** PCPHO20	**Title of the Course:** Practical III: Advanced General Experiments	**Course Type:** Practical	**Course Category:** Core	**H/W** 4	**Credits** 4	**Marks** 100

Course Objectives

1. To provide the student hands-on experiences to conduct advanced general experiments in laboratory in lieu with the theory taught in the class.

Course Outcomes (CO)

The learners will be able to
1. Interpret and appreciate the advanced concepts in physics.
2. Use scientific equipment for analysis and data acquisition.
3. Analyse the properties (electric, magnetic, nuclear and dielectric) of solids/liquids.
4. Apply acquired knowledge to the analysis of experimental data.
5. Get exposure to work environment at research level and motivation for a lifelong learning.

CLO	**PSO**					
	1	**2**	**3**	**4**	**5**	**6**
CLO1	H	L	H	L	H	H
CLO2	M	H	L	M	H	H
CLO3	H	H	H	M	H	H
CLO4	H	M	H	L	H	H
CLO5	L	M	L	L	H	H

CLO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CLO1	H	H	H	H	H	H
CLO2	H	H	M	M	H	H
CLO3	H	H	H	M	H	H
CLO4	H	M	H	M	H	H
CLO5	H	H	H	H	H	H

(Low - L, Medium – M, High - H)

Course Syllabus

(Any 15 experiments) (K1 - K6)

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

PCPHP20 - PRACTICAL- IV
MICROPROCESSOR, MICROCONTROLLER AND C PROGRAMMING

Year: II **Sem:** IV	**Course Code:** PCPHP20	**Title of the Course:** Microprocessor, Microcontroller & C-Programming	**Course Type:** Practical	**Course Category:** Core	**H/W** 4	**Credits** 4	**Marks** 100

Course Objectives

1. To provide the students hands on training of programming knowledge on Microprocessor, Microcontroller and C language.
2. To make the students develop the assembly language programs for arithmetic and peripheral interface operations.

CourseOutcomes (CO)

The learners will be able to

1. Develop assembly language programs on arithmetic and sorting operations using 8085 and 8051
2. Develop and perform peripheral interface programs with 8085 Microprocessor
3. Perform all code conversions and analog signals into digital and vice versa. Also can generate wave forms.
4. Write C program for any basic operations
5. Solve any physical problems using C language along with numerical techniques

CO	**PSO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	H	M	H	M	H	M
CO2	H	M	L	H	H	M
CO3	H	M	L	L	M	M
CO4	H	L	M	M	M	M
CO5	H	M	M	H	H	M

CO	PO					
	1	2	3	4	5	6
CO1	H	H	H	M	M	M
CO2	H	H	M	H	M	M
CO3	H	M	L	L	M	M
CO4	H	H	M	M	M	M
CO5	H	H	M	H	M	M

(Low - L, Medium – M, High - H)

Course Syllabus

(Any 20 experiments)

Microprocessor 8085 Programmes (K1 - K6)

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

1. 16-Bit Addition & subtraction and Multiplication & division.
2. 16-Bit Ascending and descending order.
3. Computation of LCM.
4. Factorial of a number.

Microcontroller 8051 Experiments

1. 8-Bit Addition and Subtraction
2. 8-Bit Multiplication and Division.
3. Sorting in ascending and descending order.
4. Sorting out the maxima and minima.

Computation Methods - C Programming

1. Lagrange interpolation with algorithm, flow chart with program and its output
2. Numerical integration by Simpson's rule with algorithm and flowchart with program and its output.
3. Numerical solution of ordinary first order differential equation -Euler's method with algorithm, flowchart and its output.
4. Numerical solution of ordinary first order differential equations by the Runge- kutta method, with algorithm, flow chart with program and its output
5. Curve fitting - Least square fitting with algorithm, flowchart and its output.