



## **AUXILIUM COLLEGE (Autonomous)**

(Accredited by NAAC with A+ Grade with a CGPA of 3.55 out of 4 in the 3<sup>rd</sup> cycle)  
Gandhi Nagar, Vellore – 6.

### **7.1.5 GREEN CAMPUS INITIATIVES ENVIRONMENTAL SUSTAINABILITY - CURRICULUM**



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Curricula developed and implemented have relevance to the local, national, regional and global developmental needs which is reflected in Programme outcomes (POs), Programme Specific Outcomes (PSOs) and Course Outcomes(COs) of the Programmes offered by the Institution.

### FOCUS: ENVIRONMENTAL SUSTAINABILITY (NEEDS)

Programme	Course Code	Title of Course	Description	PO	PSO	CO
B.A. English	UENGA20	General English Paper-I	Course units like The Piper and The Kitten and Falling Leaves (Poems) Panchatantra Tales- Book III - Crows and the Owls: How the Birds Picked a King. How the Rabbit Fooled the Elephant (Short Stories) initiate and instill in the minds of students love for the environment and its ecology	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Appreciate life, think critically, and develop positive, interpersonal relationship with fellow humans	Locate the historical and cultural context of English Romanticism. Discuss the traits of Romanticism with emphasis on concepts of self, imagination and the unconscious Apply historical, social, philosophical and political contexts to interpret texts

B.A. English	UENGB20	General English Paper-II	Course units like The Tree Speaks and Sparrows - Short story, initiate and instill in the minds of students love for the environment and its ecology	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Pursue higher knowledge, qualify professionally, enhance entrepreneurial skills and contribute towards the needs of the society.	Locate the historical and cultural context of English Romanticism. Discuss the traits of Romanticism with emphasis on concepts of self, imagination and the unconscious Apply historical, social, philosophical and political contexts to interpret texts
B.A. English	UCENH20	Romantic Literature	The course sensitizes students on the value of nature, environment, ecology and human lives	Attain knowledge and understand the principles and concepts in the respective discipline. Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society. Emulate positive social values and exercise leadership qualities and team work.	Remember the principles of Literature in general and English Literature in particular and understand its typological, critical, socio-cultural aspects	Locate the historical and cultural context of English Romanticism. Discuss the traits of Romanticism with emphasis on concepts of self, imagination and the unconscious Apply historical, social, philosophical and political contexts to interpret texts
B.A. History	UEHIE20	Elective- Geography of India	To enable the students to understand the physiographic of India and its natural resources	Appreciate Bio-diversity and enhance eco-consciousness for sustainable development	Acquire the social values that indwell in History to become the leaders of politics and commit to work for social justice, peace, and sustainable development	State the evolution of the physical features of India

B.B.A	UABEA20	Business Environment and Ethics	Course focuses on the environment and its impact on business. Recognize the importance of business ethics and social responsibility in today's business	Prepare the students to be persistent enough to pull out their own ideas and opinions and to become a strong pillar to the family and society highlighting their feminine power.	To attain the ability to be self - directed towards their career and contribute to the society as responsible citizens.	To recognize the importance of business ethics and social responsibility as an individual to the society
B.B.A	UCBAM20	Industrial Relations	Course is designed to cover the basic concepts of Industrial Relations	Prepare the students to be persistent enough to pull out their own ideas and opinions and to become a strong pillar to the family and society highlighting their feminine power	To acquire the ability to be a future leader, manager and an entrepreneur reflecting ethical and social values.	Understand the basic concepts of Industrial relations like payment of wages act, factories act, maternity act, Industrial disputes act, Employees state insurance act.
B.B.A	UCBAR20	Project	Course is designed to make the students identify a problem in the organization based on the area of specialization and provide solutions and suggestions to the management.	To formulate, to apply the theoretical knowledge into practice by carrying the institutional training and projects, to adopted sense of creative thinking and learn problem solving skills to take up challenges faced in today's modern world.	To get an exposure by applying the theoretical knowledge into practice by carrying out the institutional training and projects in the organizations.	Course includes field studies, surveys, interpretation, planning and designing of the Research Methodology presented in a comprehensive manner with recommendations for solutions based on scientifically worked out data.
B.B.A	UCBAS20	Legal aspects of Business	Course designed to make the students learn the fundamental principles underlying in the law of contract.	To be stimulated towards the change and to be conscious for sustainable development of the society.	To acquire the ability to be a future leader, manager and an entrepreneur reflecting ethical and social values.	Be thorough in the contractual relationships in business

B.B.A	UEBAC20	Total Quality Management	Course is designed to make the students understand the concepts of total quality management	To communicate the general ideas, opportunities and opinions and to become empowered and motivated citizens of the country.	To attain the ability to be self - directed towards their career and contribute to the society as responsible citizens.	Evaluate the principles of quality management and to explain how these principles can be applied within quality management systems
B.B.A	UEBAD20	Entrepreneurial Development	Course is designed to develop entrepreneurial way of thinking	To pursue higher knowledge, acquire quality professional education, and to develop entrepreneurial skills and contribute towards the needs of the society	Acquire the ability to be a future leader, manager and an entrepreneur reflecting ethical and social values.	Have the ability to discern entrepreneurial traits
B.B.A	USBAF520	Application of GST	Course is designed to enable the students to learn the concepts of GST from the pre-GST period to post- GST period	To be passionate about multi-disciplinary approach for problem solving, critical analysis and decision making in their personal and professional life	To attain the ability to be self - directed towards their career and contribute to the society as responsible citizens.	Enable the students to learn the concepts of GST from the pre-GST period to post- GST period
B.Com	USCOD520	Consumer Guide and Empowerment	Acquired conceptual knowledge on consumer act, RTI act and FSSAI.	Excel as a socially committed individual having empathy for the needs of the society through value-based education.	Practical Applications gained over the year in the field of auditing	Students will be able to appreciate the emerging questions and policy issues in consumer law for future research

B.Com	USCOA120 / USCOA220	Consumer Awareness	Learn ways and means in safeguarding the rights of consumers	Life Long Learning recognize the need for and have the ability to engage in lifelong learning process to cope up with the emerging trends in social, cultural, economic and technological changes	Addressing the needs of the nation cater to the needs of the society so as to contribute for the development of the nation	Students gained conceptual knowledge on the social responsibilities of the consumers
B.Com	UCCOK20	Marketing	Understand the various methods of channels of distribution and familiarize with latest Technologies.	Function effectively as an individual and as a member or leader in teams strengthening group dynamics to achieve the common goals of the organisations.	Exercise leadership qualities and moral values through ethical ways with the concern for the society and the environment with team spirit to adapt to change throughout their professional career.	To understand the dynamics of marketing and to know about latest trends in marketing
B.Sc. Biochemistry	UCBCA20	Bioorganic Chemistry	To provide a clear note on the bioorganic compounds.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Assess the structural features of genetic material.
B.Sc. Biochemistry	UCBCC20	Main Practical-I	To provide a wide practical knowledge on Qualitative and Quantitative Analysis.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Analyses quantitatively the biomolecules and mineral components

B.Sc. Biochemistry	UCBCB19	Cell Biology	To provide a deep knowledge about cell – the basic unit of life.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Develop knowledge about the functions of various subcellular organelles
B.Sc. Biochemistry	UCBCD20	Biochemical techniques	To study about the principles and applications of biochemical techniques.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Compare natural and artificial radiation source and its importance
B.Sc. Biochemistry	UCBCE20	Physiology and Nutrition	To understand the homeostatic mechanism of each organ.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Identify the nutrients in food and their functions in maintaining health
B.Sc. Biochemistry	UCBCF20	Main Practical-II	To inculcate practical skill in Biochemistry.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Explain the basic principles involved in isolation of bio molecules from various source
B.Sc. Biochemistry	USBCBn20	Skill Based Elective: Health Care for Women	To provide awareness about common health problems of women and how to overcome certain diseases	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Understand the common health problems of women
B.Sc. Biochemistry	UCBCG20	Enzymes & Intermediary metabolism	To impart knowledge about the enzymes and the metabolism of biomolecules and its interrelationship.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Compile the catabolism of amino acid and metabolism of lipids with their significance



B.Sc. Biochemistry	UCBCH20	Endocrinology	Endocrinology describes in detail the role of endocrine glands, their secretion and its regulatory effect on metabolic activities to maintain homeostasis.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	
B.Sc. Biochemistry	UEBCA20	Elective IA: Immunology	To help the students to understand the components of Immune system	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Explain the stages of transplantation
B.Sc. Biochemistry	UEBCB20	Elective IB: Environmental Toxicology	To understand the basics in toxicological aspects that effect the environment.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Explain the properties of pollutants, effects, origin and occurrence in the environment
B.Sc. Biochemistry	UCBJ20	Main Practical-III	The course is aimed to enhance the practical skill of the student in handling and estimating the components present in the biological samples.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Predict the biochemical laboratory analysis
B.Sc. Biochemistry	UBCK20	Main Practical-IV	The course is aimed to enhance the practical skill of the student in handling and estimating the components present in the biological samples.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Analyze the biological sample for the enzyme activity



B.Sc. Biochemistry	USBCCn20	Skill Based Elective: III: Entrepreneurial Biochemistry	To understand the concept of entrepreneurship	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Identify strategic marketing planning and mobilize resources for future growth, development and protection of their enterprise
B.Sc. Biochemistry	UCBCI20	Molecular Biology	To make a study on life and the information centers called genes.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Demonstrate the nature of Genes
B.Sc. Biochemistry	UEBCC20	Elective IIA: Clinical Biochemistry	To understand the biochemical basis of various diseases and disorders	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Compare the application of diagnostic enzymes
B.Sc. Biochemistry	UEBCD20	Elective IIB: Pharmacology	To make detailed study of drugs, and their actions on living systems	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	List out commonly used analgesic and anesthetic drug classes
B.Sc. Biochemistry	UEBCE20	Elective IIIA: Biotechnology	To explore the applications and future potential of Biotechnology	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Identify and debate the ethical and social issues in the field of biotechnology and get insight in application of rDNA technology

B.Sc. Biochemistry	UEMCF20	Elective IIIB: Plant Biochemistry	To explore the applications of plant and their products	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Compile the mechanism of seed germination
B.Sc. Biochemistry	USBCDn20	Skill Based Elective: IV- Medical Laboratory Technology	To make detailed study of the organization and functions of a laboratory	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Apply histopathological techniques in detecting abnormal cells
B.Sc. Biochemistry	USBCAn20	Skill Based Elective: II - Nutritional Biochemistry	To make a note on nutrients and its role on metabolism.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Describe the role of antioxidants
B.Sc. Biochemistry	UABCA20	Allied Biochemistry - I	To acquire knowledge on the structure and the function of biomolecules	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	
B.Sc. Biochemistry	UABCB20	Allied Biochemistry - II	To understand the basic of metabolic pathway	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	

B.Sc. Biochemistry	UABCC20	Allied Biochemistry Practical	To acquire knowledge on the structure and the function of biomolecules	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	
B.Sc. Biochemistry	UGBCAn19	NME: Disease and Treatment	To provide a basic knowledge about common diseases and its treatment.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Acquire a broad knowledge about the deadliest diseases in the world
B.Sc. Biochemistry	UCBCBn19	NME: Therapeutic Agents	To impart knowledge on action of drugs in treating diseases.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Create an awareness of resources and enhance eco - consciousness for sustainable development of society	Acquire knowledge on the medicinal therapy for various health conditions and function of medicinal plants as therapeutics
B.Sc. Chemistry	USCHA320	Industrial Chemistry	Enables students to acquire an in depth knowledge on various areas of industrial chemistry and effluent treatment.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Integrate the knowledge and skills developed in multidisciplinary environments and function effectively as an individual or a leader and contribute towards the needs of the society.	Explain the various process involved in the manufacture of leathers and leather products.

B.Sc. Chemistry	USCHB420	Agricultural Chemistry	Emphasize the benefits and adverse effects of pesticides, fungicides and insecticides.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Integrate the knowledge and skills developed in multidisciplinary environments and function effectively as an individual or a leader and contribute towards the needs of the society.	Summarize the certification of organic products. Identify the benefits and adverse effects of pesticides.
B.Sc. Chemistry	UNEVS20	Environmental Studies	To gain knowledge about the elements of nature and its protection.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Integrate the knowledge and skills developed in multidisciplinary environments and function effectively as an individual or a leader and contribute towards the needs of the society.	Gain knowledge on multidisciplinary nature of Environmental studies Understand the Ecosystem, its structure and function Understand the conservation of Biodiversity
B.Sc. Chemistry	UGCHB520 /UGCHB620	Cosmetics and Dyes	contribution of various industries to environmental pollution and its effect on human health.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Integrate the knowledge and skills developed in multidisciplinary environments and function effectively as an individual or a leader and contribute towards the needs of the society.	Understand the impact of dyes used in textile and leather industry to environmental pollution and analyse the importance of dyes in pharmaceutical and food industry.

B.Sc. Microbiology	UCMBK20	Microbial Ecology and Soil Microbiology	The course is designed to enable the learners understanding on the microorganisms present in their environments and their habitat, microbial interaction, biogeochemical cycling and waste management.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Understand and explain the diversity of microorganisms and its interaction with the environment for sustainable development.	Compare the role of microbial communities in the environment and discuss on the significance of Aero and Water Microbiology Assess on the microbiological aspects of management of sewage and design the treatment procedures.
B.Sc. Microbiology	UAMBB20	Allied IV: Microbiology-II	The course is designed to make the students know about the third major component of the biotic system and provide a detailed insight on the significance microbes in different environments.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Understand and explain the diversity of microorganisms and its interaction with the environment for sustainable development.	Discuss the role of microorganisms in soil and biogeochemical cycles. Disseminate knowledge on the potability of water, purification of municipal water supplies and sewage treatment process Communicate sources of airborne pathogens and the diseases caused.

B.Sc. Microbiology	UGMBB20	Waste water Microbiology	The course is designed to provide in depth knowledge on the significance of waste water and on waste water and its treatment cum recycling methods.	Acquire and apply analytical, critical and creative thinking, and problem-solving skills	Realize the application-oriented aspects of Microbiology and assimilate the technical skills in basic, medical and applied Microbiology.	Use the available technologies for physical, chemical and biological treatment of municipal water. Demonstrate the microbiological analysis of potable water and brief out water borne diseases. Outline bioremediation of pesticides, heavy metals and oil spills. Explain the sewage treatment process. Utilization of solid and liquid waste.
B.Sc. Visual Communication	UCVCG20	Media, Culture and Society	To enable the students to understand the theories of media and the impact of media on society and culture	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	To become a socially responsible citizen with a global vision.	Analyze the various models of media and Categories the ecological perspective of media audience
B.Sc. Visual Communication	UCVCN20	Project -1 Documentary Production	To train students in short-film making or documentary making by putting into practice the techniques learned in television production and script writing through team work.	Emulate positive social values and exercise leadership qualities and team work.	To make women professionals in media and attain professional portfolios to become entrepreneurs to increase employability.	Presenting the Documentation with Master Copy.

B.Sc. Visual Communication	UCVCR20	Project – 2 - Short Film Production	To train students in short-film making or documentary making by putting into practice the techniques learned in television production and script writing	Emulate positive social values and exercise leadership qualities and team work.	To make women professionals in media and attain professional portfolios to become entrepreneurs to increase employability.	Presenting the Documentation with Master Copy.
UG Zoology	UCZOK20	Environmental Biology	Create awareness on Environment issues and its conservation.	Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.	Demonstrate comprehensive knowledge on the complexity of life process, their molecular, cellular and physiological process, their genetics, evolution, behaviour and their interrelationship with the environment.	Explain ecology its branches and abiotic and biotic components of ecosystem. Discuss animal association, biogeochemical cycle and Ecosystem and its functions. Discuss the structure and functions of terrestrial and aquatic ecosystems.
B. Com (B & I)	UCBIR20	E-commerce, E-banking and Tally	Learn about various components of E-commerce, E-Banking Technologies and accounts in TALLY	Pursue higher knowledge, qualify professionally, enhance entrepreneurial skills and contribute towards the needs of the society.	Engaging in Lifelong Learning, apply ethical principles and excel as a socially committed individual having empathy for the needs of the society.	To provide technical knowledge about the applications of E-Banking and E-Commerce



Allied Botany	UNEVS20	Environmental Studies	Course is designed for students to learn biodiversity and to conserve the environment and for their future. They are also exposed to projects on environmental issues.	Acquire and apply analytical, critical and creative thinking, and problem-solving skills Effectively communicate general and discipline-specific information, ideas and opinions. Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society	Engaging in Lifelong Learning, apply ethical principles and excel as a socially committed individual having empathy for the needs of the society.	Gain knowledge on multidisciplinary nature of environmental studies Understand the Ecosystem, its structure and function Understand the conservation of biodiversity Gain knowledge on Environmental pollution, causes and its effects Apply the laws in prevention of environment.
M.A. English	PCENI20	Romantic and Victorian Literature	The course aims at creating awareness and subsisting students regarding environmental sustainability through representations in literary texts.	Integrate issues of social relevance in the field of study.	Appreciate and discuss varying opinion of literary works	Explain the nature of Industrial Revolution, the subsequent scientific and material progress and to explore a society that was being re-organized around Science, Factories and Business. Connect the works of the Romantics and Victorians to their social and historical backgrounds and evaluate it

M.A. English	PIENH20	Independent Elective–IV B: Literature and Environment	The course aims at creating awareness and sensitizing students regarding environmental sustainability through representations in literary texts.	Integrate issues of social relevance in the field of study.	Appreciate and discuss varying opinion of literary works Critically interpret emerging traditions of literature, culture and thought in the canon of new literatures	Explain the nature of Industrial Revolution, the subsequent scientific and material progress and to explore a society that was being re-organized around Science, Factories and Business. Connect the works of the Romantics and Victorians to their social and historical backgrounds and evaluate it
MSW	PISWA20	Disaster Management	Course designed to gain preliminary knowledge on disasters and ability to respond to the situation	Assimilate and apply principles and concepts towards skill development and employability	To utilize the opportunity and of professionalism in the development process	Equip students to work in disaster situations and expose knowledge on the impact of disaster on individual and community
MSW	PESWA20	Social Problems	The paper introduces various social problems and catastrophes such as fire, drought, famine etc., and the various methods to find out the roots of the problems from various cultural/geographical backgrounds.	Integrate issues of social relevance in the field of study	To utilize the available resources for the empowerment of vulnerable groups and critically analyze the problems and needs to create impact in society	Critically analyze the impact of social problems in the society

MSW	PSHRD20	Organizational Behaviour	To present a new perspective for management	Develop research skills through multi/inter/trans-disciplinary perspectives.	It brings a change in attitudes and values of individual respective of their class, caste or gender	Explore managerial and interpersonal skills in presenting a new perspective for management
MBA	PIBAB20	Disaster Management	To empower and inhibit the knowledge about the Disaster Rehabilitation & Futuristic Sustainable Measures adopted	Integrate issues of social relevance in the field of study.	Students develop self-learning skills, and remain updated on contemporary management practices and can leverage their learning to provide solutions to business problems.	Empower and inhibit the knowledge about the Disaster Rehabilitation & Futuristic Sustainable Measures adopted.
MBA	PIBAC20	Industrial Safety and Pollution Management	To Ascertain the Procedures of Environmental Safety	Integrate issues of social relevance in the field of study.	Students develop self-learning skills, and remain updated on contemporary management practices and can leverage their learning to provide solutions to business problems.	Understand the concepts of Environmental Management
M.Sc. Biochemistry	PCBCA20	Biomolecules	To understand the salient features of biomolecules in the organization of life.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	List out the significance of vitamins, its deficiency diseases and about the porphyrin ring containing molecules in living system

M.Sc. Biochemistry	PCBCB20	Human Physiology and Nutrition	To study about the Physiological system of human body and Nutrients with their deficiencies.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Utilize knowledge on nutrients with their deficiencies
M.Sc. Biochemistry	PCBCC20	Cell Biology	To understand the Cell, Cell organelle's structure, function and metabolism	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Discuss about the various sub-cellular components of cells and its functions in the biological system
M.Sc. Biochemistry	PCBCG20	Practical I: Main Practical-I	To help students to expertise in the Biomolecules, Cell Dynamics and biochemical techniques.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	
M.Sc. Biochemistry	PCBCH20	Practical II: Main Practical-II	To learn about the analytical techniques and enzymology experiments.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	
M.Sc. Biochemistry	PEBCA20	Elective IA: Biophysical Chemistry	To make the students to understand the concepts of bioenergetics and techniques.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Demonstrate the concept of bioenergetics and its importance

M.Sc. Biochemistry	PEBCB20	Elective IB: Pharmaceutical Biochemistry	To make the students aware of uses and abuse of drugs.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Use the medicinal plants in drugs as a curative
M.Sc. Biochemistry	PCBCD20	Analytical Biochemistry	To understand the principles and applications of analytical techniques.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Pursue knowledge about centrifugation and radioactivity and critically assess advances with in the field
M.Sc. Biochemistry	PCBCE20	Enzymology	To learn the methodology involved in assessing the enzyme activity and mechanism of enzyme action.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Explain various industrial and clinical applications of enzymes as a catalyst in industries and also as a therapeutic aid
M.Sc. Biochemistry	PCBCF20	Intermediary Metabolism	To make the students to understand the reactions catalyzed by different enzymes and their metabolic pathways.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Interpret how plants convert energy to nourish themselves
M.Sc. Biochemistry	PEBCC20	Elective IIA: Ecology, Evolution and Developmental Biology	The course enables the students to understand and analyze the role of ecological and evolutionary modifications in the development of organisms and their survival.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Apply the concept of evolution in population genetics

M.Sc. Biochemistry	PEBCD20	Elective II B: Toxicology	The course gives a detailed understanding and identification of toxic substances, dose-response, tests conducted and its impact on cellular activities.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Discuss the effects of toxic substances on molecular and cellular levels
M.Sc. Biochemistry	PCBCI20	Advanced Endocrinology	The course describes in detail about the role of endocrine glands, their secretion, its metabolic effect on target cells involving various signaling pathways and signal chain proteins.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	
M.Sc. Biochemistry	PCBCJ20	Advanced Immunology	To help the students to understand the components of immune system and it's functioning.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Compare and contrast innate and adaptive immunity
M.Sc. Biochemistry	PCBCK20	Advanced Biotechnology	To learn how to apply the knowledge of genetic engineering in problem solving and in practice.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Categorize how plant and animal cells are cultured and genetically manipulated in laboratory

M.Sc. Biochemistry	PCBCN20	Practical II: Main Practical III	The course is aimed to enable the student interpret hormonal imbalance and clinical conditions and also to provide in-depth practical knowledge and skill in performing immune-techniques and cell culture techniques.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Analyse the prevalence and impact of endocrine hormone in regulating health
M.Sc. Biochemistry	PCBCO20	Practical II: Main Practical - IV	To help students to expertise in the molecular biology and clinical Biochemistry techniques.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	
M.Sc. Biochemistry	PEBCE20	Elective III A: Microbiology	To understand the importance of applications of microorganisms.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Recall the taxonomy, morphological features and division process of microbes
M.Sc. Biochemistry	PEBCF20	Elective III B: Research Methodology	To addresses the issues inherent in selecting a research problem and discuss the techniques and tools to be employed in completing a research project	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Practice the concepts of animal studies and CPCSEA guidelines in research



M.Sc. Biochemistry	PCBCL20	Molecular Biology	The course will enable the student to learn the molecular events occurring in gene and its application in field of biomedical and genetic research.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Demonstrate the nature and role of Gene in life activity.
M.Sc. Biochemistry	PCBCM20	Advanced Clinical Biochemistry	To gain concepts of assessing the human physiology using biological fluid.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	
M.Sc. Biochemistry	PEBCG20	Elective IVA: Plant Biochemistry	To help the students to understand the plant metabolites and their application in the field of medicine.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Identify various natural and artificial ways to propagate plants
M.Sc. Biochemistry	PEBCH20	Elective IV B: Herbal Therapy	To help students to understand the concepts in pharmacognosy and the role of medicinal plants.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Predict the Herbal medicines for Human ailments
M.Sc. Biochemistry	PIBCA20	IEC: Organic Farming	To help students to understand the concepts and importance of organic farming and use it as a source of income generation	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Relate the importance of plant protection

M.Sc. Biochemistry	PIBCB20	IEC: Food Preservation	To enable students to understand the concepts of food preservation and methods involved	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Apply the general methods for preserving fruits and vegetables
M.Sc. Biochemistry	PIBCC20	IEC: Horticulture	To emphasis on the significance and concepts of horticulture and the techniques involved.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Outline the impact of soil nature on horticulture
M.Sc. Biochemistry	PIBCD20	IEC: Cancer Biology	To help students to understand the biology, diagnosis and treatment involved in cancer.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	
M.Sc. Biochemistry	PIBCE20	IEC: Nanobiotechnology	The course aims to provide an interdisciplinary knowledge on Nano materials and their applications in biosciences.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	Identify the role of plants in Nanoparticle synthesis
M.Sc. Biochemistry	PIBCF20	IEC: Stem cell Technology	The course gives in depth knowledge on stem cell biology, regulation of stem cell differentiation, tools to study and its utilization in treating various disorders	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	

M.Sc. Biochemistry	PIBCG20	IEC: Psychology	The course is aimed to enhance the psychological skills for the students to acquire factual knowledge and ability to conceptualize and apply in their life.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	
M.Sc. Biochemistry	PIBCH20	IEC: Entrepreneurial Biochemistry	The course provides detailed knowledge on ideas, opportunities and components necessary for bio-entrepreneurship.	Persist in life-long learning for personal and societal progress	Demonstrate understanding of the societal, health, safety, legal and cultural issues and consequent responsibilities	
M.Sc. Chemistry	PCCHB20	Structural Inorganic Chemistry	This course educates students about environmentally friendly solvents.	Persist in life-long learning for personal and societal progress	Communicate effectively through report writing, documentation and effective presentations and integrate the knowledge in chemistry for sustainable environment.	Summarize the theories of acids and bases.
M.Sc. Chemistry	PCCHC20	Kinetics and Photo Chemistry	This course educates students about eco-friendly photochemical reactions.	Persist in life-long learning for personal and societal progress	Communicate effectively through report writing, documentation and effective presentations and integrate the knowledge in chemistry for sustainable environment.	Derive the kinetics of photochemical reactions, and explain the applications of radiation chemistry, kinetics of photochemical reactions, solar energy conversion and radiolysis of water.

M.Sc. Chemistry	PECHE20	Elective III A: Analytical Chemistry	This course enables students to know about the importance of water chemistry and green chemistry to environmental sustainability.	Persist in life-long learning for personal and societal progress	Communicate effectively through report writing, documentation and effective presentations and integrate the knowledge in chemistry for sustainable environment.	Elaborate the principle, instrumentations of the Gas, HPLC and SCF chromatographic techniques and their applications. Analyze the importance of Green Chemistry and its impact on the sustainable environment and the quality of water.
M.Sc. Chemistry	PECHF20	Elective III B: Green Chemistry	Apply the goals and principles of green chemistry in synthesizing chemical compounds.	Persist in life-long learning for personal and societal progress	Communicate effectively through report writing, documentation and effective presentations and integrate the knowledge in chemistry for sustainable environment.	Explain the goals and progress of green chemistry. Analyse the future trends in green chemistry
M.Sc. Chemistry	PECHH20	Elective IV B: Organic Farming and Solid Waste Management	To manage solid and hazardous wastes in an eco-friendly manner.	Persist in life-long learning for personal and societal progress	Communicate effectively through report writing, documentation and effective presentations and integrate the knowledge in chemistry for sustainable environment.	Evaluate the technology to approach the benefits of organic farming. Demonstrate the methods to reduce hazards.

M.Sc. Chemistry	PICHJ20	IEP: Leather Chemistry	To practice cleaner technology in leather industries.	Persist in life-long learning for personal and societal progress	Communicate effectively through report writing, documentation and effective presentations and integrate the knowledge in chemistry for sustainable environment.	Discuss the cleaner technology in leather industry. Apply waste water management and zero discharge approaches in leather industry.
M.Sc Computer Science	PICSB20	Green Computing	Understand the dimensions and goals of Green IT.	Attain an in-depth knowledge in the respective domains augmented through self-learning	To design, implement, and evaluate a computer-based system, process, component, or program for various applications.	Understand the Concept of Green IT.
M.Sc. Electronic Media	PEEMC20	Elective II A: Inter-Cultural Communication	To initiate students to the challenges in global communication in the age of cross-culture communication	Develop research skills through multi/inter/trans-disciplinary perspectives.	To become ethically committed media professionals and entrepreneurs by adhering to Human values, the Indian and the Global cultures.	Evaluating the Relationship Between Intercultural Communications in News Media Production.

M.Sc. Zoology	PCZOE20	Applied Entomology	Create awareness on pest and their control measures.	Integrate issues of social relevance in the field of study.	Conduct their duty with at most honesty and adhere to ethical protocols. On the whole, be agents of social transformation to up bring their society at large.	Identify the pest in different cash crops and the mode of infection. Analyze the pest species of vegetables, fruits, stored grains and household pests. Categorize the different insect pests and vectors of livestock. Explain the classification of insecticides and the mode of action. Apply appropriate method of insect pest management and integrated pest management.
M.Sc. Zoology	PCZOF20	Biodiversity and Wildlife Conservation	Students will understand the biodiversity and know the methods of conservation.	Persist in life-long learning for personal and societal progress.	Conduct their duty with at most honesty and adhere to ethical protocols. On the whole, be agents of social transformation to up bring their society at large.	Discuss the Biodiversity India and ecosystems. Explain the values of Biodiversity. Discuss the Wildlife of India and threats to the wildlife. Explain Wildlife protection and conservation. Explain conservation

M.Sc. Zoology	PCZOI20	Environmental Biology	Create awareness on Environment issues and its conservation.	Integrate issues of social relevance in the field of study.	Conduct their duty with at most honesty and adhere to ethical protocols. On the whole, be agents of social transformation to up bring their society at large.	methods. Describe ecological succession and Environmental stresses and their management. Explain the major classes of contaminants and their impact on environment. Explain green energy and the types of recycling technologies for solid and liquid wastes and their role in environmental conservation. Discuss environmental indicators and their role in environmental balances and bioremediation. Explain the importance of global ecology towards sustainable civilization.
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M.Sc. Zoology	PCZOJ20	Limnology and Toxicology	Enable the students to understand the importance of freshwater ecosystem and its conservation.	Persist in life-long learning for personal and societal progress.	Conduct their duty with at most honesty and adhere to ethical protocols. On the whole, be agents of social transformation to up bring their society at large.	Attains basic concept about fresh water habitats and its types. Describe the Physio-Chemical Characteristics and its importance in freshwater ecosystems. Summarize about the organisms and adaptation in the freshwater ecosystem.
M.Sc. Zoology	PIZOG20	Independent Elective IV A: Biosystematics	Appreciate the diversity and evolutionary relationship among organisms.	Apply critical and scientific approaches to address problems and find solutions.	Be technically sound in applying the Information technology and will be lifelong learners in updating to the current advancements in their respective fields.	Explain the concept, importance and attributes of biosystematics. Discuss the biological characteristics. Compute the evolutionary relationship among the organisms. Familiarize different taxonomic procedures, taxonomic keys and zoological nomenclature. Apply phylogeny classification at species level and infra species level.

M.Sc. Microbiology	PCMBB20	Food, Agriculture and Environmental Microbiology	The syllabus is framed to make the students familiarize on Food, Agriculture and Environmental aspects of Microbiology.	Apply critical and scientific approaches to address problems and find solutions.	Acquaint a broader knowledge in the concepts of Taxonomy, molecular biology, immunology, food, environment and agricultural Microbiology, nanotechnology, forensic science and genetic engineering.	Discuss the role of microorganisms in soil and microbial interaction. Utilize the knowledge on biogeochemical cycles to produce biofertilizers. Assess information about microbiological quality of air and water.
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*S. Dargaveeli*

**Controller of Examinations**

**Controller of Examinations,  
Auxilium College (Autonomous)  
Gandhi Nagar, Vellore - 632 006.**

*Sr. Vijay Suresh - a*

**PRINCIPAL  
AUXILIUM COLLEGE (Autonomous)  
Gandhi Nagar, Vellore - 632 006.  
Vellore District, Tamil Nadu.**

ENGLISH PAPER – I

<b>Year: 2020</b>	<b>Code:</b> UENGA20	<b>Title:</b> English Paper - I	<b>Course Type:</b> Theory	<b>Course Category:</b> Language	<b>H/W:</b> 6	<b>Credits:</b> 3	<b>Marks:</b> 100
<b>Sem: I</b>							

**COURSE OUTCOMES (COs):**

CO1: Recognize the elements of English language at the levels of vocabulary, spelling, grammar and pronunciation

CO2: Rephrase ideas into sentences in both speech and writing with accuracy, clarity and fluency

CO 3: Use the LSRW (listening, speaking, reading & writing) skills in English language with ease in academic and real-life situations.

CO4: Explain one's ideas and opinions on any given subject, clearly and effectively

CO5: Discern (figure out) effective ways of communication with etiquette

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
<b>CO1</b>	<b>H</b>	M	M	M	M	M
<b>CO2</b>	H	<b>H</b>	M	M	M	M
<b>CO3</b>	H	H	<b>H</b>	H	M	M
<b>CO4</b>	H	H	M	<b>H</b>	M	M
<b>CO5</b>	H	H	M	M	<b>M</b>	M

**H - High – (3), M - Moderate (3), L - Low (1)**

**Unit 1**

**(18 Hours)**

1.1. Poetry - The Piper K3

1.2. Fairy Tale –The Ugly Duckling K2

1.3. Short Story - Panchatantra Tales- Book III-  
Crows

K2 and the Owls- 1. How the Birds Picked a  
King

1.4. How the Rabbit Fooled the Elephant K2

1.5. From Raymond Murphy's Essential English Grammar.

K1, K2 Grammar Units 1-11		
1.6. Composition - Jumbled Sentences		K3
- Writing Skills		
<b>Unit 2</b>		<b>(18 Hours)</b>
2.1. Poetry - The Donkey		K3
2.2. Poetry - The Kitten and Falling Leaves		K3
2.3. Fairy Tale - The Country Mouse and the Town Mouse		K2
2.4. Short Story - The Gift of the Magi		K2
2.5. Grammar Units 12-22		K1, K2
2.6. Composition - Writing Advertisement		K3
- Writing Skills		
<b>Unit 3</b>		<b>(18 Hours)</b>
3.1. Poetry-The Owl and the Pussy Cat		K3
3.2. Fairy Tale -The Leap-Frog		K2
3.3. Short Story- Arabian Nights		
The Seven Voyages – Third Voyage		K3
3.4. Of Sindbad the Sailor - Fourth Voyage		K3
3.5. Grammar Units 23-33		K1, K2
3.6. Composition - Precise Writing		K3
- Writing Skills		
<b>Unit 4</b>		<b>(18 Hours)</b>
4.1. Poetry -The Brook		K4
4.2. Fairy Tale -Rumpelstiltskin		K2
4.3. The Elves and the Shoemaker		K2
4.4. Short Story -The Golden Deer		K2
4.5. Grammar Units 34-44		K1,K2
4.6. Composition – Letter Writing- Informal Letter		K3
–Writing Skills		
<b>Unit 5 – Fiction- The Tales From Shakespeare</b>		<b>(18 Hours)</b>
5.1. The Tempest		K4
5.2. The Winter’s Tale		K4
5.3. The Merchant of Venice		K4
5.4. King Lear	K4	
5.5. Othello		K4
5.6. Grammar Units 45-57		K1, K2
Composition- Story Writing-own imagination		K4

### Text Books

1. *Darts: A Voyage of Learning English* by the Department of English, Auxilium College, Vellore. Bloomsbury Publications: New Delhi, 2017.
2. Murphy, Raymond. *Essential English Grammar*, Cambridge University Press. Ed. 2. New Delhi. a. 2017

### Reference Books

Charles & Mary Lamb, *Tales from Shakespeare*, New Delhi, 2018.

### OER (Open educational resources):

1. <https://open.umn.edu/opentextbooks>
2. <https://www.saylor.org/>
3. <https://textbooks.opensuny.org/browse-by-subject/>
4. [www.bloomsbury.com](http://www.bloomsbury.com)

### UENGB17 - ENGLISH PAPER –II

<b>Year: 2020</b>	<b>Course Code:</b>	<b>Title of the Course:</b>	<b>Course Type:</b>	<b>Course Category:</b>	<b>H/W:</b>	<b>Credits:</b>	<b>Marks:</b>
<b>Sem II</b>	UENGB20	English – Paper II	Theory	Language	6	3	100

### COURSE OUTCOMES (COs):

CO1: Relate with the time-tested values of Indian culture and assimilate communicative skills through the reading of texts by Indian English writers

CO2: Outline the values and ideas from the prescribed texts in self-made sentences with accuracy, clarity and fluency

CO 3: Use the LSRW (listening, speaking, reading & writing) skills in English language with ease in academic and real-life situations.

CO4: Explain one's ideas and opinions on any given subject, clearly and effectively

CO5: Figure out effective ways to make a point and describe one's standpoint

	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>
<b>CO1</b>	H	H	M	M	M	M

<b>CO2</b>	H	H	M	M	M	M
<b>CO3</b>	H	H	H	M	M	M
<b>CO4</b>	H	H	H	H	M	M
<b>CO5</b>	H	H	H	H	H	M

**H - High – (3), M - Moderate (3), L - Low (1)**

**Unit 1 ( 18 Hours)**

- 1.1. Poetry-Where the Mind is without Fear K3
- 1.2. Prose - Science and Religion K4
- 1.3. Short Story -The Tree Speaks K3
- 1.4. Autobiography - Shyness My Shield K3
- 1.5. Grammar Units 58-70 K2, K3
- 1.6. Composition: Email Writing – Writing Skills K3

**Unit 2 ( 18 Hours)**

- 2.1. Poetry - Peace K3
- 2.2. Prose - Dynamic Life K4
- 2.3. Short Story - Father and Son K3
- 2.4. Autobiography - Wings of Fire K3
- 2.5. Grammar Units 71-82 K2, K3
- 2.6. Composition: Dialogue Writing –Writing Skills K4

**Unit 3 (18 Hours)**

- 3.1. Poetry- Freedom K3
- 3.2. Prose - The India of My Dreams K4
- 3.3. Short Story – Sparrows K2
- 3.4. Biography - Bankim Chandra Chattopadhyaya K4
- 3.5. Grammar Units 83-95 K2, K3
- 3.6. Composition: Report Writing – Writing Skills K3

**Unit 4 (18 Hours)**

- 4.1. Poetry - A Scratch K3
- 4.2. Prose - How Economic Growth Has Become Anti-Life K4
- 4.3. Short Story - Eight Rupees K2
- 4.4. Biography – The Saint of the Gutters K3

- |                                      |        |
|--------------------------------------|--------|
| 4.5. Grammar Units 96-107            | K2, K3 |
| 4.6. Composition - Preparing Posters | K3     |

**Unit 5 (18 Hours)**

- |  |        |
|--|--------|
| 5.1. Poetry- On Killing a Tree   | K3     |
| 5.2. Prose- Future of Our Past: Towards a<br>Critique of<br>Globalization<br>and Culture<br>Industry | K4     |
| 5.3. Short Story-The Guest   | K2     |
| 5.4. Biography- Daring to Dream  | K3     |
| 5.5. Grammar Units 108-114   | K2, K3 |
| 5.6. Composition: Formal Letter Writing -Writing Skills  | K2, K3 |

**Text Books**

1. *Darts: A Voyage of Learning English* by the Department of English, Auxilium College, Vellore.  
a. Bloomsbury, New Delhi, 2017.
2. Murphy, Raymond. *Essential English Grammar*, Cambridge University Press. Ed. 2. New  
a. Delhi. 2017.

**Reference Books**

1. Hall, Donald and Sven Birkerts. *Writing Well*. New York: Harper Collins Publishers, 1991.
2. Kahn, John Ellison (Ed.) *Reader's Digest: How to Write and Speak Better*. New York:  
Reader's  
a. Digest, 1993.

**OER (Open educational resources):**

1. [www.bloomsbury.com](http://www.bloomsbury.com)
2. Open Textbook Library
3. Saylor.org
4. <https://textbooks.opensuny.org/browse-by-subject/>



## UCENH20 - ROMANTIC LITERATURE

<b>Year:</b> II	<b>Course Code:</b> UCENH20	<b>Title of the Course:</b> Romantic Literature	<b>Course Type:</b> Theory	<b>Course Category:</b> Main	<b>H/W</b> 5	<b>Credits</b> 5	<b>Marks</b> 100
<b>Sem:</b> IV							

### Course Outcomes

The Learners will be able to

1. Locate the historical and cultural context of English Romanticism.
2. Discuss the traits of Romanticism with emphasis on concepts of self, imagination and the unconscious
3. Apply historical, social, philosophical and political contexts to interpret texts
4. Analyse the effects of the major events in that period.
5. Evaluate the impact of Romanticism on the development of literary form and modes of expression.

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

**H - High – (3), M - Moderate (3), L - Low (1)**

### Unit I: Introduction / Detailed Poetry Hours)

**K Level (20**

- |   |        |
|---|--------|
| 1.1 The French Revolution: The American war of Independence   | K1, K3 |
| 1.2 William Wordsworth: Lines Composed upon Westminster Abbey | K2, K4 |
| 1.3 John Keats: Ode on a Grecian urn                          | K2, K3 |
| 1.4 Poetic Techniques in Ode on a Grecian urn                 | K3, K4 |
| 1.5 P. B. Shelley: Ode to the West Wind                       | K3, K4 |
| 1.6 Themes and Symbols in Ode to the West Wind                | K3, K4 |

### Unit II: Non- Detailed Poetry

**K Level (20 Hours)**

- |  |        |
|--|--------|
| 2.1 S. T. Coleridge: The Rime of the Ancient Mariner | K1, K3 |
|--|--------|

2.2 Themes of The Rime of the Ancient Mariner	K2, K4
2.3 Lord Byron: She walks in Beauty	K2, K3
2.4 Robert Southey: To the Genius of Africa	K3, K4
2.5 Charlotte Byrne: The Female Philosopher	K3, K4
2.6 Characteristics of English Romantic Poetry.	K3, K4

**Unit III: Prose – Detailed K Level (20 Hours)**

3.1 William Hazlitt: The Indian Jugglers	K1, K2
3.2 William Hazlitt as a Romantic Essayist	K2, K3
3.3 Characteristics of the Indian Jugglers	K2, K3
3.4 Salient Characteristics of Romanticism	K2, K3
3.5 William Hazlitt: On Nicknames	K3, K4
3.6 Charles Lamb: Dream Children	K3, K4

**Unit IV: Fiction K Level (15 Hours)**

4.1 Walter Scott: Kenilworth	K2, K3
4.2 Kenilworth as a Romantic novel	K2, K3
4.3 Narrative art in Kennilworth	K2, K3
4.4 Jane Austen: Pride and Prejudice	K3, K4
4.5. Austen's portrayal of the women in Pride and Prejudice	K3, K4
4.6 Significance of the title Pride and Prejudice	K3, K4

**Unit V: Fiction K Level(15 Hours)**

5.1 Mary Shelley: Frankenstein	K2, K3
5.2 The role of suspense and foreshadowing in the novel	K2, K3
5.3 Theme of loneliness in Frankenstein	K2, K3
5.4 Horace Walpole: The Castle of Otranto	K2, K3
5.5 How was Walpole's novel connected to the actual Goths and their culture?	K3, K4
5.6 Symbolism and Imagery in The Castle of Otranto	K3, K4

**Books for Study:**

1. Nayar. K Pramod. The English Romantic Poets: An Anthology, Orient Blackswan Private Limited. 2013
2. Ed. Hollingworth. Essays: Hazlitt. University Tutorial Press Limited.
3. Austen, Jane, Pride and Prejudice, Rupa Publication. New Delhi,2004.
4. Walpole Horace, The Castle of Otranto, Oxford University Press, India, 2008.

**Books for Reference:**

1. Plowman, Max. An Introduction to the Study of William Blake. Atlantic Publishers and Distributors. New Delhi. 1994.
2. Ed., Gill, Stephen, WU, Duncan, William Wordsworth

- Selected Poetry, Oxford University Press, New York, 2008.
3. Ed., Holloway, John, Selected Poems of Percy Bysshe Shelley, Heinemann Educational Books Ltd., Hong Kong, 1964.
  4. Ed., Blunden, Edmund, Selected Poems John Keats, Rupa Publications India Private Limited, New Delhi, 2011.
  5. Ed., Bloom, Harold, Jane Austen's Pride and Prejudice, Viva Books Private Limited, New Delhi, 2010.

### 1.1.1 – DEPARTMENT OF HISTORY – ENVIRONMENTAL NEEDS

#### UEHIE20: ELECTIVE: III A- GEOGRAPHY OF INDIA

Year:	Course Code:	Title of the Course:	Course Type:	Course Category:	H/W	Credits	Marks
III	UEHIE20	Elective III A:Geography of India	Theory	Core Elective	6	5	100 40+60
Sem: VI							

#### Course Objective:

1. To help the students to understand the concepts of Geography its foundation and its development through the ages
2. To help the students to know the physiographic of India
3. To help the students to acquire the knowledge of natural resources and the climatic changes.

#### Course Outcomes:

##### After completion of the course the student will able to:

1. Explain the foundation of Geography and its application in day today's context
2. Describe about the Themes, Traditions and types of Geography
3. State the evolution of the physical features of India
4. Estimate about the Natural Resources to commit oneself for Sustainable Development
5. Examine the prevention of Disaster and Relief measures available in India to create respect for Human Values

CO/P O	1	2	3	4	5	6
CO1	H	L	M	H	L	M
CO2	M	M	H	H	L	L

CO3	H	M	H	H	L	L
CO4	H	L	M	H	M	M
CO5	H	L	M	H	L	L

**H-High (3) M-Medium (2) L-Low(1)**

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

H-High (3) M-Medium (2) l-Low (1)

**Unit I:**

**(18 Hours)**

1.1- Meaning and Definition of Geography- Geography as a Science- Geography and its relations with Physical Science- Mathematics- Astronomy (K1, K2)

1.2- The Scope of Geography- Geography teaches the past - Values- Importance of Geography-Geographer, Geologist- Understand Places- teaches a skill- International Understanding – Better Citizen – Provides Clues to the Past(K1, K2, K4)

1.3- Foundation of Geography-Evolution of Geography- Ancient – Medieval- Modern (K2)

1.4- Contribution and Importance of Geography (K2)

1.5-Four Traditions of Geography-Spatial Tradition- Area Studies Tradition- Man Made Tradition- Earth Science Tradition (K1, K2, K4)

1.6-Branches of Geography- Physical Geography-Human Geography-Geographic Techniques- Mathematical Geography- Statistical Geography- Cartography(K1, K2, K4)

**Unit II:****(18 Hours)**

2.1- Theories of Earth Origin- Big Bang Theory- Galaxy - Milky Way- Solar System- History of Earth Creation-Geological History of India- Pangea- Tethys- Creation of Himalayas

(K1,K2)

2.2- Basic Concepts of Geography in India(Islands- Peninsula- Strait- Gulf- Cape- Archipelago- Atoll-Census-Continental Drift-Equator-Estuary-Glacier- Global Positioning System(GPS) (K2, K4)

2.3- Major Physiographic Divisions-Mountains-The Northern Great Plains (K2)

2.4- Himalayan Mountain- Central Himalaya- Eastern- Western Himalaya- Significance of Himalayas (K2)

2.5-Northern Great Plains- Indus Basin- its Significance- Ganga Basin- its Significance- Sundarbans (K2)

2.6-Brahmaputra Basin- The Brahmaputra Delta – Significance of Northern Great Plains (K2)

**Unit III:****(18 Hours)**

3.1- Deccan Plateau – Peninsular Plateau- Malwa Plateau- Chotta Nagpur Plateau- Deccan trap- Western Ghats and Eastern Ghats (K2)

3.2-Rivers of India- Perennial Rivers- Non-Perennial Rivers- Water Resources- Rain Water Harvesting-Multi Purpose River Projects- Integrated Water Resource Management in India (K2, K4)

3.3- Deserts:- Thar Desert- Islands: – Andaman- Nicobar Islands - (K2, K4)

3.4-Natural Resources of India - Biodiversity- Flora and Fauna- Geographical classification of Forest (K2, K4)

3.5-National Forest Policy- Forest Products- Conservation of Forest-Problems of Indian Forestry(K4)

3.6-Wild life- Mammal Species- Carnivores- Herbivores- Conservation of Wild life- Problems of Wild Life-Red Data Book (K2, K4)

**Unit IV:****(18 Hours)**

4.1-Land Resources- Land Utilization- Land Conservation Measures- Agricultural patterns of India (K2, K4)

4.2-Mineral Resources- Water Resources – Growth of Fisheries- Inland Fishing- (K2)

4.3- Development of Industries in India- Essential need for industries - Private and Public Sector- Manufacturing Industries- Agro-based Industries- Cottage Industries- (K4)

4.4-India – Climate of India-Indian Monsoon- North East Monsoon- South East Monsoon-Seasons of India:- Winter – Summer- Jet Streams- Reasons for Climate Changes (K2 )

4.5-EL- Nino- Tropical Cyclones- Thunder Storms- Rainfall distribution- Variability of Rainfall (K2)

4.6- Soil- Characteristics of Soils- Classification of soils- Soil Erosion- Importance of Soil Conservation-(K2, K4)

**Unit V: (18 Hours)**

5.1-Disaster-Natural Disaster- Man Made Disaster -Terrorism-War-Biological Disaster (K2, K4)

5.2-National Disaster Management of India National Disaster Management Policy – Prevention- Mitigation- Relief- Restoration (K4)

5.3-Energy Resources- Conventional Energy- Non- Conventional Energy(K2)

5.4-Major Developmental Projects- Atomic, Solar, Hydro, Wind, Dams – Energy Crisis- Importance of Energy Conservation (K2, K4)

5.5- Transport and Communication (Road, Railways, Water, Airways) (K2)

5.6- India’s Space Exploration and Geography- Satellite Geo-Location, Remote Sensing Satellite- (K2,K4)

### **Maps (India)**

1. Physical Features
2. Forest and Vegetation
3. Crops
4. Mineral Resources
5. Soil

### **B. Text Books:**

1. Majid Hussain-Geography of India-MC Grow Hill Education Pvt.Ltd, New Delhi,2018

### **Books for Study and Reference:**

1. S.A. Qazi-Geography of the World- S.N. Nagar, APH Publishing Corporation New Delhi, 2007
2. Dr. Satnam Singh- Indian Geography- Damini Garg, Murari Lal and Sons, New Delhi,2007
3. Majid Husain- World Geography-Satyam Apartment, Jawahar Nagar, Jaipur,2008
4. Prithivish Nag, Smita Sengupta Ahsok Kumar Mittal- Geography of India- Concept Publishing, New Delhi, 2002
5. A.M. Bagulia- Indian Geography-Anmol Publications Pvt Ltd., New Delhi, 2006
6. Dr. Satnam Singh- Indian Geography- Damini Garg, Murari Lal and Sons, New Delhi,2007
7. Pradeep Sharma- Human Geography, the land-Discovery Publishing house, New Delhi-2007

### **Open Educational Resources (OER):**

- 1.<https://www.openstreetmap.com>
- 2.[www.mhhe.com/getis10e/](http://www.mhhe.com/getis10e/)
- 3.<https://www.imd.gov.in>
- 4.<https://www.glovis.usgs.gov>
- 5.[www.nasagov.com](http://www.nasagov.com)



**B.A. / B.Sc. / B.Com. / B.B.A. / B.C.A. – SEMESTER IV**  
**UNEVS17 – ENVIRONMENTAL STUDIES**  
**(Effective for the Batch of Students admitted in 2016 – 2017)**

**SYLLABUS**

**Unit I:**

Definition of Environment - scope and importance, components and segments of environment - Multidisciplinary nature of Environmental Studies

Natural Resources: Water, Land, Wind, Energy, Forest and Mineral resources

**Unit II:**

Ecosystem - Structure and functions of ecosystems – Food chain and Food web – Ecological Pyramids – Types of Ecosystems – Lake ecosystem, Pond Ecosystem, Forest Ecosystem, Grassland Ecosystem, Desert Ecosystem and Ocean Ecosystem- Energy flow in Ecosystem – Ecological Succession

**Unit III:**

Biodiversity: General terms related to biodiversity – Types of Diversity - India as a mega biodiversity zone - Threats to Biodiversity - Conservation of Biodiversity – Values of Biodiversity

**Unit IV:**

Environmental pollution: Air pollution, Water pollution, Soil pollution and Noise pollution – Causes, effects and control measures – Rainwater harvesting – Watershed management – Solid waste management

**Unit V:**

Human population and Environment: Environmental Protection Act, 1986 – Environment protection agencies (International and National) - Air (Prevention and Control of Pollution) Act 1981, Water (Prevention and Control of Pollution) Act 1976, Wildlife Protection Act, 1972 - Forest (Conservation) Act, 1980 - Wildlife Protection Act, 1972

General Environmental issues – Global warming - Climate change – Ozone layer depletion – Acid rain - Sustainable Development – Population explosion - Role of Information Technology in Environmental Conservation

## SEMESTER – II

### UABEA20 – Business Environment and Ethics

<b>Year: I</b> <b>Sem: II</b>	<b>Course Code:</b> UABEA20	<b>Title of the Course:</b> Business Environment and Ethics	<b>Course Type:</b> Theory	<b>Course Category:</b> Elective	<b>H/W</b> 5	<b>Credits</b> 5	<b>Marks</b> 100
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#### Objectives

1. To know about the environment and its impact on business
2. To understand the political environment and role of government in business
3. To understand the economic system, financial system and their implication in business
4. To know the impact of Privatization, Globalization and Liberalization on the business
5. To realize the importance of business ethics and social responsibility as an individual to the society

#### Course Outcomes (CO)

The learners will be able to

1. Understand the Business environment
2. Be able to inter-relate the political and legal environment in business
3. Relate the importance of economic and financial environment to business
4. Comprehend the vitality of Privatization, Globalization and Liberalization in the business
5. Recognize the importance of business ethics and social responsibility in today's business

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

**H- High (3), M- Moderate (2), L- Low (1)**

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

**H- High (3), M- Moderate (2), L- Low (1)**

## **Course Syllabus**

### **UNIT I Introduction**

**(15 Hours)**

- 1.1 Business Environment – Definition (K1,K2)
- 1.2 Significance (K1,K2)
- 1.3 Political, Legal environment (K1,K2)
- 1.4 Economic and Social environment (K1,K2)
- 1.5 Cultural environment (K1,K2)
- 1.6 Cultural heritage (K1)

### **UNIT II Political and legal Environment**

**(15 Hours)**

- 2.1 Political environment (K1,K2.K3)
- 2.2 Rights according to Indian constitution (K1,K2.K3)
- 2.3 Economic roles of Government in business (K1,K2.K3)
- 2.4 Legal environment- Classification of companies (K1,K2.K3)
- 2.5 Memorandum of Association- Articles of Association- Prospectus (K1,K2.K3)
- 2.6 Types of shares- Debentures -Winding up of companies. (K1,K2.K3)

### **UNIT III: Economic System and Financial Environment**

**(15 Hours)**

- 3.1 Economic System and their impact of business (K1,K2)
- 3.2 Business Cycle (K1,K2)
- 3.3 Inflation and Deflation - Meaning – Causes - Effects - Control (K1,K2)
- 3.4 Measures to be adopted by business firms to reduce the evil effects of business cycle (K1,K2)
- 3.5 Financial Environment (K1,K2)
- 3.6 Financial system – Commercial Banks. (K1,K2)

### **UNIT IV: Privatization, Liberalization and Globalization**

**(15 Hours)**

- 4.1 Privatization – Meaning (K1,K2)
- 4.2 Ways of privatization – Privatization in India (K1,K2)
- 4.3 Liberalization – Meaning (K1,K2)
- 4.4 Globalization – Meaning (K1,K2)
- 4.5 Merits and demerits of globalization (K1,K2)
- 4.6 Consumer Protection Act

### **UNIT V: Business ethics**

**(15 Hours)**

- 5.1 Business ethics (K1,K2, K3)
- 5.2 Ethics in business and community (K1,K2)
- 5.3 Social responsibility towards customers and community (K1,K2)
- 5.4 Social responsibility towards and community (K1,K2)
- 5.5 Business Giving (K1,K2)
- 5.6 Social Audit (K1,K2)

## **Text Books**

1. Sankaran S, Business Environment, Margham Publications, Chennai, 5<sup>th</sup> Edition, 2013.
2. Francis Cherunilam, Business Environment: Text and Cases, Himalaya Publishing House Pvt.Ltd., Mumbai, 12<sup>th</sup> Edition, 2013

## **Reference Books**

1. R. Jayaprakash Reddy, Business Environment, APH Publishing Corporation, New Delhi, 4<sup>th</sup>Edition, 2004.
2. S.K. Bhatia, Business Ethics and Managerial Value, Deep and Deep Publication, New Delhi, 3<sup>rd</sup> Edition, 2010

**SEMESTER – V****UCBAM20 – Industrial Relations**

<b>Year: III</b> <b>Sem: V</b>	<b>Course Code:</b> UCBAM20	<b>Title of the Course:</b> Industrial Relations	<b>Course Type:</b> Theory	<b>Course Category:</b> Core	<b>H/W</b> 6	<b>Credits</b> 4	<b>Marks</b> 100
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**Objectives**

1. To understand the concept and the meaning of Industrial Relations and The Payment of Wages Act, 1936
2. To acquire knowledge about The Factories Act, 1947
3. To understand the concept of The Maternity Benefit Act, 1936
4. To understand the concept of The Industrial Dispute Act, 1947
5. To enable the learners absorb the concept of The Employees State Insurance Act, 1948 and The Minimum Wages Act 1948

**Course Outcomes (CO)**

The learners will be able to

1. Understand the concept & meaning of Industrial Relations and The Payment of Wages Act, 1936
2. Acquire knowledge about The Factories Act, 1947
3. Analyse and understand the concept of The Maternity Benefit Act, 1961
4. Attain knowledge of The Industrial Dispute Act, 1947
5. Be able to absorb the concept of The Employees State Insurance Act, 1948 & The Minimum Wages Act 1948

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

**H- High (3), M- Moderate (2), L- Low (1)**

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

**H- High (3), M- Moderate (2), L- Low (1)**

## **Course Syllabus**

### **UNIT I Introduction**

**(18 hours)**

- 1.1 Introduction to IR – meaning – importance (K1)
- 1.2 Participation and Empowerment – definition – objectives – advantages (K1, K2)
- 1.3 The Payment of Wages Act, 1936 – rules for the payment of wages (K1, K2, K3)
- 1.4 Deduction of wages – enforcement of the Act (K2, K3)
- 1.5 Roles and functions of the inspectors (K2, K3)
- 1.6 Powers of the inspectors (K1, K2, K3)

### **UNIT II The Factories Act, 1948**

**(18 hours)**

- 2.1 The Factories Act, 1948 – definition – Factory – Manufacturing process – Worker (K1, K2)
- 2.2 Approval, licensing and registration – notice by occupier (K1, K2, K3)
- 2.3 The Inspecting staff (K2, K3)
- 2.4 Health of the worker (K2, K3)
- 2.5 Safety of the worker (K2, K3)
- 2.6 Welfare of the worker – the working hours of adults – employment of adults – employment of young person – holidays and leave – overtime. (K2, K3, K4)

### **UNIT III The Maternity Benefit Act, 1961 & The Employee State Insurance Act, 1948 (18 hours)**

- 3.1 The Maternity Benefit Act, 1961 – definition – child – employer – circumstances and period (K1, K2)
- 3.2 Prohibition of Employment – right to the payment to Maternity Benefit – leave and nursing breaks – appointment of inspectors - penalties and offences (K2, K3, K4)
- 3.3 The Employee State Insurance Act, 1948 – definition – Principal Employer – Insurable Workman (K1, K2)
- 3.4 ESI Corporation – powers and duties of the corporation – the Standing Committee – medical benefit council (K2, K3, K4)
- 3.5 ESI fund – inspectors – contributions – benefits – rules regarding benefits – employee's insurance court – penalties (K2, K3, K4)
- 3.6 Obligations and rights of the employees and employers. (K2, K3)

### **UNIT IV The Industrial Dispute Act, 1947**

**(18 hours)**

- 4.1 The Industrial Dispute Act, 1947 – scope and objectives (K1, K2)
- 4.2 Features – definition of Industry (K1, K2, K3)
- 4.3 Industrial dispute – industrial establishment of undertaking (K1)
- 4.4 Layoff, lockout (K2, K3)
- 4.5 Retrenchment – strike (K2, K3)
- 4.6 Unfair labour practices. (K2, K3)

### **UNIT V The Minimum Wages Act, 1948**

**(18 hours)**

- 5.1 The Minimum Wages Act, 1948 – definition – fixation and revision of wages – minimum rates of wages (K1, K2)
- 5.2 Procedure for fixing and revision minimum wages – advisory board – central advisory board (K2, K3)
- 5.3 Safeguard in the payment of minimum wages (K2, K3)
- 5.4 Power of inspectors – claims (K2, K3)
- 5.5 Offences and penalties (K2, K3)
- 5.6 Obligation and rights of the employees (K2, K3, K4)

**Text Books**

1. Saravanavel & Sumathi, Legal Aspects of Business, Eswar Press, New Delhi, 2<sup>nd</sup> Edition, 2012
2. S C Srivastava, Industrial Relations and Labour Laws, Vikas Publishing House, New Delhi, 6<sup>th</sup> Edition, 2017

**Reference Books**

1. Martand T Telsang, Industrial and Business Management, Sultan Chand & Sons, New Delhi, 3<sup>rd</sup> Edition, 2014
2. M R Sreenivasan, Industrial Relations and labour Legislations, Margham Publications, Chennai, 6<sup>th</sup> Edition, 2014

## UCBAR20 – PROJECT

Each student shall be required to do a project and prepare the report on the basis of the investigation carried out by her in an institution or industrial organization. The student is expected to identify a problem in the organization based on her area of specialization and provide solutions and suggestions to the management. The report should demonstrate the capability of the students in analysing and evaluating the problem and to create original approach in providing solutions to the problem.

The project should include field studies, surveys, interpretation, planning and designing of the Research Methodology presented in a comprehensive manner with recommendations for solutions based on scientifically worked out data and Viva-Voce Examinations will be conducted on the basis of the report and presentation.

### 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 the report writing and the other will be through Viva-Voce.
- ✓ The valuation of the report writing will be done by the Internal Examiner while for the oral i.e. Viva-Voce Examination an External Examiner will be called for.
- ✓ 60 marks will be awarded for the report writing and 40 marks for the Oral (Viva-Voce) Examination.
- ✓ Training will be for a period of 30 days (One Month) which will be during the month May – June of every academic year.
- ✓ Each student should find a reputed organization which carries out the important functions like Production, Human Resource, Finance and Marketing to carry out her investigation with the approval of the department
- ✓ Records should be maintained for the daily activities signed by the concerned authorities in the organization.
- ✓ After completion of the training, the students should get the Completed Certificate and the Attendance Certificate from the company when she comes to the College.
- ✓ Any change of the organization during the course of the Training should be done only after getting the consent from the Head of the Department of the College in a written format
- ✓ The following are the components for Report Writing (60 Marks)

Content	40 Marks
Layout	10 Marks
Grammar	10 Marks

- ✓ For the Viva-Voce Examinations (Semester – 40 Marks)

Oral Presentation	30 Marks
Question and Answer	10 Marks



**SEMESTER – VI**  
**UCBAS20 – Legal Aspects of Business**

<b>Year:</b> <b>III</b> <b>Sem: VI</b>	<b>Course Code:</b> UCBAS20	<b>Title of the Course:</b> Legal Aspects of Business	<b>Course Type:</b> Theory	<b>Course Category:</b> Core	<b>H/W</b> 7	<b>Credits</b> 4	<b>Marks</b> 100
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**Objectives**

1. To learn the fundamental principles underlying in the law of contract, offer and acceptance
2. To develop an understanding of the free consent, discharge and breach of contract
3. To understand the concept of sale as a contract and its essential conditions
4. To inculcate the knowledge of formation of company
5. To acquire the knowledge on elements of Partnership, Registration and Reconstitution of the firm

**Course Outcomes (CO)**

The learners will be able to

1. Be thorough in the contractual relationships in business
2. Understand the Indian contract act, 1872 and discuss legal remedies in case of breach of a certain contract
3. Apply basic legal knowledge to business transaction especially in sale and resale agreement
4. Gain knowledge in the regulatory framework of companies in India
5. Acquire knowledge on partnership and registration of firms.

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

**H- High (3), M- Moderate (2), L- Low (1)**

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

**H- High (3), M- Moderate (2), L- Low (1)**

## **Course Syllabus**

### **UNIT I Indian Contract Act 1872**

**(18 Hours)**

- 1.1 : Law of contract - Offer and Acceptance (K1, K2)
- 1.2 : Consent, Consideration and capacity of contract (K1, K2, K3)
- 1.3: Free consent - Discharge of contract (K1, K2)
- 1.4 : Breach of contract (K1, K2)
- 1.5 : Void Agreements – Quasi Contract – Contract of Indemnity (K1, K2)
- 1.6: Contract of Guarantee – Kinds of Guarantee (K1, K2, K3, K4)

### **UNIT II Sale of goods act 1930**

**(18 Hours)**

- 2.1 : Definition of sale - Actual sale - Agreement to sell (K1, K2)
- 2.2 : Distinction between sale and agreement to sell - Conditions and warranties (K1, K2)
- 2.3: Doctrine of caveat emptor (K1, K2)
- 2.4 : Delivery of goods (K1, K2, K3, K4)
- 2.5 : Transfer of property - Transfer of title by non-owners (K1, K2)
- 2.6: Resale - Auction sale (K1, K2)

### **UNIT III The Companies Act 2013**

**(18 Hours)**

- 3.1: Company and its formation: Definition – Characteristics – Kinds (K1, K2, K3, K4)
- 3.2: Memorandum of Association - Articles of association (K1, K2, K3, K4)
- 3.3: Prospectus – Definition – Contents - Statement in lieu of prospectus (K1, K2)
- 3.4: Shares and Debentures - Definition and kinds (K1, K2)
- 3.5: Meetings - Classification of meetings (K1, K2)
- 3.6: Modes of winding up (K1, K2)
- 3.7: Dissolution of a company (K1, K2, K3, K4)

### **UNIT IV Indian Partnership Act 1932**

**(18 Hours)**

- 4.1: Definition - Elements of partnership - Classification of partnership (K1, K2, K3)
- 4.2: Partners and their liability (K1, K2, K3)
- 4.3: Registration of firms and effects for non-registration (K1, K2)
- 4.4: Reconstitution of the firm (K1, K2)
- 4.5: IPR (Intellectual Property Rights) – Patents – Filing of Patents (K1, K2)
- 4.6: Copyrights (K1, K2, K3)

### **UNIT V Law of Negotiable Instrument and Consumer Protection Act**

**(18 Hours)**

- 5.1: Negotiable Instruments – Promissory notes (K1, K2, K3)
- 5.2: Bill of Exchange - Cheques of Exchange (K1, K2, K3)
- 5.3: Cheques – Presentment (K1, K2, K3)
- 5.4: Dishonour – Crossing of Cheques (K1, K2, K3, K4)
- 5.5: Paying Banker – Rights of Consumers (K1, K2, K3)
- 5.6: Nature and scope of Complaints (K1, K2)
- 5.7 : Remedies available to consumers (K1, K2, K3)

**Text Books**

1. N. D. Kapoor, Business Law, Sultan Chand & Sons, New Delhi, 5<sup>th</sup> Edition, 2019
2. Saravanavel P and Sumathi S, Legal Systems in Business, Himalaya Publishing House, New Delhi, 7<sup>th</sup> Edition, 2013

**Reference Books**

1. M C Kuchhal, Business Law, Vikas Publications House, New Delhi, 7<sup>th</sup> Edition, 2018
2. Akhileshwar Pathak, Legal Aspects of Business, Tata McGraw Hill Education Private Limited, New Delhi, 7<sup>th</sup> Edition, 2018

**SEMESTER – VI****UEBAC20 – Total Quality Management**

<b>Year: III</b>	<b>Course Code:</b>	<b>Title of the Course:</b>	<b>Course Type:</b>	<b>Course Category:</b>	<b>H/W</b>	<b>Credits</b>	<b>Marks</b>
<b>Sem: VI</b>	UEBAC20	Total Quality Management	Theory	Elective	5	5	100

**Objectives**

1. To understand the concepts of total quality management
2. To acquire knowledge about the customers and to have continuous improvement
3. To analyze the supplier partnering and the performance measure for improvement
4. To create an awareness regarding quality challenges and benchmarking
5. To analyze critically the strategic issues in quality management and standardization

**Course Outcomes (CO)**

The learners will be able to

1. Evaluate the principles of quality management and to explain how these principles can be applied within quality management systems
2. Identify the key aspects of the quality improvement cycle and to select and use appropriate tools and techniques for controlling, improving and measuring quality
3. Critically appraise the organizational, communication and teamwork requirements for effective quality management
4. Know the concept of benchmarking and total productive maintenance in the organization
5. Identify key challenges in implementing TQM and maintain standardization

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

**H- High (3), M- Moderate (2), L- Low (1)**

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

**H- High (3), M- Moderate (2), L- Low (1)**

## **Course Syllabus**

### **UNIT I Introduction**

**(15 Hours)**

- 1.1 Definition of Quality – Need for quality - Dimensions of product and service quality – Quality planning (K1,K2)
- 1.2 Quality costs – Analysis techniques for quality costs - TQM - Introduction – Definition (K1,K2)
- 1.3 Principles of TQM (K1,K2)
- 1.4 Quality council – Quality Statements (K1,K2)
- 1.5 Deming Philosophy (K1,K2)
- 1.6 Barriers to TQM Implementation. (K1,K2)

### **UNIT II Customer Satisfaction**

**(15 Hours)**

- 2.1 Customer Satisfaction – Customer perception of quality (K1,K2)
- 2.2 Customer complaints, Service quality (K1,K2)
- 2.3 Customer retention, Employee involvement (K1,K2)
- 2.4 Continuous process improvement (K1,K2)
- 2.5 Juran Trilogy, PDCA Cycle (K1,K2,K3)
- 2.6 5S, Kaizen (K1,K2,K3)

### **UNIT III Supplier Partnering and Performance Measure**

**(15 Hours)**

- 3.1 Supplier Partnership – Partnering, Sourcing (K1,K2,K3)
- 3.2 Supplier selection, Supplier rating, Relationship development (K1,K2,K3)
- 3.3 Performance Measures – Basic concepts – Strategy (K1,K2,K3)
- 3.4 Performance measure - Process capability (K1,K2,K3)
- 3.5 Concept of six- sigma (K1,K2,K3)
- 3.6 Control charts (K1,K2,K3)

### **UNIT IV Benchmarking and Failure Mode and Effect Analysis (FMEA)**

**(15 Hours)**

- 4.1 Benchmarking – Reasons to Benchmark (K1,K2,K3)
- 4.2 Benchmarking process (K1,K2)
- 4.3 Quality Function Development (QFD) – House of Quality, QFD process – Benefits (K1,K2,K3)
- 4.4 Taguchi Quality Loss Function (K1,K2)
- 4.5 Total Productive Maintenance (TPM) – Concept - Improvement – Needs (K1,K2,K3)
- 4.6 FMEA – Stages of FMEA – Types (K1,K2)

### **UNIT V Standardization**

**(15 Hours)**

- 5.1 ISO - Origin – Introduction (K1,K2)
- 5.2 Need for ISO 9000 and other Quality Systems (K1, K2)
- 5.3 ISO 9000: 2000 Quality System – Elements (K1,K2)
- 5.4 Implementation of Quality System (K1,K2)
- 5.5 Documentation (K1)
- 5.6 Quality Auditing (K1)

## **Text Books**

1. Dale H. Besterfield, et al., Total Quality Management, Pearson Education, New Delhi, 3<sup>rd</sup> Edition Reprint, 2012.
2. V. Jayakumar, Total Quality Management, Lakshmi Publication, Chennai, 7<sup>th</sup> Edition, 2014.

## **Reference Books**

1. James R. Evans & William M. Lindsay, The Management and Control of Quality, South Western Cengage Learning, London, 8<sup>th</sup> Edition, 2011
2. Narayana V. & Sreenivasan N.S., Quality Management: Concept and Tasks, New Age International, Chennai, 4<sup>th</sup> Edition, 2012.

## SEMESTER – VI

### UEBAD20 – Entrepreneurial Development

<b>Year: III</b> <b>Sem: VI</b>	<b>Course Code:</b> UEBAD20	<b>Title of the Course:</b> Entrepreneurial Development	<b>Course Type:</b> Theory	<b>Course Category:</b> Elective	<b>H/W</b> 5	<b>Credits</b> 5	<b>Marks</b> 100
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#### Objectives

1. To develop entrepreneurial way of thinking
2. To understand to design the business plan for getting institutional support
3. To understand the different level of entrepreneur and their roles in the economy
4. To know the strategies for entering into new market to be successful in business
5. To nurture the entrepreneurial skills and help to identify the new business opportunity

#### Course Outcomes (CO)

The learners will be able to

1. Have the ability to discern entrepreneurial traits
2. Know the different entrepreneur and supporting institution and Write a business plan
3. Know the parameters to assess opportunities for new business ideas
4. Identify the various forms of entrepreneur and to correlate which form of business will suit their need
5. Understand the environment and to apply the strategies to enter into new market

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

H- High (3), M- Moderate (2), L- Low (1)

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

H- High (3), M- Moderate (2), L- Low (1)

## **Course Syllabus**

### **UNIT I: Introduction (15 Hours)**

- 1.1 Introduction – Definition- Understanding the meaning of entrepreneurship (K1)
- 1.2 Importance of entrepreneurship (K1, K2)
- 1.3 Characteristics of an entrepreneur (K1, K2)
- 1.4 Classification of the entrepreneurs (K1, K2)
- 1.5 Factors influencing entrepreneurship (K1, K2)
- 1.6 Role played by Government and non- government agencies (K1, K2)

### **UNIT II: Entrepreneurial growth, Project appraisal (15 Hours)**

- 2.1 Project Appraisal – Techniques (K1, K2)
- 2.2 Business plan - Content of business plan (K1, K2, K3)
- 2.3 EDP's (K, K2)
- 2.4 SIDBI (K1, K2)
- 2.5 DIC– MSME (K1, K2)
- 2.6 Industrial policy of Government of India (K1, K2)

### **UNIT III: Business Idea generation technique (15 Hours)**

- 3.1 Starting an enterprise (K1)
- 3.2 Business Generation Techniques (K1)
- 3.3 Marketing feasibility (K1)
- 3.4 Financial feasibility (K1)
- 3.5 Technical feasibility – Legal feasibility (K1)
- 3.6 Managerial and Location feasibility (K1)

### **UNIT IV: Forms of Entrepreneur (15 Hours)**

- 4.1 Rural entrepreneurs (K1, K2)
- 4.2 Small scale entrepreneurs (K1, K2)
- 4.3 Export entrepreneur-Export procedure (K1, K2, K3)
- 4.4 Family Business - Importance of family business - Responsibilities and rights of shareholders of a family business Pitfalls of the family business (K1, K2)
- 4.5 Women entrepreneurship – Meaning - Definition- Problems of women entrepreneur (K1, K2)
- 4.6 Prospects of women entrepreneur – Success stories of women entrepreneurs (K1, K2)

### **UNIT V: Entering the Market (15 Hours)**

- 5.1 Michael porter's five force model (K1, K2)
- 5.2 Acquisition (K1, K2, K3)
- 5.3 Joint ventures (K1, K2, K3)
- 5.4 Franchising (K1, K2, K3)
- 5.5 Licensing (K1, K2, K3)
- 5.6 Piggybacking (K1, K2)



## **Text Books**

1. Jayshree Suresh, Entrepreneurial Development, Margham Publication, Chennai, 5<sup>th</sup> Edition, 2012.
2. S S Khanka, Entrepreneurial Development, Sultan Chand & Sons, New Delhi, 5<sup>th</sup> Edition, 2013.

## **Reference Books**

1. Robert, Michael, Dean A. Shepherd, Entrepreneurship, Tata McGraw Hill, New Delhi, 10<sup>th</sup> Edition, 2017
2. Poornima M. Charantimath, Entrepreneurship Development: Small Business Enterprises, Pearson Education, New Delhi, 2<sup>nd</sup> Edition, 2013.

**SEMESTER – V/VI**

**USBAF520/USBAF620– Applications of GST**

<b>Year: III</b> <b>Sem: V/VI</b>	<b>Course Code:</b> USBAF520/ USBAF620	<b>Title of the Course:</b> Applications of GST	<b>Course Type:</b> Theory	<b>Course Category:</b> Skill Based Elective	<b>H/W</b> 2	<b>Credits</b> 2	<b>Marks</b> 100
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**Objectives**

1. To enable the students to learn the concepts of GST from the pre-GST period to post- GST period
2. To Attain knowledge in formalities and registration
3. To study the procedure of filing GST returns
4. To comprehend the principles of taxations, objectives of taxes and its impact, shifting and incidence process of indirect taxes in the market orientated economy
5. To understand the implications of GST on the taxable capacity consumers, dealers and of the society at large and its changes
6. To make them to be a tax consultant in preparing the tax planning, tax management, Payment of tax and filing of tax returns

**Course Outcomes (CO)**

The learners will be able to

1. Study the basic concepts of GST
2. Learn the registration of tax filling
3. Understand the GST returns
4. Learn the composition scheme
5. Know the input tax credit

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

**H- High (3), M- Moderate (2), L- Low (1)**

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

**H- High (3), M- Moderate (2), L- Low (1)**

## **Course Syllabus**

### **Unit I - Introduction to Goods and Services Tax (12 Hours)**

- 1.1 Introduction - Stages of Evolution of Goods and Services Tax (K1)
- 1.2 Methodology of GST (K1, K2, K3)
- 1.3 Constitutional background (K1, K2, K3)
- 1.4 Benefits of implementing GST (K1, K2, K3)
- 1.5 Structure of GST- Central Goods and Services Tax - State Goods and Services Tax (K1, K2, K3)
- 1.6 UTGST - Integrated Goods and Services Tax (K1, K2, K3)

### **Unit II: Levy, Tax Collection and Reverse Charge Mechanism (12 Hours)**

- 2.1 Levy and Collection of Tax (K1)
- 2.2 Rates of GST- Scope of Supply (K1, K2, K3)
- 2.3 Composite and Mixed Supplies (K1, K2, K3)
- 2.4 E-commerce under GST regime (K1, K2, K3)
- 2.5 Composition Scheme of Levy-Value of taxable supply (K1, K2, K3)
- 2.6 Interstate supply-Intra state supply (K1, K2, K3)

### **Unit III-Concept of time and place of supply & Import and Export (12 Hours)**

- 3.1 Time of supply (K1)
- 3.2 Place of supply (K1, K2, K3)
- 3.3 Significance (K1, K2, K3)
- 3.4 Time and place of supply in case of intra state supply (K1, K2, K3)
- 3.5 Interstate supply (K1, K2, K3)
- 3.6 Import and export of goods and services (K1, K2, K3)

### **Unit IV- Input Tax Credit & Payment of GST (12 Hours)**

- 4.1 Cascading Effect of Taxation- Benefits of Input Tax Credit (K1)
- 4.2 Computation - Input service distribution (K1, K2, K3)
- 4.3 Recovery of Credit -Reversal of credit-Utilization of Input tax credit (K1, K2, K3)
- 4.4 Cases in which input tax credit is not available (K1, K2, K3)
- 4.5 Tax Invoice - Unauthorized Collection of Tax - Credit Notes - Debit Notes (K1, K2, K3)
- 4.6 Electronic Cash Ledger - Electronic Credit Ledger - Electronic liability ledger (K1, K2, K3)

### **Unit V – Registration, Returns and Accounts and Assessment (12 Hours)**

- 5.1 Registration - Persons Liable for Registration (K1, K2, K3)
- 5.2 Compulsory Registration - Deemed Registration (K1, K2, K3)
- 5.3 Procedure For Registration - GSTIN (K1, K2, K3)
- 5.4 Amendment of Registration - Cancellation of Registration (K1, K2, K3)
- 5.5 Revocation of cancellation (K1, K2, K3)
- 5.6 Furnishing Details of Supplies - Returns - Accounts and Records (K1, K2, K3)

## **Text Books**

1. Goods and service taxes (GST) by Dr.M.C Mehotra and Prof.V.P.Agarwal - Sahitya Bhawanpublication, 5<sup>th</sup> Edition, 2019.
2. Goods and Services Tax (GST) in India B. Viswanathan, 1st Edition, 2016.

## **Reference Books**

1. GST Guidebook - ClearTax - Reckitt Benckinser



**SEMESTER V / VI****USCOD520/USCOD620 - CONSUMER GUIDE AND EMPOWERMENT**

Year/ Semester	Course Code	Title of the course	Course type	Course category	No. of Hours	Credits	Marks
III/V/VI	USCOD520/ USCOD620	Consumer Guide and Empowerment	Theory	Skill Based Elective	2	2	40+60

**Course Objectives**

- 1.To understand the advantages and limitation of the consumer movement and the right of consumer
- 2.To understand the role of the consumer guidance society of India
- 3.It get information about demerits or defects of products from consumer and suggests remedial measures
- 4.Students learn food safety and standards authority of India
5. Students will be able to appreciate the emerging questions and policy issues in consumer law for future research

**Course Learning Outcomes (CLO)**

- 1.Gain knowledge on Consumer Movement
2. Apprehend Knowledge on Right to Information act
- 3.Acquire Theoretical Knowledge Consumer Protection act
- 4.Know About FSSAI 2006 Act
- 5.Have In-Depth Knowledge on Certification Marks

**CO's consistency with PO'S**

CO	PO1	PO2	PO3	PO4	PO5	PO6
1	H	M	H	H	H	H
2	H	M	H	H	H	H
3	H	H	M	H	M	M
4	M	H	H	M	H	M
5	H	M	H	H	H	M

**(Low – L, Medium – M, High – H)****CO's consistency with PSO'S**

CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
1	H	M	H	H	H	H
2	H	M	H	H	H	H
3	H	H	M	H	M	M
4	M	H	H	M	H	M
5	H	M	H	H	H	M

**(Low – L, Medium – M, High – H)**

## **Course Syllabus**

### **Unit I: Consumer Awareness Movement (6 Hours)**

- 1.1 Consumer Awareness Movement (K<sub>1</sub>, K<sub>2</sub>)
- 1.2 Gandhiji's quote - Brief History (K<sub>1</sub>, K<sub>2</sub>)
- 1.3 Main features and Provision for Consumer Rights (K<sub>1</sub>, K<sub>2</sub>)
- 1.4 Responsibilities towards each Right (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>)
- 1.5 Critical Awareness (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>)
- 1.6 Environmental concern and United Nations Guidelines (K<sub>1</sub>, K<sub>2</sub>)

### **Unit II: Right to Information (6 Hours)**

- 2.1 Right to Information Act (K<sub>1</sub>, K<sub>2</sub>)
- 2.2 Public information Officer and Assistant (K<sub>1</sub>, K<sub>2</sub>)
- 2.3 Supply of Information to Associations (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>)
- 2.4 Time period for supply of Information (K<sub>1</sub>, K<sub>2</sub>)
- 2.5 Appeals and Complaints (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>)
- 2.6 Third party Information and Disclosure (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>)

### **Unit III: Consumer Protection Act 1986 (6 Hours)**

- 3.1 Consumer Protection Act 1986 (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>)
- 3.2 Preliminary (Introduction, commencement and application) (K<sub>1</sub>, K<sub>2</sub>)
- 3.3 Consumer Protection Council (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>)
- 3.4 Establishment, Composition, Jurisdiction, Complaint, Manner, Procedure on Receipt of Complaint finding, Appeal (K<sub>1</sub>, K<sub>2</sub>)
- 3.5 Finality of order -limitation Period (K<sub>1</sub>, K<sub>2</sub>)
- 3.6 Administrative control and Enforcement of Orders by the Redressal Agencies (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>)

### **Unit IV: FSSAI ACT 2006 (Food Safety and Standards) (6 Hours)**

- 4.1 FSSAI Act 2006 (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>)
- 4.2 Food safety and standards Authority of India (K<sub>1</sub>, K<sub>2</sub>)
- 4.3 General provisions as to Articles of Food (K<sub>1</sub>, K<sub>2</sub>)
- 4.4 Compliance steps of FBO (K<sub>1</sub>, K<sub>2</sub>)
- 4.5 Liability of the Manufacturers, Packers, Wholesalers, Distributors and Sellers  
Food Recall Procedures (K<sub>1</sub>, K<sub>2</sub>)
- 4.6 Offences and penalties, General Provisions relating to Penalty (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>)

### **Unit V: Certification Agencies - Certification Mark (6 Hours)**

- 5.1 Certification Agencies (K<sub>1</sub>, K<sub>2</sub>)
- 5.2 Certification Marks, BIS Hall Mark, AGMARK, ISI Mark, FPO Mark (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>)
- 5.3 Vegetarian and Non Vegetarian Mark, Geographical Indication Mark (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>)
- 5.4 Significance of Certification Mark (K<sub>1</sub>, K<sub>2</sub>)
- 5.5 Bureau of Indian Standards (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>)
- 5.6 Objectives and Activities (K<sub>1</sub>, K<sub>2</sub>)

**Text Books:**

- 1.E-books available in the FSSAI website like
- 2.Dart, Pink, Yellow and Orange books
3. Newsletters (quarterly publications) of State Consumer Knowledge Helpline Resource Management Portal (SCHKRMP)
- 4.“Nugarvor Kavasam” a publication by the Department of Civil Supplies and Consumer

**Web Resources:**

1. [www.consumer.tn.gov.in](http://www.consumer.tn.gov.in) – publications
2. [www.consumeradvice.in](http://www.consumeradvice.in) – publications



## SEMESTER I / II

### USCOA120/USCOA220 - CONSUMER AWARENESS

Year/ Semester I/II	Course Code USCOA120/ USCOA220	Title of the course Consumer Awareness	Course type Theory	Course category Skill Based Elective	No. of Hours 2	Credits 2	Marks 40+60
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#### Course Objectives

1. To create awareness among the students with regard to consumer movement.
2. To enable the students learn the rights of consumer.
3. To analyse the methods of handling grievances and its redressal measures.
4. To impart them the procedure for filing complaint.
5. To learn ways and means in safeguarding the rights of consumers.

#### Course Learning Outcomes(CLO)

1. Students gain an insight knowledge on consumer awareness movement and FSSAI 2006.
2. Students were familiarised with the rights of consumers.
3. Students gained thorough knowledge in handling grievances and its redressal measures.
4. Students were well versed in filing the complaints and appeals.
5. Students gained conceptual knowledge on the social responsibilities of the consumers.

#### COs consistency with POs

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
1	H	M	H	M	H	H
2	H	M	H	H	H	H
3	H	M	H	H	M	H
4	H	H	H	H	M	H
5	H	H	H	H	H	H

Low – L, Medium – M, High - H

#### COs consistency with PSOs

CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
1	M	H	L	M	M	M
2	H	H	M	L	H	M
3	H	M	M	M	M	M
4	H	M	M	M	H	H
5	M	M	M	H	H	M

Low – L, Medium – M, High - H

## **Course Syllabus**

### **Unit I: Consumer protection Act**

**(6 Hours)**

- 1.1 Gandhi's Quote - Brief History (K<sub>1</sub>,K<sub>2</sub>)
- 1.2 Consumer Protection Act, 1986 (K<sub>1</sub>,K<sub>2</sub>)
- 1.3 Rights of Consumer (K<sub>1</sub>,K<sub>2</sub>)
- 1.4 United Nations Guidelines (K<sub>1</sub>,K<sub>2</sub>)
- 1.5 Responsibility of consumers (K<sub>1</sub>,K<sub>2</sub>)
- 1.6 Standard Certification Marks (K<sub>1</sub>,K<sub>2</sub>)

### **Unit II: Right to Information Act**

**(6 Hours)**

- 2.1 Meaning of Brand name, label, Package & Trade Mark (K<sub>1</sub>,K<sub>2</sub>)
- 2.2 Advertisements, print and Electronic Media (K<sub>1</sub>,K<sub>2</sub>)
- 2.3 Official records and citizen charter (K<sub>1</sub>,K<sub>2</sub>)
- 2.4 Meaning of right to Choose (K<sub>1</sub>,K<sub>2</sub>)
- 2.5 Platforms for consumer representation (K<sub>1</sub>,K<sub>2</sub>)
- 2.6 Consumer Protection Councils (K<sub>1</sub>,K<sub>2</sub>)

### **Unit III: Right to Redressal – I**

**(6 Hours)**

- 3.1 Types of Grievances (K<sub>1</sub>,K<sub>2</sub>)
- 3.2 Remedies available under the Consumer Protection (K<sub>1</sub>,K<sub>2</sub>)
- 3.3 Restrictive Trade Practice Act, 1986 (K<sub>1</sub>,K<sub>2</sub>)
- 3.4 Unfair Trade Practice (K<sub>1</sub>,K<sub>2</sub>)
- 3.5 Pre-packed goods and unfair trade practices (K<sub>1</sub>,K<sub>2</sub>)
- 3.6 Advertising Standards Council of India (K<sub>1</sub>,K<sub>2</sub>)

### **Unit IV: Right to Redressal – II**

**(6 Hours)**

- 4.1 Definitions; goods, services, Consumer of Goods, consumer of Services, Complaint, complainant, consumer dispute, defect, deficiency, Appropriate laboratory, manufacturer (K<sub>1</sub>,K<sub>2</sub>)
- 4.2 Filing a complaint (K<sub>1</sub>,K<sub>2</sub>)
- 4.3 Procedure on receipt of complaint (K<sub>1</sub>,K<sub>2</sub>, K<sub>3</sub>)
- 4.4 Appeals (K<sub>1</sub>,K<sub>2</sub>,K<sub>3</sub>)
- 4.5 District Forum, State Commission and National Commission (K<sub>1</sub>,K<sub>2</sub>)
- 4.6 Composition, Appointment, Term of office (K<sub>1</sub>,K<sub>2</sub>)

### **Unit V: Consumer Responsibilities and Case laws and other tips**

**(6 Hours)**

- 5.1 Responsibilities (K<sub>1</sub>, K<sub>2</sub>)
- 5.2 Critical Awareness – Social Responsibility (K<sub>1</sub>, K<sub>2</sub>)
- 5.3 Environmental Awareness (K<sub>1</sub>, K<sub>2</sub>)
- 5.4 Solidarity (K<sub>1</sub>, K<sub>2</sub>)
- 5.5 Responsibilities in association with all the Rights (K<sub>1</sub>, K<sub>2</sub>)
- 5.6 Leading Case Laws (K<sub>1</sub>, K<sub>2</sub>)

### **Reference Book:**

1. E-books available in the FSSAI website like Dart, Pink, Yellow and Orange books
2. Newsletters (quarterly publications) of State Consumer Knowledge Helpline Knowledge Resource Management Portal (SCHKRMP)

3. "Nugarvor Kavasam" a publication by the Department of Civil Supplies and Consumer

**Web Resources:**

[www.consumer.tn.gov.in](http://www.consumer.tn.gov.in)

[www.consumeradvice.in](http://www.consumeradvice.in)

## SEMESTER IV

### UCCOK20 - MARKETING

Year/ Semester II/IV	Course Code UCCOK20	Title of the course Marketing	Course type Theory	Course category Core	No. of Hours 5	Credits 5	Marks 40+60

#### Course Outcomes:

1. To identify, understand and satisfy the needs of customers and markets.
2. To provide knowledge on various marketing functions.
3. To analyse consumer behaviour and decision making process.
4. This course enables the students to understand marketing mix elements.
5. To understand the dynamics of marketing and to know about latest trends in marketing.

#### Course Learning Outcomes(CLO):

The learners will able to:

1. Classify the various marketing activities and to summarize consumer behavior and decision making process.
2. Evaluate the strategies used by the marketers to sustain a product for longer period.
3. Familiarise the factors influencing pricing decisions.
4. Acquire knowledge on various promotional mix used by marketers to promote goods and services.
5. Understand the various methods of channels of distribution and familiarize with latest Technologies.

#### COs consistency with POs

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
1	H	H	H	H	H	H
2	H	H	H	H	H	H
3	H	H	H	H	H	H
4	H	H	H	H	H	H
5	H	H	H	H	H	H

(Low – L, Medium – M, High – H)

#### COs consistency with PSOs

CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
1	H	M	L	L	M	M
2	H	H	M	H	H	M
3	H	M	M	M	M	M
4	H	M	M	M	H	H
5	M	M	M	H	H	M

Low – L, Medium – M, High - H

## **Course Syllabus**

### **Unit I: Introduction**

**(15 Hours)**

- 1.1 Market, Meaning, Types, Marketing, Meaning, Definition (K<sub>1</sub>, K<sub>2</sub>)
- 1.2 Functions of Marketing, Role and Importance (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)
- 1.3 Marketing Mix, Classification of Goods (K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)
- 1.4 Market Segmentation (K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)
- 1.5 Consumer Behaviour, Meaning and Importance (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)
- 1.6 Services Marketing, Difference between Product and Service, 7Ps of Service Marketing (K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)

### **Unit II: Product Mix**

**(15 Hours)**

- 2.1 Product, Meaning, Importance and Features (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>)
- 2.2 New Product Planning and Development, Types (K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)
- 2.3 Product Mix, Product Life Cycle (K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)
- 2.4 Branding, Brand Loyalty and Equity (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)
- 2.5 Copyrights, Trademarks and Patents (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)
- 2.6 Packing. (K<sub>3</sub>, K<sub>4</sub>)

### **Unit III: Price Mix**

**(15 Hours)**

- 3.1 Pricing, Meaning, Definitions, Objectives (K<sub>1</sub>, K<sub>2</sub>, K<sub>4</sub>)
- 3.2 Types of Pricing (K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)
- 3.3 Methods of Pricing (K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)
- 3.4 Pricing Strategies (K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)
- 3.5 Factors affecting pricing (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)
- 3.6 Pricing in Product Life Cycle. (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)

### **Unit IV: Promotion Mix**

**(15 Hours)**

- 4.1 Promotion, Meaning, Need (K<sub>1</sub>, K<sub>2</sub>)
- 4.2 Promotion Mix, Meaning (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)
- 4.3 Types of promotional mixes (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)
- 4.4 Promotional mixes, strategies, Forms (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)
- 4.5 Advantages, Limitations (K<sub>1</sub>, K<sub>2</sub>)
- 4.6 Promotions in Product Life Cycle. (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)

### **Unit V: Channels of distribution and Electronic Marketing**

**(15 Hours)**

- 5.1 Channels of Distribution I, Meaning, Definition, Types (K<sub>1</sub>, K<sub>2</sub>)
- 5.2 Market consideration, Logistic Management. (K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)
- 5.3 Channels of Distribution II, Middlemen in Distribution, Agent Middlemen and Merchant Middlemen (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>)
- 5.4 Wholesalers and Retailers, Recent Trends in Marketing (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)
- 5.5 Tele-Marketing, Relationship Marketing, Word of Mouth Marketing, Test Marketing (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>)
- 5.6 E-Marketing, Meaning, Types, Participants in E-Marketing, Crisis Marketing Techniques during the Pandemic period (K<sub>1</sub>, K<sub>3</sub>, K<sub>4</sub>)

### **Text Books:**

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

Delhi,2015

2. Natatrajan L. – Marketing – Margham Publications, Chennai.(latest Edition)

**Reference Books:**

- 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, Reprint2012
5. Jayachandran S. – Marketing Management – SAI Book House, Hyderabad, Edition2018

**Web Resources:**

1. Content Marketing Institute
2. Marketing Profs
3. American Marketing Association
4. eMarketer
5. Direct Marketing News
6. <https://www.sitepoint.com>
7. <http://www.ethinos.com>

**SEMESTER – I**  
**UCBCA20 - BIOORGANIC CHEMISTRY**

<b>Year/ Sem</b> I	<b>Course Code</b> UCBCA20	<b>Title of the Course</b> Bioorganic Chemistry	<b>Course Type</b> Theory	<b>Course Category</b> Core	<b>H/W</b> 6	<b>Credits</b> 5	<b>Marks</b> <b>100</b> 40+60=100
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**Objectives:**

To provide a clear note on the bioorganic compounds.

**Course Outcomes (CO)**

On completion of the course, the students will be able to;

1. Outline the structure, properties and biological importance of carbohydrates.
2. Classify the structure and functions of amino acids along with proteins.
3. Build an idea about the role of lipids in the living system.
4. Assess the structural features of genetic material.
5. Explain the crucial role of vitamins and minerals for maintaining healthy life.

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	M	L	L	L	H
CO 2	H	M	M	M	H	M
CO 3	H	H	H	M	M	M
CO 4	H	M	H	M	H	H
CO 5	H	M	H	M	M	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	M	L	M	H
CO 2	H	M	M	M	H	M
CO 3	H	H	H	M	M	M
CO 4	H	M	H	M	H	L
CO 5	H	M	H	M	M	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit I:**

**(18 hours)**

- 1.1 Carbohydrates: Occurrence and Structure of Carbohydrates (K1, K2, K3)
- 1.2 Classification of Carbohydrates (K1, K2, K3)
- 1.3 Physical and chemical properties of Glucose and Fructose (Oxidation, Reduction and Phenylhydrazine reaction), Isomerism of monosaccharides (K1, K2, K3, K4)
- 1.4 Biological importance of Monosaccharides (Glucose and Fructose) (K1, K2, K3, K4)
- 1.5 Disaccharides (Maltose, Lactose, Sucrose) (K1, K2, K3)
- 1.6 Polysaccharides (Starch, Glycogen, Cellulose) and Mucopolysaccharides. (K1, K2, K3)

**Unit II: (18 hours)**

- 2.1 Amino Acids: Structure of naturally occurring and non-protein amino acids (K1, K2, K3, K4)
- 2.2 Classification of amino acids based on structure, number of amino and carboxylic groups, nutrition and polarity of side chain (K1, K2, K3, K4)
- 2.3 Physical properties - Chemical properties - Structure of Peptide bond (K1, K2, K3)
- 2.4 Classification of proteins - Primary Structure - Secondary structure- Tertiary structure - Quaternary structure - Various forces stabilizing the structures (K1, K2, K3, K4)
- 2.5 Biologically important peptides - Glutathione (K1, K2, K3)
- 2.6 Biologically important peptide hormones- Insulin, Vasopressin, Oxytocin (Structure and functions). (K1, K2, K3)

**Unit III: (18 hours)**

- 3.1 Lipids- Structure of fatty acids and Classification of fatty acids (K1, K2, K3, K4)
- 3.2 Functions of lipids and fatty acids (K1, K2, K3)
- 3.3 Classification of lipids: Simple, Compound lipids, Derived lipids (K1, K2, K3, K4)
- 3.4 Sterols (Cholesterol, Ergosterol - structure and functions) (K1, K2, K3, K4)
- 3.5 Characteristics of lipids - Iodine number, acid number, Saponification number, Reichert - Meissl number (K1, K2, K3)
- 3.6 Properties of lipids- Physical and Chemical properties. (K1, K2, K3)

**Unit IV: (18 hours)**

- 4.1 Nucleic Acids: Structure of Purine and Pyrimidines (K1, K2, K3)
- 4.2 Nucleosides and Nucleotides (K1, K2, K3, K4)
- 4.3 Structure and forms of DNA (A, B, Z) (K1, K2, K3)
- 4.4 Properties-Denaturation, T<sub>m</sub>, Hypo and Hyperchromicity, Cot value (K1, K2, K3, K4)
- 4.5 Renaturation, Hybridization (K1, K2, K3, K4)
- 4.6 Structure and types of RNA - rRNA, tRNA, mRNA and SnRNA- Functions of RNA. (K1, K2, K3, K4)

**Unit V: (18 hours)**

- 5.1 Vitamins: Classification of vitamins (K1, K2, K3, K4)
- 5.2 Fat soluble vitamins- Sources, RDA, Biochemical functions and Deficiency diseases (A, D, E, K) (K1, K2, K3)
- 5.3 Water soluble vitamin B-complex (vitamin B<sub>1</sub>, B<sub>2</sub>, B<sub>5</sub>, B<sub>6</sub> and B<sub>12</sub>) (Structure notrequired) (K1, K2, K4)
- 5.4 Water soluble vitamin non-B complex (vitamin C) (K1, K2, K3)
- 5.5 Minerals: Iron, Calcium, Sodium, Potassium (K1, K2, K3)
- 5.6 Microelements: Copper, Iodine and Zinc. (K1, K2, K3)

[Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyse]

**Text Books:**



1. Satyanarayana U - Textbook of Biochemistry - Books and Allied Pvt Ltd, 2<sup>nd</sup> edition, 2005
2. Martin David W, Harper, Harold A - Harper's review of Biochemistry- 31<sup>st</sup>edition, 2018

**Reference Book:**

1. West, Todd, Mason, Vanbruggen - Textbook of Biochemistry. - Oxford Publishers, - 4<sup>th</sup>edition, 2000.
2. Chatterjea M N - Textbook of Medical Biochemistry. R S Jaypee Publications, 7<sup>th</sup> edition, 2007.
3. Lehninger D Nelson and Cox - Principles of Biochemistry. WH Freeman and Company Ltd, 4<sup>th</sup> edition, 2005.
4. Gurdeep Chatwal - Organic Chemistry of Natural Products. Himalaya Publishing House, Vol I, 2<sup>nd</sup> edition, 2003.
5. Donald Voet and Judith G Voet – Biochemistry. VP and Publisher Kaye Pace Associate Publisher, 4<sup>th</sup> edition, 2011.

**Open Educational Resources (OER):**

1. <https://youtu.be/JxK5rZxbyQY>
2. <https://youtu.be/NfMZLk-8r34>
3. <https://youtu.be/GVWBcEv1bgk>
4. <https://youtu.be/0lZRAShqft0>
5. [https://youtu.be/qmUtK\\_Rf7iY](https://youtu.be/qmUtK_Rf7iY)

**SEMESTER I & II**  
**UCBCC20 MAIN PRACTICAL – I**

<b>Year: I</b> <b>Sem: I/II</b>	<b>Course Code:</b> UCBCC20	<b>Title of the Course:</b> Main Practical - I	<b>Course Type:</b> Practical	<b>Course Category</b> : Core	<b>H/W</b> 4	<b>Credits</b> 4	<b>Marks</b> 100
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**Objective:**

To provide a wide practical knowledge on Qualitative and Quantitative Analysis.

**Course Outcomes (CO):**

On the completion of the course, the students will be able to;

1. Apply the safety rules in the laboratory
2. Use the measuring technique to weigh the compounds
3. Analyses quantitatively the biomolecules and mineral components
4. Identify the carbohydrate and amino acids qualitatively
5. Explain the idea on the cell division process

<b>CO / PO</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>
<b>CO 1</b>	H	H	H	M	H	H
<b>CO 2</b>	H	H	H	H	H	H
<b>CO 3</b>	H	H	H	H	H	H
<b>CO 4</b>	H	H	H	M	H	H
<b>CO 5</b>	H	H	H	M	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO 1</b>	H	H	H	M	M	H
<b>CO 2</b>	H	H	H	H	L	H
<b>CO 3</b>	H	M	H	H	M	H
<b>CO 4</b>	H	H	H	M	H	M
<b>CO 5</b>	H	H	H	M	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**1. Safety Measures In The Laboratory-I**

**2. Balance**

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

**3. Volumetric Analysis**

1. Estimation of Glucose by Benedict's 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

#### **4. Qualitative Analysis**

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

#### **5. 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, CBS Publishers 6<sup>th</sup> edition, 2002
3. David T Plummer - Practical Biochemistry. McGraw Hill Publishers, 3<sup>rd</sup> edition, 2005
4. Sawhney SK and Randhir Singh - Introductory Practical Biochemistry. Narosa Publishers, 2<sup>nd</sup> edition - 2001
5. Sadhana Sharma and Reema Sharma - Practical Manual of Biochemistry. Medtec publication, 1<sup>st</sup> edition, 2016

**SEMESTER – II**  
**UCBCB20 CELL BIOLOGY**

Year/ Sem I/ II	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks 100 40+60=100
	UCBCB20	Cell Biology	Theory	Core	6	5	

**Objective:**

To provide a deep knowledge about cell – the basic unit of life.

**Course Outcomes (CO)**

On completion of the course, the students will be able to;

1. Describe cell as the basic unit of life, its structural organization and cytoskeleton
2. Develop knowledge about the functions of various subcellular organelles
3. Identify the type of cell division processes and its significance
4. Recall on the components of cell membrane and its role in maintaining cell function
5. Examine clearly about the mechanism of transport across the membrane

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	M	M	M	L	M
CO 2	H	H	M	M	L	H
CO 3	H	H	H	H	M	L
CO 4	H	H	H	M	M	M
CO 5	H	H	H	H	M	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	M	M	L	L	H
CO 2	H	M	M	M	L	M
CO 3	H	H	H	L	M	M
CO 4	H	M	H	M	H	H
CO 5	H	M	H	M	M	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit I:**

**(18 hours)**

- 1.1 An overall view of cells- origin-evolution of cells- Cell theory (K1, K2, K3)
- 1.2 Cell organization: Types of cell - Structural organization of Prokaryotic (*E.coli*) and Eukaryotic cells (Animal and plant cell) (K1, K2, K3, K4)
- 1.3 Comparison between plant cell and animal cell structure (K1, K2, K3, K4)
- 1.4 Virus cell structure: T4 Bacteriophage, Corona virus (K1, K2, K3)
- 1.5 An overview of molecular organization of cells - Microfilaments (Actin and Intermediary filament), Microtubules, Centrioles, Basal bodies, Cilia, flagella (K1, K2, K3)
- 1.6 Structure and function of TMV (Tobacco Mosaic Virus). (K1, K2, K3)

**Unit II:**

**(18 hours)**

- 2.1 Components and functions of Organelles: Structure and functions of Mitochondria (K1,K2, K3, K4)

- 2.2 Endoplasmic reticulum- Rough and Smooth endoplasmic reticulum (K1, K2, K3, K4)
- 2.3 Structure and functions of Ribosomes (K1, K2, K3)
- 2.4 Structure and functions of Golgi apparatus (K1, K2, K3)
- 2.5 Structure and functions of Lysosomes – Chloroplast (K1, K2, K3)
- 2.6 Structure and functions of Peroxisomes and Glyoxysomes (K1, K2, K3)

**Unit III: (18 hours)**

- 3.1 Nucleus: Nuclear membrane, nucleolus, nuclear pore and annulus (K1, K2, K3)
- 3.2 Structure of chromosomes (K1, K2, K3, K4)
- 3.3 Functions of chromosomes (K1, K2, K3, K4)
- 3.4 Materials of chromosomes (K1, K2, K3, K4)
- 3.5 Cell cycle – Overview - Cell Division - Mitosis (K1, K2, K3, K4)
- 3.6 Cell Division- Meiosis I & II. (K1, K2, K3, K4)

**Unit IV: (18 hours)**

- 4.1 Cell membrane: Molecular organization of animal cell membrane (K1, K2, K3, K4)
- 4.2 Membrane lipids, proteins and carbohydrates (K1, K2, K3, K4)
- 4.3 The Fluid Mosaic Model and artificial membranes (K1, K2, K3, K4)
- 4.4 Structure of Mitochondrial membrane (K1, K2, K3)
- 4.5 Structure of Red cell membrane (K1, K2, K3)
- 4.6 Cell wall: Components and role of cell wall. (K1, K2, K3)

**Unit V: (18 hours)**

- 5.1 Membrane functions: Cell permeability, Ion selective channels (Uniport, Antiport, Symport with example) and carriers (K1, K2, K3, K4)
- 5.2 Transport processes, Diffusion, Facilitated diffusion (K1, K2, K3, K4)
- 5.3 Active transport proteins (Na<sup>+</sup>-K<sup>+</sup> ATPase), Ionophores (K1, K2, K3)
- 5.4 Types of cell junctions: Gap junction and tight junctions (K1, K2)
- 5.5 Cell-Cell communication (Belt and Spot desmosomes) (K1, K2, K3)
- 5.6 Cell adhesion proteins: Integrin, Cadherin and selectin. (K1, K2, K3)

**[Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze]**

**Text Books:**

- 1. Powar CB - Cell Biology - Himalaya Publishing House, 2010
- 2. Arumugam N - Cell Biology - Saras Publication, 2014

**Reference Books:**

- 1. Dalela A Verma - Text book of Cytology- Jai Prakash Nath and Co, 2000
- 2. De Robertis - Cell and Molecular Biology. Lippincott Williams, 8<sup>th</sup> edition -, 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. Academic Internet Publishers. 9<sup>th</sup> edition, 2016
- 5. Harvey Lodish. Molecular Cell Biology. WH Freeman, 8<sup>th</sup> edition, 2016

**Open Educational Resources (OER):**

- 2. <https://youtu.be/7X2a2Vwboek>
- 3. <https://youtu.be/1Z9pqST72is>
- 4. <https://youtu.be/DwAFZb8juMQ>
- 5. <https://youtu.be/LXaPt9i9hqk>
- 6. <https://youtu.be/Ptmlvtei8hw>

**SEMESTER III**  
**UCBCD20 - BIOCHEMICAL TECHNIQUES**

Year/ Sem II / III	Course Code UCBCD20	Title of the Course Biochemical Techniques	Course Type Theory	Course Category Core	H/W 7	Credits 5	Marks 40+60=100
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**Objective:**

To study about the principles and applications of biochemical techniques.

**Course Outcomes (CO)**

On completion of the course, the students will be able to;

1. Develop the ability to apply the principles of biochemical techniques
2. Compare the difference between various methods of chromatography
3. Explain how electrophoresis and centrifugation facilitates the separation of molecules
4. Analyse certain functionalities of bio molecules by using spectroscopic techniques
5. Compare natural and artificial radiation source and its importance

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	H	H	H	M
CO 2	H	H	H	H	M	M
CO 3	H	H	H	H	M	M
CO 4	H	H	H	H	M	M
CO 5	H	H	H	H	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	H	H	H	M
CO 2	H	H	H	H	M	M
CO 3	H	H	H	H	M	M
CO 4	H	H	H	H	M	M
CO 5	H	H	H	H	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit I:**

**(15 hours)**

- 1.1 Expression of the concentration of solutes in solutions: Normality, Molarity, Molality, Mass concentration- Osmole- Acids, Bases, Buffers and pH (Definition and examples) (K1, K2, K3, K4)
- 1.2 Buffer system of the body – Henderson equation - Osmosis, Isotonic- Hypo and

- Hypertonic, Osmotic Pressure (VantHoff's Law) (K1, K2, K3, K4)
- 1.3 Surface tension and Viscosity: Biological importance (K1, K2, K3, K4)
- 1.4 pH Electrode (Hydrogen and Glass): Instrumentation, operation and application.(K1, K2, K3, K4)
- 1.5 Clark Oxygen Electrode: Instrumentation, operation and application. (K1, K2, K3, K4)
- 1.6 Colloids: Definition - Types and Application (K1, K2, K3)

**Unit II: (15 hours)**

- 2.1 Chromatography – General Principles- Paper and TLC: Principle, instrumentation, operation and applications. (K1, K2, K3, K4)
- 2.2 Affinity chromatography: Principle, instrumentation, operation and applications. (K1, K2, K3, K4)
- 2.3 Ion-exchange chromatography: Principle, instrumentation, operation and applications. (K1, K2, K3, K4)
- 2.4 Molecular sieve chromatography: Principle, instrumentation, operation and applications. (K1, K2, K3, K4)
- 2.5 Gas chromatography: Principle, instrumentation, operation and applications (K1, K2, K3, K4)
- 2.6 HPLC: Principle, instrumentation, operation and applications. (K1, K2, K3, K4)

**Unit III: (15 hours)**

- 3.1 Electrophoresis- General Principles -Factors affecting electrophoretic mobility - Paper, Agarose and Starch Electrophoresis: Principle, instrumentation, operation and applications. (K1, K2, K3, K4)
- 3.2 SDS-PAGE: Principle, instrumentation, operation and applications. (K1, K2, K3, K4)
- 3.3 Isoelectric focusing and Capillary electrophoresis: Principle, instrumentation, operation and applications. (K1, K2, K3, K4)
- 3.4 Centrifugation: Svedberg unit- Basic principle of centrifugation. (K1, K2)
- 3.5 Types of Centrifuges and Rotors (K1, K2)
- 3.6 Preparative and Analytical Ultra Centrifuges: Instrumentations and applications (Cell fractionation) (K1, K2, K3, K4)

**Unit IV: (15 hours)**

- 4.1 Spectroscopy: Fundamental principles of spectroscopy - Basic laws of absorption - Beer-Lambert's law - Principle and applications of Colorimetry (K1, K2, K3)
- 4.2 Ultra violet – Visible (UV-VIS) Spectrophotometry: Principle, instrumentation, operation and applications (K1, K2, K3, K4)
- 4.3 Infra-Red (IR) Spectrophotometry: Principle, instrumentation, operation and applications (K1, K2, K3, K4)
- 4.4 Fluorimetry: Principle, instrumentation, operation and applications. (K1, K2, K3, K4)
- 4.5 Atomic absorption spectrometry (AAS): Principle, instrumentation, operation and applications. (K1, K2, K3, K4)

4.6 Flame Emission Spectroscopy (FES): Principle, instrumentation, operation and applications. (K1, K2, K3, K4)

**Unit V : ( 15 hours)**

5.1 Radio isotopic Techniques: Radioisotopes- Stable and Unstable, Units of Radioactivity, Types of Radioactivity (K1, K2, K3, K4)

5.2 Detection and measurement of radioactivity: Based on Gas ionization (K1, K2, K3, K4)

5.3 Detection and measurement of radioactivity: Based on Autoradiography (K1, K2, K3, K4)

5.4 Detection and measurement of radioactivity(Method based on excitation)(K1, K2, K3, K4)

5.5 Application of radioisotopes in biological science: (Isotope dilution technique, metabolic studies, radio dating) (K1, K2, K3)

5.6 Radiation hazards and safety aspects (K1, K2, K3)

[Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyse]

**Text Books:**

1. Keith Wilson and John Walker - Principles and Techniques of Practical biochemistry - 5<sup>th</sup> edition - Cambridge University, 2005
2. Upadhyay, Upadhyay and Nath - Biophysical Chemistry: Principles and Techniques - 2<sup>nd</sup> edition - 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 edition - McGraw Hill College
3. Robert D Braun - Introduction to Instrumental Analysis - Pharma Book Syndicate, 2006
4. David Freifelder - Physical Biochemistry - 2nd edition - WH Freeman
5. Shawney SK and Randhir Singh - Practical Biochemistry - 2nd edition - Alpha Science, 2005

**OPEN EDUCATIONAL RESOURCES (OER):**

1. <https://youtu.be/y7zbmlEaPAs>
2. <https://youtu.be/eCj0cRtJvJg>
3. [https://youtu.be/i\\_6y6Z5UvwE](https://youtu.be/i_6y6Z5UvwE)
4. <https://youtu.be/A9wmCsMiy70>
5. <https://youtu.be/QPHo5lFWgT0>
6. <https://youtu.be/VTHQYjkCqV0>
7. <https://youtu.be/A8EEH5Fyc8k>



## SEMESTER IV

### UCBCE20 – PHYSIOLOGY AND NUTRITION

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II / IV	UCBCE20	Physiology and Nutrition	Theory	Core	5	5	40+60=100

**Objectives:** To understand the homeostatic mechanism of each organ.

#### Course Outcomes (CO)

On completion of the course, the students will be able to;

1. Outline the mechanism of breathing and the circulatory system
2. Describe the basic components and functions of the digestive system
3. Compile the functions of the urinary system and the physiology of muscle
4. Explain the central and peripheral nervous system organization
5. Identify the nutrients in food and their functions in maintaining health

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	M	H	L	M	M
CO 2	H	M	H	L	M	M
CO 3	H	M	H	L	M	M
CO 4	H	M	H	L	M	M
CO 5	H	H	H	M	M	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	M	H	L	M	M
CO 2	H	M	H	L	M	M
CO 3	H	M	H	L	M	M
CO 4	H	M	H	L	M	M
CO 5	H	H	H	M	M	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

#### Unit I:

(15 hours)

1.1 Respiratory system: Overview of respiratory system (K1, K2)

1.2 Exchange of Gases (K1, K2)

1.3 Circulation: Blood composition and Functions - Types of Blood cells –  
Morphology and Function (K1, K2)

- 1.4 ABO Blood Groups - Blood Coagulation (K1, K2)
- 1.5 Structure of Heart and Blood vessels (K1, K2)
- 1.6 Cardiac cycles - Blood pressure (Diastolic, Systolic and Normal Blood pressure) Normal ECG curve (K1, K2, K3)

**Unit II: (15 hours)**

- 2.1 Digestive System: Structure and function of different components of digestive system (K1, K2)
- 2.2 Carbohydrates: Digestion, Absorption and Nutritional significance (K1, K2, K3)
- 2.3 Lipids: Digestion, Absorption and Nutritional significance (K1, K2, K3)
- 2.4 Proteins: Digestion, Absorption and Nutritional significance (K1, K2, K3)
- 2.5 Role of Bile salts in Digestion and Absorption (K1, K2, K3)
- 2.6 Mechanism of HCl and Gastric juice formation in stomach (K1, K2, K3)

**Unit III: (15 hours)**

- 3.1 Excretory System: Structure of Kidney and Nephron - Composition of Urine (K1, K2)
- 3.2 Formation of Urine – Filtration, Active and passive transport of various substances and Secretion. (K1, K2, K3)
- 3.3 Muscle: Types of Muscle - Structure of Skeletal Muscle (K1, K2)
- 3.4 Mechanism of Muscle Contraction (K1, K2, K3)
- 3.5 Male reproductive system (K1, K2)
- 3.6 Female reproductive system (K1, K2)

**Unit IV: (15 hours)**

- 4.1 Nervous System: Brief outline of Nervous system – Nerve fibres (K1, K2)
- 4.2 Structure of Brain and Spinal Cord (K1, K2)
- 4.3 Synapses – Nerve Impulse – Action potential, Membrane potential, Types and Mechanism – Neurotransmitters (K1, K2, K3)
- 4.4 Composition and functions of CSF and Lymph (K1, K2, K3)
- 4.5 Eye: Structure and functions (K1, K2, K3)
- 4.6 Ear: Structure and functions (K1, K2, K3)

**Unit V: (15 hours)**

- 5.1 Nutrition: Nutrients - Balanced diet –Nutritional status - Food groups (K1, K2, K3)
- 5.2 Calorific value of food- Bomb calorimeter (K1, K2, K3, K4)
- 5.3 RQ: Definition and Measurement (K1, K2, K3, K4)

5.4 SDA: Definition and Measurement (K1, K2, K3, K4)

5.5 BMR: Definition and Measurement (K1, K2, K3, K4)

5.6 Adverse effects of Fast foods -Brief outline on the common adulterants in food (K1, K2)

[Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze]

**Text Books:**

1. Ross, Wilson – Anatomy and Physiology in Health and illness – 13<sup>th</sup> edition – Elsevier, 2018
2. Swaminathan MS – Principles of Nutrition – Bappco publishers,2010

**Reference Books:**

1. Ganong – Review of Medical Physiology- 25<sup>th</sup> Edition – McGraw – Hill Education,2016
2. Davidson and Passmore – Human Nutrition and Dietetics – 8<sup>th</sup> edition – Churchill Livingstone
3. Skilis ME and Young VR – Modern Nutrition and Health Diseases, 2004
4. Chatterjee CC – Human Physiology- 11<sup>th</sup> edition - CBS publishers, 2019
5. Guyton and Hall – Textbook of Medical Physiology – 13<sup>th</sup> edition – 2016 Elsevier

**Open Educational Resources (OER)**

1. <https://youtu.be/XOGn4IKjcl8>
2. <https://youtu.be/kacMYexDgHg>
3. [https://youtu.be/\\_qmNCJxpsr0](https://youtu.be/_qmNCJxpsr0)
4. <https://www.youtube.com/watch?v=Og5xAdC8EUI>
5. <https://youtu.be/zVzgswdRRHA>
6. <https://www.youtube.com/watch?v=ousflrOzQHc>
7. <https://youtu.be/R5myMWxKD4k>
8. <https://youtu.be/YdlTLuweXv8>

**SEMESTER III & IV**  
**UCBCF20 MAIN PRACTICAL - II**

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/ W	Credits	Marks
II / IV	UCBCF20	Main Practical - II	Practical	Core	3	5	40+60=100

**Objective:**

To inculcate practical skill in biochemistry.

**Course Outcomes (CO)**

On completion of the course, the students will be able to;

1. Work safely and effectively in a laboratory
2. Implement experimental protocol, and adapt them to plan and carry out simple colorimetric estimation
3. Explain the basic principles involved in isolation of bio molecules from various source
4. Analyse, interpret and report the results of their biochemical experiments

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	H	H	M	M
CO 2	H	H	H	H	M	M
CO 3	H	H	L	H	M	M
CO 4	H	H	H	H	M	M
CO 5	H	H	H	H	M	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	H	H	M	M
CO 2	H	H	H	H	M	M
CO 3	H	H	L	H	M	M
CO 4	H	H	H	H	M	M
CO 5	H	H	H	H	M	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**1. Safety Measures In The Laboratory – II**

**2. 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 & Subbarow method
8. Estimation of Tryptophan

### **3. 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

### **4. 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)

### **Reference Books:**

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

## SEMESTER 1V– SKILL BASED ELECTIVE -II YEARS

### USBCBn20- SBE: HEALTH CARE FOR WOMEN

Year / Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks 100
II/IV	USBCBn20	Health Care for Women	Theory	Skill Based Elective - II	2	2	40+60=100

#### Objective:

To provide awareness about common health problems of women and how to overcome certain diseases

#### Course Outcomes (CO)

On completion of the course, the students will be able to;

1. Understand the common health problems of women
2. Describe the function of Estrogen and Progesterone hormone
3. Outline the Stages of women hood
4. Discuss the types of anemia and obesity
5. Gain knowledge to overcome PCOS, Ovarian cancer and Depression

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	H	H	M	L
CO 2	H	H	H	H	H	M
CO 3	H	H	M	L	H	H
CO 4	H	M	H	M	H	H
CO 5	H	H	M	H	M	L
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	H	H	M	H
CO 2	H	H	H	H	H	M
CO 3	H	H	M	M	L	L
CO 4	H	M	H	M	H	H
CO 5	H	H	M	H	M	L
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

#### Unit - I:

**(6 Hours)**

- 1.1 Introduction-Women's health-Importance, Healthy tips for women (K4)
- 1.2 Healthy diet for Women – Physiology of Exercise – Importance of yoga (K3)
- 1.3 Preventive care and screenings (K2, K3)
- 1.4 Women and Drug abuse (K3)
- 1.5 Feminism and women's health movement (K2, K4)
- 1.6 Factors influencing women's health (K3)

**Unit - II:****(6 Hours)**

- 2.1 Anatomy of female reproductive system (K3)
- 2.2 Primary and secondary sexual organs (K2, K4)
- 2.3 Hormones related with females-Estrogen and Progesterone (K3)
- 2.4 Puberty-Early and Late puberty (K2, K4)
- 2.5 Menstrual cycle, Menopause Amenorrhea (K3)
- 2.6 Endometriosis, Vaginal discharge (K4)

**Unit - III:****(6 Hours)**

- 3.1 Stages of women hood: Pregnancy, Delivery, Lactating period - Gestation Diabetes – Hypertension during pregnancy period (K2, K4)
- 3.2 C-Section, D and C, Hysterectomy (K3)
- 3.3 Obstetrical fistula (K2, K4)
- 3.4 Female infertility (K4)
- 3.5 Contraception-Variou methods (K3)
- 3.6 Diet and nutrition services (K3, K4)

**Unit - IV:****(6 Hours)**

- 4.1 Anemia-Types, Causes, Symptoms, Diagnosis and Treatment (K2, K4)
- 4.2 Osteoporosis (K4)
- 4.3 Obesity (K2, K4)
- 4.4 Urinary infection (K3)
- 4.5 Blood Grouping, Erythroblastosis foetalis (K3)
- 4.6 Role of thyroid hormones (K4)

**Unit - V:****(6 Hours)**

- 5.1 Cancer Prevalent In Women: Ovarian Cancer, Cervical Cancer, -Etiology, Symptoms, Diagnosis And Treatment (K3)
- 5.2 Breast Cancer-Etiology, Symptoms, Diagnosis And Treatment (K3)
- 5.3 Polycystic Ovaries, Fibroids- Etiology, Symptoms, Diagnosis & Treatment (K3, K4)
- 5.4 Violence Against Women-Domestic Violence And Intimate Partner Violence (K2)
- 5.5 Depression And Anxiety (K2, K3)
- 5.6 Chronic Fatigue Syndrome (K2)

**Note:** The study material will be provided by the Department

**Reference Books:**

1. N. Murugesh-Health Education and community Pharmacy- Sathya publishing Company, 4<sup>th</sup> edition, 2005
2. Ross and Wilson-Anatomy and Physiology in Health and illness-Churchill living stone publishers,10<sup>th</sup> edition, 2008
3. Dr .Ch.Murali Manothar-Ayurveda for All- Pustak Mahal Publication-1<sup>st</sup> edition, 2003
4. John Zerwekh-Women's health Nurse Practioner 1<sup>st</sup> edition, 2013
5. Victoria Maizes-Integrative Women's health,4<sup>th</sup> edition, 2015

**Open Educational Resources (OER):**

1. <https://youtu.be/FxvQBx-AKDg>
2. <https://youtu.be/T7t8eM6gbvk>
3. <https://youtu.be/mOrRJBqm744>
4. <https://youtu.be/6nrnczjKS2o>
5. [https://youtu.be/wJCVU4L\\_fqA](https://youtu.be/wJCVU4L_fqA)



## SEMESTER V

### UCBCG20 - ENZYMES AND INTERMEDIARY METABOLISM

Year/ Sem III / V	Course Code UCBCG20	Title of the Course Enzymes and Intermediary Metabolism	Course Type Theory	Course Category Core	H/W 6	Credits 6	Marks 40+60=100
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#### Objective:

To impart knowledge about the enzymes and the metabolism of biomolecules and its interrelationship.

#### Course Outcomes (CO)

On completion of the course, the students will be able to;

1. Describe the properties, hypothesis and IUB classification of enzymes
2. Discuss the kinetics of enzyme catalyzed reactions, enzyme immobilization and applications of enzymes and their future potential
3. List the major pathways of carbohydrates metabolism and discuss their bioenergetics and regulation
4. Compile the catabolism of amino acid and metabolism of lipids with their significance
5. Revise the metabolic activity of tissues and organ with their function

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	M	M	L	H
CO 2	H	M	H	H	H	M
CO 3	H	H	M	M	L	M
CO 4	H	M	M	M	L	M
CO 5	H	H	M	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	M	M	L	H
CO 2	H	M	H	H	H	M
CO 3	H	H	M	M	L	M
CO 4	H	M	M	M	L	M
CO 5	H	H	M	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

#### Unit 1: (18 hours)

1.1 Enzymes - Nomenclature and IUB classification. (K1, K2, K3, K4, K5, K6)

1.2 Enzymes: Properties and Specificity (K1, K2, K3, K4, K5, K6)

1.3 Salient features of active site. (K1, K2, K3, K4, K5, K6)

1.4 Enzyme units (IU, Katal and Turnover number) (K1, K2, K3, K4, K5, K6)

1.5 Lock and key hypothesis and induced fit theory (K1, K2, K3, K4, K5, K6)

1.6 Collision theory (K1, K2, K3, K4, K5, K6)

**Unit II:**

**(18 hours)**

2.1 Kinetics of single and bi substrate enzyme catalyzed reaction (K1, K2, K3, K4, K5, K6)

2.2 Catalysis-mechanism of reactions involving acid-base catalysis, electrostatic catalysis and Covalent catalysis (K1, K2, K3, K4, K5, K6)

2.3 Co-enzymes -NAD<sup>+</sup>, FMN, Co-ASH, Pyridoxyl phosphate, Biotin, FH 4 - Structure and Functions (K1, K2, K3, K4, K5, K6)

2.4 Enzyme Inhibition- Competitive, Non- competitive and Uncompetitive inhibition – Irreversible inhibition – Suicidal Inhibitors (K1, K2, K3, K4, K5, K6)

2.5 Various methods of immobilization (K1, K2, K3, K4, K5, K6)

2.6 Industrial and Medical applications of Enzyme (K1, K2, K3, K4)

**Unit III:**

**(18 hours)**

3.1 Carbohydrate metabolism: Glycolysis - Role of PDH complex - Citric acid cycle (Pathway, Key enzymes and Regulation) Amphibolic role of TCA cycle (K1, K2, K3, K4, K5, K6)

3.2 Glycogenesis – Glycogenolysis: Pathway, Key enzymes and Regulation (K1, K2, K3, K4, K5, K6)

3.3 Gluconeogenesis: Pathway, Key enzymes and Regulation (K1, K2, K3, K4, K5, K6)

3.4 Pentose phosphate pathway: Pathway, Key enzymes and Regulation (K1, K2, K3, K4, K5, K6)

3.5 Metabolism of Galactose and Fructose - High energy compounds (K1, K2, K3, K4, K5, K6)

3.6 Electron transport chain, Oxidative Phosphorylation, Uncoupler and Inhibitors (K1, K2, K3, K4, K5, K6)

**Unit IV:**

**(18 hours)**

4.1 Fate of Dietary proteins - Catabolism of amino acids -Oxidative and non-oxidative deamination – Transamination (K1, K2, K3, K4, K5, K6)

4.2 Decarboxylation and Urea cycle (K1, K2, K3, K4, K5, K6)

4.3 Fate of dietary lipids – Biosynthesis fatty acids (K1, K2, K3, K4, K5, K6)

4.4  $\alpha$ ,  $\beta$ ,  $\omega$ - Oxidation of fatty acids-Energetic of  $\beta$  Oxidation (K1, K2, K3, K4, K5, K6)

4.5 Biosynthesis of Cholesterol. (K1, K2, K3, K4, K5, K6)

4.6 Biosynthesis of TG and Phospholipids (K1, K2, K3, K4, K5, K6)

**UNIT V:**

**(18 hours)**

5.1 Nucleic acid metabolism: Fate of dietary nucleic acid (K1, K2, K3, K4, K5, K6)

5.2 Purine: Biosynthesis (K1, K2, K3, K4, K5, K6)

5.3 Pyrimidine: Biosynthesis (K1, K2, K3, K4, K5, K6)

5.4 Degradation of Purine and Pyrimidine nucleotides - Inhibitors of nucleotide biosynthesis

(K1, K2, K3, K4, K5, K6)

5.5 Interrelationship of carbohydrates, proteins and fat metabolism (K1, K2, K3, K4, K5, K6)

5.6 Detoxification - Conjugation, Hydrolysis, Reduction and Oxidation (K1, K2, K3, K4, K5, K6)

**[Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create]**

**Text Books:**

1. Robert K Murray - Harper's Illustrated Biochemistry - 31<sup>st</sup> edition - McGraw Hill, 2018
2. Satyanarayana U - Biochemistry- 5<sup>th</sup> edition - Elsevier, 2017
3. Trevor Palmer and Philip Bonner - Enzymes: Biochemistry, Biotechnology and Clinical Chemistry, 1<sup>st</sup> edition - Horwood Publishing, Chichester 2008

**Reference Books:**

1. David L Nelson Michael M cox - Lehninger's Principles of Biochemistry - 8th edition - W H Freeman and co, 2021.
2. Davidson and Sittman - Biochemistry- NMS- 4<sup>th</sup> edition - Lippincott Williams and Wilkins
3. Donald Voet and Judith G Voet - Biochemistry- 4<sup>th</sup> edition - CBS Publishers and Distributers -2011
4. Jeremy M Berg, John L Tymoczko, Stryer L -Biochemistry -7<sup>th</sup> edition - W H Freeman 2011
5. Christopher K Mathews, KE Van Holde, Kevin G Ahern - Biochemistry - 3<sup>rd</sup> edition – Pearson Education, 2000

**OPEN EDUCATIONAL RESOURCES (OER):**

1. [https://youtu.be/pVoytz\\_3H\\_s](https://youtu.be/pVoytz_3H_s)
2. [https://youtu.be/sL\\_iEOuvK80](https://youtu.be/sL_iEOuvK80)
3. <https://youtu.be/i8CC8pmtAp4>
4. <https://youtu.be/9kcrJZNFslw>
5. <https://youtu.be/fJScSmrR1MI>

**SEMESTER-V**  
**UEBCA20- ELECTIVE I A: IMMUNOLOGY**

Year / Sem	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
III/V	UEBCA20	Elective I A: Immunology	Theory	Elective I A	5	5	40+60=100

**Objective:**

To help the students to understand the components of Immune system

**Course Outcomes (CO)**

On completion of the course, the students will be able to;

1. Outline the cell types and organ present in the immune response
2. Identify the role of MHC antigens
3. Discuss the basic techniques of antigen and antibody interactions
4. Compare the spectrum of autoimmune diseases
5. Explain the stages of transplantation

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	M	H	H	M	M
CO 2	L	L	H	M	H	L
CO 3	M	H	M	L	H	M
CO 4	H	M	H	M	L	H
CO 5	M	H	L	H	M	L
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	H	M	M	H
CO 2	H	M	L	M	M	M
CO 3	H	H	H	H	H	H
CO 4	H	M	M	M	H	M
CO 5	H	H	M	H	L	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit I:**

**(15 Hours)**

- 1.1 Lymphoid Organs-Primary Lymphoid organs—Structure of Thymus and Bone marrow (K1, K3)
- 1.2 Secondary Lymphoid organs -Structure of Lymph node, Spleen (K2)
- 1.3 Cells involved in immune system -Morphology, secretions and functions (K3)
- 1.4 Immunity-Innate immunity and Acquired immunity (K2)
- 1.5 Immuno techniques: RIA-Types, advantages and disadvantages (K1, K4)
- 1.6 ELISA- Types - Direct, Indirect, Competitive ELISA (K2)

**Unit II: (15 Hours)**

- 2.1 Antigens: Essential features (K1, K2)
- 2.2 Epitopes, Haptens and Adjuvants (K1, K2)
- 2.3 Types of MHC antigens (K3)
- 2.4 Antibodies: Types, structure, properties and biological functions (K2, K4)
- 2.5 Clonal Selection theory (K3)
- 2.6 Production and applications of monoclonal antibodies (K3, K4)

**Unit III: (15 Hours)**

- 3.1 Antigen - antibody interactions: Precipitation reaction (K2, K4)
- 3.2 Agglutination (K2, K3)
- 3.3 Complement fixation, Lysis, and Opsonization (K3, K4)
- 3.4 Fluorescent antibody technique (K2, K4)
- 3.5 Immunoblotting technique (K2, K4)
- 3.6 Immuno electrophoresis with their types (K2, K3, K4)

**Unit IV: (15 Hours)**

- 4.1 Complement- Salient features, Classical pathway and Alternative pathway (K2, K4)
- 4.2 Humoral immunity and Cell mediated immunity (K2, K4)
- 4.3 Autoimmunity- Pathogenesis of Graves diseases and Myasthenia gravis -etiology, clinical features and treatment (K2, K3)
- 4.4 Rheumatoid arthritis and Systemic lupus erythematosus (SLE) -Etiology, clinical features and treatment (K2, K3)
- 4.5 Multiple Sclerosis -Etiology, clinical features and treatment (K2, K3)
- 4.6 Corona -Etiology, clinical features and treatment (K2)

**Unit V: (15 Hours)**

- 5.1 Transplantation immunology: Types of grafts (K3)**
- 5.2 Mechanism of allograft rejection (K3, K4)**
- 5.3 Hypersensitivity-factors affecting hypersensitivity (K1, K3)**
- 5.4 Hypersensitivity type I-Mechanism (K2, K3)**
- 5.5 Hypersensitivity type II, III Mechanism (K3)**
- 5.6 Hypersensitivity type IV- Mechanism (K3)**

[Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze]

**Text Books:**

- 1. Kuby J -Immunology - W H Freeman Company, New York, 8<sup>th</sup> edition ,2022
- 2. Dulsy Fathima and Arumugam- Immunology- Saras Publication ,2014

**Reference Books:**

- 1. Tizard L R -Immunology, Saunders 13<sup>th</sup> edition ,2017
- 2. Eli Benjamin -Immunology: A Short Course, Wiley Liss, 8<sup>th</sup> edition ,2021
- 3. Roitt -Essential Immunology -Blackwell Science, 12<sup>th</sup> edition ,2015
  
- 4. Raj Khanna-Immunology- Oxford University Publication, 3<sup>rd</sup> edition , 2011

5. Ramesh - Essential Immunology - Mc Graw Hill India Publishers,2017

**Open Educational Resources (OER):**

1. <https://youtu.be/lgapzgPAsZ0>
2. <https://youtu.be/8iyrbv1JauY>
3. [https://youtu.be/Ll\\_7z4YS2Ak](https://youtu.be/Ll_7z4YS2Ak)
4. <https://youtu.be/3XszVyYWZJE>
5. <https://youtu.be/2HPWIgzeRCs>

**SEMESTER V**  
**UEBCB20 - ELECTIVE I B: ENVIRONMENTAL TOXICOLOGY**

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
III / V	UEBCB20	Environmental Toxicology	Theory	Elective- I B	5	5	40+60=100

**Objective:**

To understand the basics in toxicological aspects that effect the environment.

**Course Outcomes (CO)**

On completion of the course, the students will be able to;

1. Explain the properties of pollutants, effects, origin and occurrence in the environment
2. Use clinical and laboratory findings in the treatment of acute toxic exposures
3. Compare and interpret the results of occupational exposure assessments within the context of safety assessments
4. Identify signs and symptoms of important toxic syndromes
5. Discuss the role of poison information services and systems for the surveillance of Poisoning

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	M	H	H	M	M
CO 2	H	H	H	M	H	M
CO 3	H	H	M	H	H	M
CO 4	H	M	H	M	H	M
CO 5	H	H	M	H	M	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	H	M	M	H
CO 2	H	M	L	M	M	M
CO 3	H	H	H	H	H	H
CO 4	H	M	M	M	H	M
CO 5	H	H	M	H	L	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit I: (15 hours)**

1.1 Definition and scope of toxicology (K1, K2, K3)

1.2 Eco-toxicology and its environment significance (K1, K2, K3)

1.3 Basis for general classification and nature, dose - response relationship (K1, K2)

1.4 Synergism and Antagonism, Determination of ED<sub>50</sub> and LD<sub>50</sub> (K1, K2)

1.5 Acute and chronic exposures. Factors influencing toxicity (K1, K2)

1.6 Pharmacodynamics & Chemo dynamics (K1, K2)

**Unit II: (15 Hours)**

2.1 Principles and procedures of testing for acute toxic effects (K1, K2, K4)

2.2 Regulators guidelines, mammalian systems affected and the clinical signs (K1, K2, K3)

2.3 Factors affecting acute toxicity studies. Biochemical basis of toxicity (K1, K2)

2.4 Mechanism of toxicity: disturbance of excitable membrane function altered calcium homeostasis (K1, K2)

2.5 Covalent binding to cellular macromolecules (K1, K2)

2.6 Tissue specific toxicity (K1, K2)

**Unit III: (15 Hours)**

3.1 Toxicity testing: Test Protocol, Genetic Toxicity Testing (K1, K2, K4)

3.2 Mutagenesis Assays: In-vivo test systems- Bacterial Mutation Tests: Reversion Tests, Ames test, Fluctuation Tests (K1, K2, K4)

3.3 Use of drosophila in toxicity testing. (K1, K2, K4)

3.4 DNA repair assays. (K1, K2, K4)

3.5 Chromosome damage test. (K1, K2, K4)

3.6 Toxicological evaluation of Recombinant DNA –Derived Proteins. (K1, K2)

**Unit IV: (15 Hours)**

4.1 Food toxicology: Toxin and Toxicants (K1, K2)

4.2 Toxicology of food additives. (K1, K2, K3)

4.3 Metal toxicity: Toxicology of Arsenic and Mercury (K1, K2, K3)

4.4 Metal contamination and human disease (K1, K2)

4.5 Environmental Factors Affecting Metal Toxicity- Effect of Light, Temperature & P<sup>H</sup> (K1, K2)

4.6 Diagnosis of toxic changes in liver and kidneys (K1, K2, K4)

**Unit V: (15 Hours)**

5.1 Air Pollution: Common Air Pollutants And Their Sources (K1, K2)

5.2 Air Pollution & Ozone. (K1, K2)

5.3 Air Pollution Due To Chlorofluorocarbons (CFCS) And Asbestos. (K1, K2, K3)

5.4 Occupational Toxicology And Assessment Of Occupational Hazards (K1, K2)

5.5 An Overview Of Regulatory Agencies: Responsibilities Of Regulatory Agencies. (K1, K2, K3)

5.6 Management of toxicological risks. (K1, K2)

**[Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze]**



**Text Books:**

1. Tyler Miller G and Scott E. Spoolman, Environmental Science, 16th edition, Cengage learning, 2018
2. Principles of Forensic Medicine & Toxicology 2<sup>nd</sup> edition – Rajesh Bardale , 3<sup>rd</sup> edition, 2021.

**Reference Books:**

1. Casarett and Doull's Toxicology, 4<sup>rd</sup> edition - Klaassen C D, Amdur M O & Doull J - Macmillan publishing company, New York, 2021
2. Williams P L & Burson J L Van- Nostrand Reinhold -Industrial Toxicology - New York, 1985
3. Hayes A W - Principles and methods of toxicology, 2<sup>nd</sup> edition Raven press New York - 1988
4. Stewart C P & Stolman A - Toxicology, Vol I Academic press, New York, 1960
5. George Tyler Miller, Jr. and Scott Spoolman, Living in the Environment – Principles, Connections and Solutions, 17th Edition, Brooks/Cole, USA, 2012.

**Open Educational Resources (OER):**

1. <https://youtu.be/O4VMW52gx90>
2. <https://youtu.be/fEibDPQRbMc>
3. <https://youtu.be/FTPscvo4H0Y>
4. [https://youtu.be/QwFl\\_PbEj1E](https://youtu.be/QwFl_PbEj1E)
5. <https://youtu.be/mMEb5pzY6wI>

**SEMESTER – V & VI**  
**UCBCJ20- MAIN PRACTICAL -III**

Year/ Sem III / VI	Course Code UCBCJ20	Title of the Course Main Practical –III	Course Type Practical	Course Category Core	H/W 4	Credits 6	Marks 40+60=100
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**Objective:**

The course is aimed to enhance the practical skill of the student in handling and estimating the components present in the biological samples.

**Course Outcomes (CO)**

On Completion of the course, the students will be able to;

1. Apply the safety measures in the laboratory
2. Predict the biochemical laboratory analysis
3. Analyse the presence and absence of abnormalities in blood
4. Assess the presence and absence of abnormalities in urine

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	M	M	L	H
CO 2	L	M	L	H	H	M
CO 3	H	L	M	M	L	M
CO 4	H	M	M	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	M	M	L	H
CO 2	H	L	H	H	H	M
CO 3	H	H	M	M	L	M
CO 4	H	M	L	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**1. Safety Measures In The Laboratory-III**

**2. Colorimetric Estimations In Clinical Samples:**

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 Vandenberg 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 Protein by Lowry's method
9. Estimation of DNA by Diphenyl amine method
10. Estimation of RNA by Orcinol method

**3. Urine Analysis:**

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

#### **4. Extraction, Isolation, Identification And Purification**

1. DNA
2. RNA
3. Proteins

#### **Reference Books:**

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

**SEMESTER – V & VI**  
**UCBCK20- MAIN PRACTICAL –IV**

Year/ Sem III / VI	Course Code UCBCK20	Title of the Course Main Practical - IV	Course Type Practical	Course Category Core	H/W 4	Credits 6	Marks 40+60=100
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**Objective:**

The course is aimed to enhance the practical skill of the student in handling and estimating the components present in the biological samples.

**Course Outcomes (CO)**

On completion of the course, the students will be able to;

1. Apply the safety measures in the laboratory
2. Analyze the biological sample for the enzyme activity
3. To obtain practical skills in basic hematological techniques.

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	M	M	L	H
CO 2	M	M	L	H	H	M
CO 3	H	L	M	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	M	M	L	H
CO 2	H	L	H	M	H	M
CO 3	M	H	M	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**1. Safety Measures In The Laboratory-IV**

**2. Enzyme Analysis:**

1. Determination of SGOT activity.
2. Determination of SGPT activity
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
7. Effect of pH on the activity of the enzyme - salivary amylase
8. Effect of Temperature on the activity of the enzyme - salivary amylase
9. Effect of substrate concentration on the activity of the enzyme - salivary amylase
10. Determination of Specific activity of the enzyme - salivary amylase

**3. Hematological Experiments:**

1. Methods for Preservation of blood for analysis
2. Collection of Blood
3. Enumeration of RBC
4. Enumeration of WBC
5. Enumeration of Platelets
6. Estimation of Erythrocyte sedimentation rate
7. Determination of Hemoglobin
8. Packed cell volume
9. Determination of Bleeding time

10. Determination of Clotting Time
11. Grouping of Blood & Rh typing

**Reference Books:**

1. Jayaraman J - Manuals in Biochemistry - New Age International Publishers,2011
2. Varley, Alan H Gowen lock - Practical Biochemistry - 6<sup>th</sup> edition - CBS Publishers,2002
3. David T Plummer - Practical Biochemistry- 3<sup>rd</sup> edition - McGraw Hill Publishers,2005
4. Sawhney SK, Randhir Singh - Introductory Practical Biochemistry - 2<sup>nd</sup> edition - Narosa Publishers,2001
5. Kanai L Mukherjee - Medical Laboratory Technology - Volume I - Tata Graw Hill Publication Company Limited,2010

## SEMESTER V

### USBCC20 – SBE: ENTREPRENEURIAL BIOCHEMISTRY

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
III / V	USBCC20	Entrepreneurial Biochemistry	Theory	Skill Based Elective III	2	2	40+60=100

#### Objective:

To understand the concept of entrepreneurship

#### Course Outcomes (CO)

On completion of the course, the students will be able to;

1. Explain the theory of entrepreneurship and its practical implementation
2. Explore and experience the joy of creating small business ideas
3. Identify strategic marketing planning and mobilize resources for future growth, development and protection of their enterprise
4. Implement market opportunities into business plan
5. Re-construct and build a mindset focusing on unique approach to market opportunities

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	M	H	H	M	M
CO 2	H	H	H	M	H	M
CO 3	H	H	M	H	H	M
CO 4	H	M	H	M	H	M
CO 5	H	H	M	H	M	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	H	M	M	H
CO 2	H	M	L	M	M	M
CO 3	H	H	H	H	H	H
CO 4	H	M	M	M	H	M
CO 5	H	H	M	H	L	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

#### Unit I:

**(6 Hours)**

- 1.1 Entrepreneurship - concept (K1, K2)
- 1.2 Entrepreneurship - Need and importance (K1, K2, K3)
- 1.3 Types of entrepreneur (K1, K2)
- 1.4 Characters of entrepreneur (K1, K2, K3)
- 1.5 Entrepreneurial values (K1, K2, K3)

1.6 Role of society and family in the growth of an entrepreneur. (K1, K2, K4)

**Unit II: (6 Hours)**

2.1 Business ideas (K1, K2)

2.2 Methods of generating ideas (K1, K2, K3)

2.3 Feasibility study and Opportunity assessment (K1, K2, K4)

2.4 Business plan preparation and Execution (K1, K2, K3)

2.5 Project report - Patent registration process (K1, K2, K4)

2.6 Challenges faced by women in entrepreneurship (K1, K2, K4)

**Unit III: (6 Hours)**

3.1 Institutional Support System and Government schemes for Entrepreneurs (K1, K2, K3)

3.2 Central Government Support system MSME – NABARD – SIDO – NSIC – KVIC –DIC (K1, K2, K3)

3.3 Start-up India - Make in India (K1, K2, K3)

3.4 Supports to Training and Employment Programme for Women (STEP) (K1, K2, K3)

3.5 Biotechnology Industry Research Assistance Council (BIARC). (K1, K2, K3)

3.6 Export- Packing licence- Marketing (K1, K2, K3)

**Unit IV: (6 Hours)**

4.1 Organic Farming (K1, K2, K3)

4.2 Preparation of value-added product from dairy farms (K1, K2, K3)

4.3 Food processing (K1, K2, K3)

4.4 Mushroom cultivation (K1, K2, K3)

4.5 Compost fertilizer production - Vermi compost (K1, K2, K3)

4.6 Biopesticide manufacturing. (K1, K2, K3)

**Unit V: (6 Hours)**

5.1 Health drinks preparation (K1, K2, K3)

5.2 Seasonal juice preparation (K1, K2, K3)

5.3 Homemade cakes and cookies (K1, K2, K3)

5.4 Homemade chocolates (K1, K2, K3)

5.5 Handmade soaps (K1, K2, K3)

5.6 Herbal preparation (Herbal incense) (K1, K2, K3)

[Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze]

**Text Books:**

**Note:** The study materials will be provided by the Department

**Reference Books:**

1. Jayashree Suresh - Entrepreneurial Development 1<sup>st</sup> edition – Margham Publication, 2016
2. Bygrave W., & Zacharakis, A, Entrepreneurship, 4<sup>th</sup> edition Wiley, 2017
3. Rajeev Roy, Entrepreneurship 2<sup>nd</sup> edition, Oxford University Press, 2011
4. Khanka S.S., Entrepreneurial Development S. Chand & Co.Ltd., Ram Nagar,

Newdelhi, 2013.

5. Donald F. Kuratko, Entrepreneurship – Theory, Process and Practice, 9<sup>th</sup> Edition, Cengage learning 2014.

**Open Educational Resources (OER):**

1. <https://youtu.be/92ZmzD70sOU>
2. <https://youtu.be/Fqch5OrUPvA>
3. [www.businessmanagementideas.com](http://www.businessmanagementideas.com)
4. <https://msme.gov.in/all-schemes>
5. <https://youtu.be/y0ux7mYJXcs>
6. <https://youtu.be/Z82rct0pknk>



**SEMESTER VI**  
**UCBCI20 - MOLECULAR BIOLOGY**

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
III / VI	UCBCI20	Molecular Biology	Theory	Core	6	6	40+60=100

**Objective:**

To make a study on life and the information centers called genes.

**Course Outcomes (CO):**

On completion of the course, the students will be able to;

1. Demonstrate the nature of Genes
2. Analyze the blueprint of life
3. Describe the mechanism of replication
4. Illustrate the mechanism of Transcription
5. Demonstrate the features of Genetic code and mechanism of Translation

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	H	H	M	H
CO 2	H	H	H	H	H	M
CO 3	H	H	M	M	H	H
CO 4	H	M	H	M	H	H
CO 5	H	H	M	H	M	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	M	M	M	M	H
CO 2	H	H	H	H	H	M
CO 3	H	H	H	H	M	M
CO 4	H	H	H	H	H	H
CO 5	H	M	H	H	M	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit I: (18 Hours)**

1.1 Genetics- Mendel's laws of inheritance, test cross, back cross and law of incomplete dominance (K1, K2, K3, K4)

1.2 Genomic organization of prokaryotes cells (K1, K2, K3, K4)

1.3 Genomic organization of eukaryotic cells (K1, K2, K3, K4)

1.4 Genetic Material – DNA and RNA, Evidences for DNA as genetic material - Griffith,

Avery et al and Hershey chase experiments (K1, K2, K3, K4)

1.5 Central dogma of molecular genetics (K1, K2, K3, K4)

1.6 Repetitive DNA (K1, K2, K3, K4)

**Unit II: (18 Hours)**

- 2.1 Prokaryotic replication: Modes of replication (K1, K2)
- 2.2 Semi conservative replication - Experimental evidences (K1, K2)
- 2.3 Process of Prokaryotic replication - Initiation, Elongation and Termination (K1, K2)
- 2.4 Enzymes and proteins involved in replication (K1, K2)
- 2.5 Inhibitors of replication (K1, K2)
- 2.6 DNA repair - Overview (K1, K2)

**Unit III: (18Hours)**

- 3.1 Prokaryotic transcription: Promoters (K1, K2)
- 3.2 Process of transcription- Initiation, Elongation & Termination (K1,K2, K3,K4)
- 3.3 Enzymes and proteins involved in transcription (K1, K2)
- 3.4 Inhibitors of transcription (K1, K2)
- 3.5 Post transcriptional processing of rRNA and tRNA in prokaryotes (K1, K2)
- 3.6 Reverse transcription (K1, K2)

**Unit IV: (18 Hours)**

- 4.1 Genetic code dictionary - General features, Wobble hypothesis (K1, K2)
- 4.2 Composition of prokaryotic ribosome (K1, K2)
- 4.3 Composition of eukaryotic ribosome (K1, K2)
- 4.4 Process of protein synthesis in prokaryotes - Initiation, Elongation and Termination (K1,K2, K3, K4)
- 4.5 Inhibitors of protein synthesis in prokaryotes (K1, K2)
- 4.6 Post translational modification (K1, K2)

**Unit V: (18 Hours)**

- 5.1 Regulation of gene expression in prokaryotes: Operon concept - lac operon (K1, K2)
- 5.2 Mutation: Definition, Classification with example (K1, K2)
- 5.3 An overview of Genomics (K1, K2)
- 5.4 An overview of Proteomics (K1, K2)
- 5.5 Chromosome mapping, Human Genome Project (K1, K2)
- 5.6 DNA micro arrays, DNA fingerprinting and foot printing (K1, K2)

**[Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyse]**

**Text Books:**

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

**Reference Books:**

1. Lodish, Darnell and Baltimore - Molecular Cell Biology - WH Freeman and Company,

4th edition -2000

2. Brown TA - Gene Cloning- Blackwell Science, 8th edition -2018
3. Benjamin Lewin - Gene VIII - Pearson Education International, 8th edition -2018
4. David Friefelder - Molecular Biology -Narosa Publishing House, 2nd edition -2008
5. Veer Bala Rastogi - Principles of Molecular Biology ,4th edition - 2016
6. Batiza Ann. Bioinformatics, Genomics, and Proteomics (English, Hardcover, Batiza Ann), Chelsea House Publishers, 2005

**Open Educational Resources (OER):**

1. <https://www.youtube.com/watch?v=0yBD0xKbcVU>
2. <https://www.youtube.com/watch?v=gZAw7pahzMM>
3. <https://www.youtube.com/watch?v=k4AI4UipziI>
4. <https://www.youtube.com/watch?v=gvYJaPpkSZg>
5. <https://www.youtube.com/watch?v=xYOK-yzUWSI>

## SEMESTER- VI

### UEBCC20- ELECTIVE II A: CLINICAL BIOCHEMISTRY

Year / Sem	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
III/VI	UEBCC20	Clinical Biochemistry	Theory	Elective II A	5	6	40+60=100

#### Objective

To understand the biochemical basis of various diseases and disorders

#### Course Outcomes (CO):

On completion of the course, the students will be able to;

1. Discuss the disorders of carbohydrate metabolism
2. Outline the role of serum lipids
3. Describe the types of jaundice and serum enzyme activities in diseases
4. Identify various renal disorders and examination of gastric residuum
5. Compare the application of diagnostic enzymes

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	H	H	M	H
CO 2	H	H	H	H	H	M
CO 3	H	H	M	M	H	H
CO 4	H	M	H	M	H	H
CO 5	H	H	M	H	M	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	M	M	M	M	H
CO 2	H	H	H	H	H	M
CO 3	H	H	H	H	M	M
CO 4	H	H	H	H	H	H
CO 5	H	M	H	H	M	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

#### Unit I:

(15 Hours)

- 1.1 Regulation of Blood Glucose level - Hypoglycemia and Hyperglycemia, renal threshold value and Tubular maximum reabsorption of Glucose (TmG) (K1, K2)
- 1.2 Diabetes mellitus - Types, Etiology, Clinical features, Complications and Management- Diabetic ketoacidosis (K2, K3)
- 1.3 Significance of fasting and post prandial blood glucose (K1, K2)
- 1.4 Glucose tolerance test and Glycosylated Hb (K2, K4)
- 1.5 Galactosemia - Fructosuria – Lactose intolerance (K2, K3)
- 1.6 Glycogen storage diseases (K2, K4)

**Unit II: (15 Hours)**

- 2.1 Lipoproteins- Types and function, Elementary details of Hypo and Hyper lipoproteinemia (K1, K2)
- 2.2 Atherosclerosis and Ischemic Heart disease (K2, K3)
- 2.3 Factors affecting Blood Cholesterol level, Hypercholesterolemia (K2, K3, K4)
- 2.4 Fatty liver-types and treatment, Cirrhosis (K2, K4)
- 2.5 Inborn errors of Amino acid Metabolism- Phenylketonuria, Alkaptonuria (K2, K3)
- 2.6 Inborn errors of Amino acid Metabolism-Cystinuria, Hemophilia, Albinism (K2, K3)

**Unit III: (15 Hours)**

- 3.1 Metabolism of Bilirubin (K2, K3)
- 3.2 Jaundice – Types: Haemolytic jaundice, Obstructive jaundice, Hepatic jaundice (K3, K4)
- 3.3 Liver function test based on abnormalities of pigment metabolism - Vandenbergh reaction and Urine bilirubin (K3)
- 3.4 Galactose tolerance test (K2, K3)
- 3.5 BSP test (K3, K4)
- 3.6 Prothrombin time (K1, K3)

**Unit IV: (15 Hours)**

- 4.1 Kidney diseases -Glomerulonephritis, Nephrotic syndrome - Etiology, clinical features, diagnosis and treatment (K2, K3)
- 4.2 Clearance- Definition and types, Renal function tests based on glomerular filtration urea and creatinine clearance (K2, K3)
- 4.3 Renal plasma flow (PAH test) and Tubular function- Phenol sulphathelein test (K3)
- 4.4 Gastric function test – Collection and Examination of gastric contents (K3, K4)
- 4.5 FTM– Collection and Examination of gastric contents (K3)
- 4.6 Stimulation test- Alcohol, Caffeine and Histamine (K2, K3)

**Unit V: (15 Hours)**

- 5.1 Assessment of Cell Damage and Proliferation – Localization of Damage – Nonspecific causes of Raised plasma Enzyme activities (K2, K3)
- 5.2 Enzymes of Diagnostic importance- Aspartate transaminase, Alanine transaminase, Lactate Dehydrogenase, Creatinine Kinase (K2, K3)
- 5.3 Enzymes of Diagnostic importance – Amylase, Acid phosphatase, Alkaline phosphatase (K2, K4)
- 5.4 Enzymes of Diagnostic importance -Streptokinase,  $\gamma$  Glutamyl transferase, Aldolase (K2, K4)
- 5.5 Cancer: Etiology- Morphological changes in Tumour cells (K4)
- 5.6 Tumour markers - AFP, CEA HCG (K4)

[Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze]

**Text Books:**

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

**Reference Books:**

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

**Open Educational Resources (OER):**

1. <https://youtu.be/LuVcPNF5Slg>
2. <https://youtu.be/wytTRDz8syo>
3. <https://youtu.be/c4CvXTYimck>
4. <https://www.youtube.com/watch?v=RwvbO-40xvw>
5. <https://www.youtube.com/watch?v=1S8XpJ1UVVM>

**SEMESTER-VI**  
**UEBCD20- PHARMACOLOGY**

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
III / VI	UEBCD20	Pharmacology	Theory	Elective II B	5	5	40+60=100

**Objective**

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

**Course Outcomes (CO):**

On completion of the course, the students will be able to,

1. Classify different dosage forms of drug
2. Discuss the basic understanding of detoxification mechanisms
3. Compare the structure and uses of antibiotics available
4. Outline the clinical applications, side effects and toxicities of cardiovascular drugs
5. List out commonly used analgesic and anesthetic drug classes

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	M	H	H	M	M	M
CO 2	M	M	H	H	M	L
CO 3	H	H	M	H	M	M
CO 4	L	H	H	M	H	M
CO 5	M	M	M	M	L	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	M	H	H	M	M	M
CO 2	M	M	H	H	M	L
CO 3	H	H	M	H	M	M
CO 4	L	H	H	M	H	M
CO 5	M	M	M	M	L	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit I:**

**(15 hours)**

- 1.1 Introduction - Sources and dosage forms (K2, K3)
- 1.2 Route of administration (K3, K4)
- 1.3 Classification- absorption of drugs, Distribution (K2, K3)
- 1.4 Binding of drugs to plasma proteins (K2, K4)

- 1.5 Receptor- Types and Binding forces in Drug-receptor interaction (K1, K3)  
1.6 Consequences of Drug-receptor interaction (K4)

**Unit II: (15 hours)**

- 2.1 Xenobiotics (K2, K4)  
2.2 Mechanism of oxidation in Phase I (K2, K3)  
2.3 Mechanism of reduction in Phase I (K2, K3)  
2.4 Mechanism of hydrolysis in Phase I (K2, K3)  
2.5 Phase II- conjugation (K3, K4)  
2.6 Structure and uses of oral hypoglycemic drugs - Classes, Parenteral (K3)

**Unit III: (15 hours)**

- 3.1 Antibiotics: Structure and therapeutic uses of Penicillin, Streptomycin, Tetracycline, Chloramphenicol and Erythromycin (K2, K3)  
3.2 Antiseptics (K1, K2)  
3.3 Disinfectants (K1, K2)  
3.4 Structure and uses of Phenols and related compounds - (a) Alkyl substituted Phenols: Cresol, Thymol (b) Chlorinated Phenols: Chloroxylenol (K3, K4)  
3.5 Halogen compounds – Chloramine and Organic mercurial - Thiomersol (K2, K3)  
3.6 Formaldehyde and its derivative - Formaldehyde and Nitro furan derivative - Nitro furazone (K2, K3)

**Unit IV: (15 hours)**

- 4.1 Cardiovascular Drugs - Structure And Action Of Cardiac Glycosides- Digoxin And Digitoxin (K2, K3)  
4.2 Antiarrhythmic Drugs - Structure And Uses Of Propranolol And Procainamide (K1, K2)  
4.3 Anti- Hypertensive Agents - Drugs Acting Centrally - Example: Clonidine And Alpha Methyl Dopa (K2, K3)  
4.4 Ganglion Blockers - Example: Pentolinium Tartrate (K2, K3)  
4.5 Vasodilators - Example: Tolazaline (K1, K2)  
4.6 B Blockers - Example: Phenoxybenzamine – Hypotensive agents (K2, K3)

**Unit V: (15 hours)**

- 5.1 Analgesics -Morphine, Pethidine, Aspirin (K2, K3)  
5.2 Salicin (K1, K2)  
5.3 Paracetamol and Phenacetin (K2, K3)  
5.4 Analgin and Indomethacin (K3)  
5.5 Anesthetics - Chloroform, Nitrous oxide, Trichloro ethylene, Benzocaine, Procaine, Lignocaine (K2, K4)  
5.6 Cytotoxic agents – Chlorambucil (K3)

[Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze]

**Text books:**

1. Jayashree Ghosh - A Textbook of Pharmaceutical Chemistry, - SS Chand and Company, 5th edition, 2014
2. Seth SD - Textbook of Pharmacology, Reed Elsevier India Private Limited, 3rd edition, 2009

**Reference Books:**



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

**Open Educational Resources (OER):**

1. <https://youtu.be/--sqCGRij40>
2. <https://youtu.be/GUyGkllMqL8>
3. <https://youtu.be/mMk6VWVpRpo>
4. <https://youtu.be/caJZweuzQO8>
5. <https://youtu.be/wx3dZmv5pM0>
6. <https://youtu.be/t2tKyjj7u5Y>

## SEMESTER VI

### UEBCE20 – ELECTIVE III A: BIOTECHNOLOGY

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
III / VI	UEBCE20	Biotechnology	Theory	Elective III A	5	5	40+60=100

#### Objective:

To explore the applications and future potential of Biotechnology

#### Course Outcomes (CO):

On completion of the course, the students will be able to;

1. Recall the steps involved in recombinant DNA technology
2. Outline the role of vector in gene technology and explain the construction of Genomic and cDNA library and their importance
3. Explain the principles of plant tissue and animal cell culture and summarize the methods used to produce transgenic plants and animals
4. Identify and debate the ethical and social issues in the field of biotechnology and get insight in application of rDNA technology
5. Discuss the various aspects of bioprocess technology

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	M	M	L	H
CO 2	H	M	H	H	H	M
CO 3	H	H	M	M	L	M
CO 4	H	M	M	M	L	M
CO 5	H	H	M	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	M	M	L	H
CO 2	H	M	H	H	H	M
CO 3	H	H	M	M	L	M
CO 4	H	M	M	M	L	M
CO 5	H	H	M	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit I: (15 hours)**

- 1.1 Introduction to Biotechnology and its branches- Scope and importance of biotechnology(K1, K2)
- 1.2 Biotechnology in India (K1, K2)
- 1.3 Introduction to Genetic Engineering- Steps and enzymes involved in Genetic Engineering(K1, K2, K3, K4)
- 1.4 Restriction endonucleases: Nomenclature – Types (K1, K2, K3, K4)
- 1.5 Reverse Transcriptase, Taq polymerase and DNA Ligases (K1, K2, K3, K4)
- 1.6 Applications of genetic Engineering. (K1, K2, K3)

**Unit II: (15 hours)**

- 2.1 Gene cloning vectors: Plasmids: Classification, Characteristics, Example: pBR322(K1, K2, K3, K4)
- 2.2 Shuttle vectors: Example pJDB219 (K1, K2, K3, K4)
- 2.3 Cosmid: Feature, Example: pLFR5 (K1, K2, K3, K4)
- 2.4 DNA Library: Genomic and cDNA library (K1, K2, K3)
- 2.5 Methods of Gene Transfer (K1, K2, K3)
- 2.6 Gene cloning in Prokaryotes: methodology of Gene cloning with reference to Insulin gene(K1, K2, K3, K4)

**Unit III: (15 hours)**

- 3.1 Plant tissue Culture: Basis of Plant cell and tissue culture- A tissue culture laboratory – Nutrient media composition and preparation - maintenance of Aseptic Environment (K1,K2, K3, K4)
- 3.2 Methods of Plant cell, Tissue and Organ culture - Somatic embryogenesis andSomaclonal variation (K1, K2, K3, K4)
- 3.3 Animal cell culture - Characteristics, Substrates and Culture Media (K1, K2, K3, K4)
- 3.4 Somatic cell fusion - Valuable products from cell culture- Tissue Plasminogen Activator(K1, K2, K3, K4)
- 3.5 Gene transfer in plants and animals- Transgenic plants -Herbicide resistance - stresstolerance - Transgenic plants as bioreactor (K1, K2, K3, K4)
- 3.6 Transgenic animals- Transgenic cattle- The first mammalian clone “Dolly- AnimalBioreactors (K1, K2, K3, K4)

**Unit IV: (15 hours)**

- 4.1 Genetically engineered microorganisms (GEMOs) in health care products: Insulin (K1,K2, K3)
- 4.2 Cytokines: Importance (K1, K2, K3)
- 4.3 Interferon: Importance (K1, K2, K3)
- 4.4 Vaccines: Importance (K1, K2, K3)
- 4.5 Risks of releasing Genetically Engineered Organisms (K1, K2)
- 4.6 Ethics of biotechnology (K1, K2)

**Unit V:****(15 hours)**

- 5.1 Fermentation systems- Batch and continuous process (K1, K2)
- 5.2 Fermentor design (K1, K2)
- 5.3 Solid substrate fermentation (K1, K2, K3)
- 5.4 Components of Medium - criteria used in media formulation (K1, K2, K3)
- 5.5 Downstream processing - introduction, separation process, example of recovery process(K1, K2, K3, K4)
- 5.6 Wine and SCP: Production and types (K1, K2, K3)

**[Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply;****K4 – Analyze]Text Books:**

1. Dubey RC - A Text book of Biotechnology - 5th edition - S Chand Publishing
2. Satyanarayana U - Biotechnology - 5th edition - Books and Allied Private Ltd, 2022

**Reference Books:**

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

**OPEN EDUCATIONAL RESOURCES (OER):**

1. <https://youtu.be/BK12dQq4sJw>
2. <https://youtu.be/VvusmIcA6i0>
3. <https://youtu.be/q0B9Bn1WW4>
4. <https://youtu.be/CfTnVx31pr0>
5. <https://youtu.be/unkZIN5qeXM>
6. <https://youtu.be/Bz02Qlsu4XI>

## SEMESTER- VI

### UEBCF20 - ELECTIVE III B: PLANT BIOCHEMISTRY

Year/ Sem	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks <b>100</b> 40+60=100
III/VI	UEBCF20	Plant Biochemistry	Theory	Elective III B	5	5	

#### Objectives:

To explore the applications of plant and their products

#### Course Outcomes (CO):

On completion of the course, the students will be able to;

1. Describe the structural features of plant cell and phytohormones
2. Outline the types of photosynthetic pigments
3. Create the impact of nitrogen, sulphur and carbon cycle on nature
4. Compile the mechanism of seed germination
5. Identify the antioxidant potential and role of secondary metabolites

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	M	M	L	H
CO 2	H	M	H	H	H	M
CO 3	H	H	M	M	L	M
CO 4	H	M	M	M	L	M
CO 5	H	H	M	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	M	M	L	H
CO 2	H	M	H	H	H	M
CO 3	H	H	M	M	L	M
CO 4	H	M	M	M	L	M
CO 5	H	H	M	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit I: (15 Hours)**

- 1.1 Architecture of plant cell and its role - Plasmodesmata, Vacuoles, Plastids, Chloroplast, Mitochondria, Peroxisomes. (K2, K3)
- 1.2 Cell wall - Structure of plant cell wall - Cellulose and Hemicelluloses. (K3)
- 1.3 Plant growth regulators - structure and physiological effects of Auxins structure and Physiological effects of Gibberellins (K2, K3)
- 1.4 Structure and physiological effects of Cytokinin. (K3, K4)
- 1.5 Structure and physiological effects of Abscisic acid. (K3, K4)
- 1.6 Structure and physiological effects of Ethylene – Phytochromes (K3, K4)

**Unit II: (15 Hours)**

- 2.1 Photosynthesis - photosynthetic pigments Chlorophyll Structure and their function (K2, K3)
- 2.2 Carotenoid - Structure and their function (K1, K3)
- 2.3 Phycobilin - Structure and their function (K1, K3)
- 2.4 Light reaction - Photo system I and Photo system II (K3, K4)
- 2.5 Hill's reaction - Emerson effect - Cyclic and non-cyclic photo phosphorylation (K3, K4)
- 2.6 Dark reaction - Calvin's cycle (K3, K4)

**Unit III: (15 Hours)**

- 3.1 Nitrogen cycle - Ammonification, Nitrification, nitrate reduction (K2, K4)
- 3.2 Denitrification - Symbiotic and non-symbiotic Nitrogen fixation (K2, K4)
- 3.3 Nitrogenase enzyme - Nodule development (K3, K4)
- 3.4 Sulfur cycle - release of sulfur from organic compounds (K1, K2)
- 3.5 Oxidation of sulfur compounds (K1, K4)
- 3.6 Reduction of sulfate Carbon cycle (K3, K4)

**Unit IV: (15 Hours)**

- 4.1 Seed germination - Mobilization of storage lipids during seed germination (K4)
- 4.2 Glyoxylate cycle (K2, K3)
- 4.3 Seed dormancy - Definition of vernalization and deverniling (K2, K3)
- 4.4 Cold tolerance in metabolic compounds (K1, K3)
- 4.5 Enzymatic activity for Esterase (K3)
- 4.6 Enzymatic activity for Peroxidases (K3)

**Unit V: (15 Hours)**

- 5.1 Secondary metabolites in plant - Biological role of Phenolic compounds (K4)
- 5.2 Biological role of Terpenoids (K3)
- 5.3 Biological role of Tannins (K3)
- 5.4 Biological role of Lignin (K4)
- 5.5 Biological role of Pectin (K3, K4)
- 5.6 Biological role of Antioxidant compounds (K3, K4)

**[Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze]**

**Text Books:**

1. Lehninger, D Nelson and C M Cox - Principles of Biochemistry -WH Freeman and Company Ltd, 4<sup>th</sup> edition -2005
2. Donald Voet and Judith G Voet - Biochemistry- 4<sup>th</sup> edition -2002

**Reference Books:**

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

**OPEN EDUCATIONAL RESOURCES (OER):**

1. <https://youtu.be/yXqRsH8Dul4>
2. <https://youtu.be/muDk823-6Yo>
3. <https://youtu.be/D68TxxbGWfo>
4. <https://youtu.be/N9X0Pue6Ffc>
5. <https://youtu.be/7rI-Lyftpd0>

## SEMESTER- VI

### USBCD20 – SBE- IV - MEDICAL LABORATORY TECHNOLOGY

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credit	Marks 100
III/VI	USBCD20	Medical Laboratory Technology	Theory	Skilled Based Elective - IV	2	2	40+60=100

#### Objectives:

To make detailed study of the organization and functions of a laboratory

#### Course Outcome (CO):

On completion of the course, the students will be able to;

1. Outline the organization of a laboratory for its efficient functioning
2. Discuss the various methods of blood collection and its preservation
3. Evaluate the significance of urine analysis and its correlation with disease
4. Demonstrate about the blood transfusion method
5. Apply histopathological techniques in detecting abnormal cells

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	M	M	L	H
CO 2	H	M	H	H	H	M
CO 3	H	H	M	M	L	M
CO 4	H	M	M	M	L	M
CO 5	H	H	M	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	M	M	L	H
CO 2	H	M	H	H	H	M
CO 3	H	H	M	M	L	M
CO 4	H	M	M	M	L	M
CO 5	H	H	M	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						



**Unit-I: (6 Hours)**

- 1.1 Introduction: Code of conduct for laboratory personnel (K1, K2, K3)
- 1.2 Medical care, organization of the clinical laboratory (K1, K2, K3)
- 1.3 Functional components of a laboratory (K1, K2)
- 1.4 Basic needs and role of medical laboratory technician (K1, K2)
- 1.5 Safety aspects in the laboratories (K1, K2, K3)
- 1.6 First aid in the laboratories (K1, K2, K3)

**Unit-II: (6 Hours)**

- 2.1 Specimen collection: Blood collection by vein puncture and capillary puncture (K1, K2, K3)
- 2.2 Equipment and storage of blood collection - transport and waste disposal (K1, K2, K3)
- 2.3 Anticoagulants (K1, K2, K3)
- 2.4 Collection and preservation of urine, sputum, throat swab (K1, K2, K3)
- 2.5 Collection and preservation of stool (K1, K2, K3)
- 2.6 Collection and preservation of CSF specimens (K1, K2, K3)

**Unit-III: (6 Hours)**

- 3.1 Collection and processing of blood for transfusion (K1, K2, K3)
- 3.2 Preparation for blood collection and Blood bank (K1, K2, K3)
- 3.3 Screening, Rejection, Registration of Donors (K1, K2, K3)
- 3.4 Blood Collection procedure, Transportation (K1, K2, K3)
- 3.5 Clinical significance of Blood Transfusion (K1, K2, K3)
- 3.6 Coomb's test (K1, K2, K3)

**Unit-IV: (6 Hours)**

- 4.1 Urine - Normal and Abnormal constituents of urine (K1, K2, K3)
- 4.2 Routine examination of urine- Physical examination -Colour, Appearance, Odour and Specific gravity (K1, K2, K3)
- 4.3 Microscopic examination of urine sediment - organized and unorganized elements –  
Culture test (24 and 48 Hrs) – Crystal appearance in urine (K1, K2, K3)
- 4.4 Pregnancy test (hCG test) –Typhoid test (Widal test) (K1, K2, K3)
- 4.5 Malaria test (QBC test) (K1, K2, K3)
- 4.6 Tuberculosis test (Mantoux tuberculin skin test) (K1, K2, K3)

**Unit-V: (6 Hours)**

- 5.1 Introduction to histopathology and cytology (K1, K2, K3)

5.2 Laboratory equipment for cytology and histology (K1, K2, K3)

5.3 Reagents, microscope, microtome, paraffin oven, tissue floating bath, automated tissue processor and slide warmer (K1, K2, K3)

5.4 Preparation of tissues for histology (K1, K2, K3)

5.5 Collection of specimens for cytological evaluation (K1, K2, K3)

5.6 Clinical significance of cytological technique (K1, K2, K3)

**[Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze]**

**Note:** The study materials will be provided by the Department

**Text Books:**

1. Ramakrishnan S, Sulochana KN. Manual of Medical Laboratory Techniques. Jaypee Brothers Medical Publishers Pvt.Ltd, 1<sup>st</sup> edition, 2012
2. Sood Ramnik. Concise Book of Medical Laboratory Technology: Methods & Interpretation. Jaypee Brothers Medical Publishers. 2<sup>nd</sup> edition, 2014

**Reference Books:**

1. Kanai L Mukherjee- Medical laboratory technology. Tata MC Graw-hill publishing company limited, Volume-I, 2<sup>nd</sup> edition, 2010
2. Kanai L Mukherjee- Medical laboratory technology. Tata MC Graw-hill publishing company limited, Volume-II, 2<sup>nd</sup> edition, 2010
3. Kanai L Mukherjee- Medical laboratory technology. Tata MC Graw-hill publishing company limited. Volume-III - 2<sup>nd</sup> edition, 2010
4. Talib VH - A Hand book of Medical laboratory technology - CBS publishers, 2004
5. Shivaraja Shankara YM - Laboratory manual for Practical Biochemistry. Jaypee publication, 2<sup>nd</sup> edition, 2013

**Open Educational Resources (OER):**

1. <https://youtu.be/OauxaRXQ2IM>
2. [https://youtu.be/a\\_m76KUab9s](https://youtu.be/a_m76KUab9s)
3. <https://youtu.be/58Gp8Tiui1E>
4. <https://youtu.be/22MHdz5sEuc>
5. <https://youtu.be/qAoa94WBaIc>

## SEMESTER – III – SKILL BASED ELECTIVE -II YEARS

### USBCAn20 - NUTRITIONAL BIOCHEMISTRY

Year / Sem	Course Code	Title Of the course	Course Type	Course Category	H/W	Credits	Marks
II / III	USBCAn20	Nutritional Biochemistry	Theory	Skill Based Elective I	2	2	100 40+60=100

#### Objective:

To make a note on nutrients and its role on metabolism.

#### Course Learning Outcomes (CLO)

On Completion of the course, the students will be able to:

1. Explain the functions of specific nutrients in maintaining health
2. Describe the role of antioxidants
3. Use a balanced diet for diseased conditions
4. Discuss basic principles and practices of common food preservation methods
5. Discuss the various aspects of protein quality

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	M	M	M	L	H
CO 2	H	M	M	H	H	M
CO 3	H	H	H	H	M	M
CO 4	H	H	H	M	H	H
CO 5	H	M	H	M	M	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	H	H	M	H
CO 2	H	H	H	H	H	M
CO 3	H	H	M	M	H	H
CO 4	H	M	H	M	H	H
CO 5	H	H	M	H	M	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit - I:****(6 Hours)**

- 1.1 Definition of food and Nutrition, (K1, K3, K4)
- 1.2 Basic Food groups - Energy yielding foods, Body Building, Protective Foods (K1, K3)
- 1.3 Basic concepts of Energy Expenditure, Unit of Energy, Measurements of Food stuffs by Bomb Calorimeter (K2)
- 1.4 Calorific values of Proteins, Carbohydrates and Fats (K1, K3)
- 1.5 Basal metabolic rate (K2, K3)
- 1.6 Factors affecting BMR (K3)

**Unit - II:****(6 Hours)**

- 2.1 Antioxidants-Types (K2, K3)
- 2.2 Antioxidant rich food (K3)
- 2.3 Sources and health effects of free radical (K2, K3)
- 2.4 Dietary fibres (K2, K3)
- 2.5 Single Cell Proteins (K1, K2)
- 2.6 Probiotics (K3)

**Unit - III:****(6 Hours)**

- 3.1 Balanced diet - Nutrition in infancy (K2, K3)
- 3.2 Nutrition in childhood (K2, K3)
- 3.3 Nutrition in Adolescence (K3)
- 3.4 Nutrition in Adulthood (K2, K3)
- 3.5 Nutrition in Elderly person. (K2)
- 3.6 Nutrition during pregnancy and lactation (K2, K3)

**Unit - IV:****(6 Hours)**

- 4.1 Food processing and preservation: Types (K2, K3)
- 4.2 Food fortification (K3)
- 4.3 Sanitation and Hygiene in Food service (K2, K3, K4)
- 4.4 Food Toxicities - organic toxicants (K2, K3, K4)
- 4.5 Inorganic toxicants (K2, K3, K4)
- 4.6 Methods of detecting adulterated food (K3)

**Unit - V:****(6 Hours)**

- 5.1 Protein Malnutrition (Kwashiorkor) Under Nutrition (Marasmus) their preventive and curative measures (K2, K3, K4)
- 5.2 Protein quality and requirement (K3)
- 5.3 Dehydration (K2, K3)
- 5.4 Overhydration (K2, K3)
- 5.5 Eating disorders - Signs of eating disorder (K3)

## 5.6 Body mass index (BMI) - obesity (K3)

**Text Books:** The study materials will be provided by the Department

### **Reference Books:**

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

### **Open Educational Resources (OER):**

1. [https://youtu.be/Ph1t\\_X1Zch8](https://youtu.be/Ph1t_X1Zch8)
2. <https://youtu.be/iP93MjBStks>
3. [https://youtu.be/\\_Ap4BXhig5c](https://youtu.be/_Ap4BXhig5c)
4. <https://youtu.be/zq6SvljUcfU>
5. <https://youtu.be/QNH79fC421g>

## SEMESTER-V/VI - NON-MAJOR ELECTIVE – III YEARS

### UGBCAn20– NON-MAJOR ELECTIVE - DISEASES AND TREATMENT

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/ W	Credits	Marks
III/ VI	UGBCAn20	Diseases and Treatment	Theory	Non-major elective - I	3	2	40+60=100

#### Objective:

To provide a basic knowledge about common diseases and its treatment.

#### Course Outcomes (CO):

On completion of the course, the students will be able to,

1. Understand the concept of immune system, blood and bone diseases
2. Know the pathology of liver and lung diseases
3. Acquire a broad knowledge about the deadliest diseases in the world
4. Understand about the pathophysiology of cardiovascular and neurological diseases
5. Learn the various types of skin diseases

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	M	M	L	L	L
CO 2	H	M	M	M	H	M
CO 3	H	H	H	H	M	M
CO 4	H	M	H	M	H	H
CO 5	H	H	H	M	M	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	H	H	M	H
CO 2	H	H	H	H	M	M
CO 3	H	H	M	M	H	M
CO 4	H	M	H	M	M	L
CO 5	H	H	M	H	M	L

<b>H- High (3), M-Medium (2), L-Low (1)</b>
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**Unit - I: (9 Hours)**

- 1.1 Diseases and its types (K1, K3)
- 1.2 Immune system - Types - Innate and Acquired (K3, K4)
- 1.3 Phagocytosis (K1)
- 1.4 Blood: Composition, Sickle Cell Anemia, Iron deficiency Anemia, Leucopenia, Hemolysis (K2, K3)
- 1.5 Bleeding disorder- Hemophilia A and B (K1, K2, K3)
- 1.6 Bone disorder: Osteomalacia, Rickets, Joint Pain (K2, K3)

**Unit - II: (9 Hours)**

- 2.1 Asthma-Types, Causes, Clinical feature and Treatment (K1, K2)
- 2.2 Tuberculosis-Causes, Clinical feature, Prevention and Treatment (K2, K3)
- 2.3 Pneumonia: Causes, Clinical features, Prevention and Treatment (K1, K3)
- 2.4 Jaundice: Causes, Clinical features, Prevention and Treatment (K1, K2)
- 2.5 Hepatitis: Causes, Clinical features, Prevention and Treatment (K2, K3)
- 2.6 Fatty liver: Causes, Clinical features, Prevention and Treatment (K2, K3)

**Unit - III: (9 Hours)**

- 3.1 Diabetes Mellitus- Types, Causes, Clinical features and Treatment (K1, K2)
- 3.2 Cancer-Causes, Clinical features and Treatment (K2, K3)
- 3.3 Types of Tumors (K1, K2)
- 3.4 Oncogenes (K3)
- 3.5 Tumor markers (K1)
- 3.6 AIDS, COVID: Causes, Clinical features, Diagnosis, Prevention and Treatment (K2, K3)

**Unit - IV: (9 Hours)**

- 4.1 Hypertension-Causes, Clinical features, Management (K2, K3)
- 4.2 Heart attack- Causes, Clinical features and Prevention (K3)
- 4.3 Dementia-Types, Causes, Symptoms and Treatment (K3, K4)
- 4.4 Seizures (K2)
- 4.5 Coma (K2)
- 4.6 Autism- Causes, Clinical features and Treatment (K2, K3)

**Unit - V: (9 Hours)**

- 5.1 Anatomy of skin (K3)

- 5.2 Alopecia Areata- Classification, Causes, Clinical features and Treatment (K2, K3)
- 5.3 Hirsutism- Causes, Clinical features and Treatment (K2)
- 5.4 Psoriasis (K2, K3)
- 5.5 Acne Vulgaris (K3)
- 5.6 Dandruff – Causes, Clinical features and Treatment (K2, K3)

**NOTE:** The study materials will be provided by the Department

**Reference Books:**

1. Davidson- Principles and practice of Medicine, Elsevier Publication, 9<sup>th</sup> edition, 2002
2. Richard A Goldsby, Thomas J Kindt, Barabra A Osborne, Janis Kubey- Immunology, WH Freeman and Company, 6<sup>th</sup> edition, 2003
3. Ada P Khan – Diabetes- Causes, Prevention and Treatment- Orient paperbacks, 2004
4. Virender N Sehgal -Diagnosis and treatment of common skin diseases, Jaypee Brothers Medical Pub, 5<sup>th</sup> edition, 2016
5. Chatterjea MN and Rana Shinde -Text Book of Medical Biochemistry - Jaypee Brothers-Medicinal Publishers Ltd, 8<sup>th</sup> edition -2012

**Open Educational Resources (OER):**

1. <https://youtu.be/P6bDq8sv9IA>
2. <https://youtu.be/p14tL18rORE>
3. <https://youtu.be/pZQ46fHFm2A>
4. <https://youtu.be/6akhmBqAe2g>
5. [https://youtu.be/Ep\\_nCSEDeAE](https://youtu.be/Ep_nCSEDeAE)
6. <https://youtu.be/rtPQHDWg-6M>
7. <https://youtu.be/ryox2SQKQPU>



**SEMESTER V / VI - NON-MAJOR ELECTIVE – III YEARS**

**UGBCBn20 – NON-MAJOR ELECTIVE: THERAPEUTIC AGENTS**

<b>Year/ Sem</b> III/ V/VI	<b>Course Code</b> UGBCBn20	<b>Title of the Course</b> Therapeutic Agents	<b>Course Type</b> Theory	<b>Course Category</b> Non-major elective - II	<b>H/W</b> 3	<b>Credits</b> 2	<b>Marks</b> <b>100</b> 40+60=100
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**Objective:**

To impart knowledge on action of drugs in treating diseases.

**Course Outcomes (CO)**

1. Analyze the drug dosage forms and its mechanism of action
2. Assess the role of vaccines in preventing diseases
3. Outline the role of antibiotics and its side effects
4. Acquire knowledge on the medicinal therapy for various health conditions and function of medicinal plants as therapeutics
5. Utilize the importance of first aid in accidents to preserve life

<b>CO / PO</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>
<b>CO 1</b>	H	H	H	M	H	M
<b>CO 2</b>	H	H	H	H	H	M
<b>CO 3</b>	H	M	H	H	H	H
<b>CO 4</b>	H	M	M	L	H	M
<b>CO 5</b>	H	H	H	H	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO 1</b>	H	H	H	M	H	M
<b>CO 2</b>	H	H	H	H	H	M
<b>CO 3</b>	H	M	H	H	H	H
<b>CO 4</b>	H	M	M	L	H	M
<b>CO 5</b>	H	H	H	H	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit - I:** (9 Hours)

- 1.1 Drug – Definition – Nature of drug (K1, K2)
- 1.2 Dosage forms of Drugs (K1, K2, K3)
- 1.3 Routes of administration (K1, K2, K3)
- 1.4 Drug Absorption – Drug Distribution (K1, K2, K3, K4)
- 1.5 Termination of Drugs – Elimination of Drugs (K1, K2, K3, K4)
- 1.6 Biotransformation (K1, K2, K3)

**Unit - II:** 9 Hours)

- 2.1 Vaccines - Definition (K1, K2, K3)
- 2.2 Types of vaccines: Attenuated live Vaccine (K1, K2, K3)
- 2.3 Killed Viral Vaccine and examples (K1, K2, K3)
- 2.4 Types of Immunization (K1, K2, K3)
- 2.5 Immunization Schedule for Children (K1, K2, K3)
- 2.6 Immunization under special circumstances (K1, K2, K3)

**UNIT - III:** (9 Hours)

- 3.1 Antibiotics: Definition (K1, K2, K3)
- 3.2 Therapeutic role of Penicillin, Erythromycin, Tetracycline, Streptomycin and Chloramphenicol (K1, K2)
- 3.3 Uses of Antiseptics (K1, K2)
- 3.4 Disinfectant and its types (K1, K2)
- 3.5 Analgesics: Morphine, Aspirin, Paracetamol (K1, K2, K3)
- 3.6 Anaesthetics: Chloroform, Procaine (K1, K2, K3)

**Unit - IV:** (9 Hours)

- 4.1 Medical Therapies for Mouth Ulcer (K1, K2, K3)
- 4.2 Definition, symptoms, causes, diagnosis and treatment of Gallstones (K1, K2, K3)
- 4.3 Definition, symptoms, causes, diagnosis and treatment of Urinary Stones (K1, K2, K3)
- 4.4 Definition, symptoms, causes, diagnosis and treatment of Intestinal Worms (K1, K2, K3)
- 4.5 Medicinal plants: Tulsi, Mint (K1, K2)
- 4.6 Medicinal plants: Neem, Turmeric (K1, K2)

**Unit - V:****(9 Hours)**

- 5.1 First Aid: Important Rules of First Aid - First Aid Box (K1, K2, K3)
- 5.2 Cuts and Abrasions – Types of Bleeding (K1, K2, K3)
- 5.3 Types of Fractures (K1, K2, K3)
- 5.4 Types of Burns, Fainting (K1, K2, K3)
- 5.5 Poisonous Bites - Some Common Poisons and their antidotes (K1, K2, K3)
- 5.6 Acid Poisoning - Alkali Poisoning and poisoning by Disinfectant (K1, K2, K3)

**Note:** The study materials will be provided by the Department

**Text Books:**

1. Jayashree Ghosh. A Textbook of Pharmaceutical Chemistry. SS Chand and Company -5<sup>th</sup> edition , 2014
2. Kanai L Mukherjee. Medical Laboratory Technology. Tata Graw Hill Publication Company Limited - Volume I, 2010

**Reference Books:**

1. Davidson and Henry - Clinical diagnosis by Laboratory Methods. edition -Saunders Publisher, 22<sup>nd</sup> edition, 2011
2. Antia FP and Philip Abraham - Clinical Dietetics and Nutrition - 4<sup>th</sup> edition - OUP India,2002
3. Jose L Martinez- Ethnobotany application of medicinal plants - CRC Press, 2018
4. Leon Shargel and Andrew B.C Yu. Applied Biopharmaceutics and Pharmacokinetics. McGraw-Hill Education/Medical; 7<sup>th</sup> edition, 2015.
5. Laurence Bruton, Bjorn Knollman and Randa Hilal- Dandan. The Pharmacological Basis of Therapeutics. Kindle 13<sup>th</sup> edition, 2019

**Open Educational Resources (OER):**

1. <https://youtu.be/EakBZqmmfMQ>
2. <https://youtu.be/qrNUPA0xaLY>
3. <https://www.dictionary.com/e/disinfectant-vs-antiseptic/>
4. <https://youtu.be/GErcHVxxK5c>
5. <https://youtu.be/V1YiDNEqOHM>

### SEMESTER III

#### USCHA320 - SKILL BASED ELECTIVE: INDUSTRIAL CHEMISTRY

Year: II	Course Code	Title of the Course	Course Type	Course category	H/W	Credits	Marks
SEM:III	USCHA320	Industrial Chemistry	Theory	Skill Based Elective	2	2	100

#### Learning Objectives:

1. To acquire an in depth knowledge on various areas of industrial chemistry like polymers, leathers, textile, fuels, glasses, ceramics, cements and paints.
2. To help the students enhance the reasoning skills and understand the working of industrial processes.

#### Course Outcomes:

The Learners will be able to

1. Discuss the composition, characteristics and manufacture of various industrial products. (Polymer, Leather, Textile, Glass, Ceramics, Cements, Paints and Pigments).
2. Explain the various process involved in the manufacture of leathers and leather products.
3. Describe the importance of natural and synthetic fibres in textile industry.
4. Understand the classifications of fuels and learn the common terms related to it.
5. Understand how to implement the concepts in industrial working environment.

CO	PSO					
	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	H	H	H	M	H
CO5	H	H	H	H	M	H
CO	PO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H

<b>CO3</b>	H	H	H	H	M	H
<b>CO4</b>	H	H	H	H	M	H
<b>CO5</b>	H	H	H	H	M	H

### **Unit I: (6 Hours)**

- 1.1 Introduction- terms involved in polymers. (K1 & K2)
- 1.2 Classification of polymers. (K1, K2& K3)
- 1.3 Polymerization, types of polymerization. (K1, K2 & K3)
- 1.4 Preparation, properties and uses of natural polymers. (K1 & K2)
- 1.5 Preparation, properties and uses of synthetic rubber- polyvinyl chloride, polyester, polyamide. (K1, K2 & K3)
- 1.6 Biodegradable polymers. (K1 & K2)

### **Unit II: (6 Hours)**

- 2.1 Introduction-constituent of animal skin. (K1 & K2)
- 2.2 Preparation of hides for tanning. (K1 & K2)
- 2.3 Process - cleaning and soaking, liming and unhairing, deliming, bating and pickling. (K1, K2 & K3)
- 2.4 Leather tanning-vegetable and chrome tanning. (K1, K2 & K3)
- 2.5 Finishing process- dyeing and fat liquoring. (K1, K2 & K3)
- 2.6 Cleaner processing and practices in beam house, Effluent treatment (K1, K2 & K3)

### **Unit III: (6 Hours)**

- 3.1 Introduction to textile fibres-Classificationof textile fibres. (K1 & K2)
- 3.2 Differences between natural and synthetic fibres. (K1 & K2)
- 3.3 Synthetic fibres- Preparation and properties of Rayon and Nylon. (K1, K2 & K3)
- 3.4 Textile chemical processing for the fibres-Singeing, de-sizing, scouring, bleaching, mercerization. (K1, K2, K3 & K4)
- 3.5 Textile dyes- difference between pigments and dyes. (K1 & K2)
- 3.6 Classification of dyes- vat dyes, Azo dyes, chrome dyes, Acid and base dyes. (K1 & K2)

### **Unit IV: (6 Hours)**

- 4.1 Introduction- Classification of fuels. (K1 & K2)
- 4.2 Solid fuel-coal and coke- composition and properties. (K1 & K2)
- 4.3 Liquid fuel- Petroleum processing and fractions, Biofuels.(K1 & K2)
- 4.4 Cracking- catalytic cracking and methods-Knocking- octane number and cetane number. (K1, K2 & K3)
- 4.5 Synthetic petrol-Fischer Tropsch and Bergius processes. (K1, K2 & K3)
- 4.6 Fuel gases- Natural gas and Water gas. (K1 & K2)

## **Unit V: (6 Hours)**

- 5.1 Glass- Raw materials- characteristics. (K1 & K2)
- 5.2 Methods of Manufacture- melting, shaping, annealing, finishing- special glasses. (K1, K2 & K3)
- 5.3 Refractories- characteristics, classification and properties. (K1 & K2)
- 5.4 General methods of manufacture of refractories. (K1, K2 & K3)
- 5.5 Cement- composition, setting of cement- crystalline and colloidal theory. (K1, K2 & K3)
- 5.6 Paints and pigments- Constituent of paints, pigments- white lead, ultramarine, Chrome yellow. (K1, K2 & K3)

## **References:**

1. B.K. Sharma, Industrial Chemistry, Goel Publishing House, Meerut, 2016.
2. B.N.Chakrabarty, Industrial Chemistry, Oxford & IBH Publishing Co, New Delhi, 1981.
3. P.C. Jain, Monika Jain, Engineering Chemistry, Dhanpat Rai Publishing Co (P) Ltd, 2018.
4. K. SesaMaheswaramma, MridulaChugh, Engineering Chemistry, Pearson Education India, 2016.
5. Thomas Bechtold, Tung Pham, Textile Chemistry, Walter de Gruyter GmbH & Co, 2019.
6. Jayashree Ghosh, A Textbook of Pharmaceutical Chemistry, S.Chand and Company Ltd., Reprint 2013.

## **Open Educational Resources (OER):**

1. <https://plastics.americanchemistry.com/How-Plastics-Are-Made/>
2. <http://wwwchem.uwimona.edu.jm/courses/CHEM2402/Textiles/Leather.html>
3. <http://www.petroleum.co.uk/>
4. <https://nios.ac.in/media/documents/313courseE/L34A.pdf>

## SEMESTER 1V

### USCHB420 - SKILL BASED ELECTIVE: AGRICULTURAL CHEMISTRY

<b>Year: II</b>	<b>Course Code</b>	<b>Title of the Course</b>	<b>Course Type</b>	<b>Course Category</b>	<b>H/W</b>	<b>Credits</b>	<b>Marks</b>
<b>SEM: IV</b>	USCHB420	Agricultural Chemistry	Theory	Skill Based	2	2	100

#### Learning Objectives:

1. To impart elementary ideas of soil chemistry, types of farming, insecticides, fungicides and herbicides.
2. To emphasize the importance of fertilizers.

#### Course Outcomes:

The Learners will be able to

1. Understand the scope of agriculture in India and Tamil Nadu.
2. Explain the physical and chemical properties of soil.
3. Describe the types of farming.
4. Summarize the certification of organic products.
5. Identify the benefits and adverse effects of pesticides.

CO	PSO					
	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	H	H	H	M	H
CO5	H	H	H	H	M	H

CO	PO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H

<b>CO3</b>	H	H	H	H	M	H
<b>CO4</b>	H	H	H	H	M	H
<b>CO5</b>	H	H	H	H	M	H

### **Unit I: (6 Hours)**

- 1.1 Agriculture – Definition – Scope of agriculture in India and Tamil Nadu. (K1 & K2)
- 1.2 Branches of agriculture. (K1 & K2)
- 1.3 Agronomy – Art, Science and business of crop production. (K1 & K2)
- 1.4 Agronomical classification of crops - their importance. (K1 & K2)
- 1.5 Major crops of India and Tamil Nadu, Water resources in Tamil Nadu. (K1 & K2)
- 1.6 Factors affecting crop production – Moisture, aeration, light, temperature and nutrients. (K1 & K2)

### **Unit II: (6 Hours)**

- 2.1 Soil chemistry – Introduction, soil classification and survey. (K1 & K2)
- 2.2 Properties of soil – soil texture and soil water. (K1 & K2)
- 2.3 Soil temperature and soil colloids. (K1 & K2)
- 2.4 Soil minerals and soil pH. (K1 & K2)
- 2.5 Soil acidity – alkalinity and buffering soil. (K1 & K2)
- 2.6 Soil fertility and soil formation. (K1 & K2)

### **Unit III: (6 Hours)**

- 3.1 Farming – types – subsistence farming and commercial farming. (K1 & K2)
- 3.2 Plantation farming, mixed farming and conventional farming. (K1 & K2)
- 3.3 Organic farming, poultry farming and dairy farming. (K1 & K2)
- 3.4 Advantages of organic farming- limitation of organic farming. (K1 & K2)
- 3.5 Certification of organic products – OFAI organic labeling system. (K1 & K2)
- 3.6 Research findings on organic food. (K1 & K2)

### **Unit IV: (6 Hours)**

- 4.1 Insecticides, Fungicides and Herbicides - Introduction. (K1 & K2)
- 4.2 Methods of using pest controls. (K1 & K2)
- 4.3 Insecticides – Arsenic compounds, fluorine compounds and boron compounds. (K1 & K2)
- 4.4 Insecticides- mercury compounds, copper compounds and sulphur compounds. (K1 & K2)
- 4.5 Modern insecticides – some important herbicides -Rodenticides. (K1 & K2)
- 4.6 Benefits of Pesticides, Adverse environmental effects of Pesticides. (K1 & K2)

### **Unit V: (6 Hours)**

- 5.1 Fertilizers – Classification- Examples of fertilizers. (K1 & K2)
- 5.2 Nitrogenous fertilizers- phosphate fertilizers- potash fertilizers. (K1 & K2)



5.3 Ill effects of fertilizers. (K1 & K2)

5.4 Manures, compost and saw dust. (K1 & K2)

5.5 Farmyard manure, compost, reinforcing manure and green manure. (K1 & K2)

5.6 Sewage and sludge - biogas production. (K1 & K2)

#### References:

1. Sankaran, S. and V.T. Subbiah Mudaliar. Principles of Agronomy. The Bangalore Printing and Publishing Co. Ltd., Bangalore. 1997
2. Principles and Practices of Agronomy. Agrobios. Jodhpur - 342 002.
3. Jayashree Ghosh. Fundamental Concepts of Applied Chemistry. S. Chand Publishing Ltd., 2006.
4. Kirpal Singh. Chemistry in Daily life 1<sup>st</sup> Edition, Prentice Hall of India Pvt. Ltd., 2008.

#### Open Educational Resources (OER):

1. <https://nptel.ac.in/courses/126/105/126105016/>
2. <https://nptel.ac.in/courses/126/105/126105016/>
3. <https://nptel.ac.in/content/storage2/courses/103107086/module1/lecture1/lecture1.pdf>
4. <https://nptel.ac.in/courses/126/105/126105014/>

### UGCHB520/620 -COSMETICS AND DYES

<b>Year: III</b> <b>SEM:</b> <b>V/VI</b>	<b>Course Code:</b> UGCHB520/620	<b>Title of the Course:</b> Cosmetics and Dyes	<b>Course Type:</b> Theory	<b>Course Category:</b> Elective	<b>H/ W</b> 3	<b>Credits</b> 2	<b>Marks</b> 100
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#### Learning Objectives:

1. To give a basic introduction to cosmetics, their classification and uses.
2. To give a broad overview on the disadvantages of using synthetic cosmetics over herbal cosmetics, cosmetic safety and evaluation method, etc.
3. To give an introduction to dyes and their applications in various industries from textile to pharmacy and food, contribution of various industries to environmental pollution and its effect on human health.

#### Course Outcomes:

The learners will be able to

1. Define and classify cosmetics, deodorants, antiperspirants, perfumes, aerosols and identify the pros and cons of synthetic cosmetics.
2. Describe the safety assessment methods used by FDA.
3. Prepare and use fruits and vegetables based herbal cosmetics and evaluate the significance of aromatherapy and apply it to human health and beauty.
4. Explain the properties of natural and synthetic dyes.

5. Understand the impact of dyes used in textile and leather industry to environmental pollution and analyse the importance of dyes in pharmaceutical and food industry.

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

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	H	H	H	M	H
CO5	H	H	H	H	M	H

**Unit I: (9 hours)**

- 1.1 Cosmetics – definition & classification based on use. (K1, K2)
- 1.2 Components of cosmetics. (K1, K2)
- 1.3 Deodorants, antiperspirants. (K1, K2)
- 1.4 Aerosols, perfumes and fragrances. (K1, K2)
- 1.5 Pros and cons of synthetic cosmetics. (K1, K2, K3)

**Unit II: (9 hours)**

- 2.1 Safety of Cosmetics. (K1, K2)
- 2.2 Basic concept of cosmetic safety. (K1, K2)

- 2.3 Safety test items. (K1,K2,K3)
- 2.4 Evaluation method. (K1, K2, K3)
- 2.5 Skin irritation, sensitization. (K1, K2)
- 2.6 Testing on human (Patch test, Usage test). (K1, K2)

### **Unit III: (9 hours)**

- 3.1 Herbal cosmetics. (K1, K2)
- 3.2 Fruits and vegetables as hair care and skin care (apple, apricot, banana, carrot, cucumber, honey, lemon, tomato). (K1, K2)
- 3.3 Herbal Perfumes and fragrance. (K1, K2)
- 3.4 Skin care herbs – olive oil, sesame oil, black pepper, Amla. (K1, K2, K3)
- 3.5 Aromatherapy – various oils used in aromatherapy and their significance. (K1,K2, K3)
- 3.6 Standardization of herbs – importance, methods employed for standardization of herbal extracts. (K1, K2)

### **Unit IV: (9 hours)**

- 4.1 Dyes - definition of dyes and types. (K1, K2)
- 4.2 Requirements of a good dye i.e.Colour, chromophore and auxochrome, solubility, linearity, coplanarity, fastness, substantivity, definition of fastness and its properties. (K1, K2,K3)
- 4.3 Mordants Definition with examples. (K1, K2)
- 4.4 Natural dyes - Definition; Advantages and limitations of natural dyes. (K1, K2)
- 4.5 Examples and uses of natural dyes with respect to henna, turmeric, saffron, indigo, chlorophyll –names of the chief dyeing material/s in each of the natural dye (structures not expected) (K1, K2)
- 4.6 Synthetic dyes - definition of synthetic dyes, primaries and intermediates. (K1, K2)

### **Unit V: (9 hours)**

- 5.1 Textile uses of dyes - impact of the textile and leather dye Industry on the environment with special emphasis on water pollution.(K1, K2, K3, K4)
- 5.2 Non textile uses of dyes - biomedical uses – Tablets, syrups and capsules. (K1, K2, K3, K4)
- 5.3 DNA markers and therapeutics. (K1, K2, K3)
- 5.4 Dyes in food and cosmetics - commonly used food colors and their limits. (K1, K2, K3)
- 5.5 Properties of dyes used in food and cosmetics. (K1, K2, K3)
- 5.6 Dyes sensitized solar cells – A tool to overcome the future energy crisis. (K1, K2)

### **Reference Books:**

1. Venkatraman K, Chemistry of Synthetic Dyes, Vol I – VIII, Academic Press 1972.
2. Lubs H.A., Robert E . The Chemistry of Synthetic Dyes and Pigments, Krieger Publishing Company, NY 1995.
3. Shenai V.A., Chemistry of Dyes and Principles of Dyeing, Sevak Publications, 1973.

4. Sodhi. G. S., Fundamental Concepts of Environmental Chemistry, 3rd Edition, Narosa Publishers, 2013.
5. Kirpal Singh, Chemistry in Daily Life, 3rd Edition, Prentice Hall of India Pvt., Ltd., 2012.
6. Dr. J. C. Kurian, Plants that heal, Vol 1., P.H. Lall, Oriental Watchman Publishing House, 1995.
7. C P Khare, Indian Medicinal plants: An illustrated Dictionary, Springer Science, 2007.
8. BehlPN, Srivatsava G., Herbs useful in dermatological Therapy, 2<sup>nd</sup> Edition, CBS Publishers & Distributors, 2002.
9. H. Panda, Herbal Soaps and Detergents Handbook, NIIR project consultancy services, 2011.
10. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, 2<sup>nd</sup> Edition, S. Chand & Company Ltd., New Delhi, 2006.
11. B C Maumdar, P C Mukhopadhyay, Principles and Practice of Herbal Garden, Daya Publishing House, New Delhi, 2006.

#### **Open Educational Resources (OER)**

1. <http://fsdaup.gov.in/reg-drug-and-costmetic.htm>
2. <https://www.theherbarie.com/The-Herbarie-Formulary.html>
3. [https://www.medicalnewstoday.com/articles/10884#essential\\_oils](https://www.medicalnewstoday.com/articles/10884#essential_oils)
4. <https://www.britannica.com/technology/dye>

### **UNEVS20: ENVIRONMENTAL STUDIES**

**II UG – B.A / B.Sc. / B.Com / B.B.A / BCA / BHA**

**SEMESTER-IV**

**UNEVS20– ENVIRONMENTAL STUDIES**

<b>Year/ Sem</b>	<b>Course Code</b>	<b>Title of the Course</b>	<b>Course Type</b>	<b>Course Catego ry</b>	<b>H/ W</b>	<b>Credits</b>	<b>Marks</b>
II/IV	UNEVS20	Environment al Studies	Theory	General paper	2	2	40+60=100

## **COURSE LEARNING OUTCOMES (CLO):**

On completion of the course, the students will be able to,

1. Gain knowledge on multidisciplinary nature of Environmental studies
2. Understand the Ecosystem, its structure and function
3. Understand the conservation of Biodiversity
4. Gain knowledge on Environmental pollution, causes and its effects
5. Apply the Laws in Prevention of Environment.

### **UNIT I: Multidisciplinary nature of Environmental studies: (6 hours)**

- 1.1 Definition, scope and importance (K2, K3)
- 1.2 Need for public awareness (K1, K3)
- 1.3 Natural resources: Renewable and non-renewable resources (K3, K4)
- 1.4 Forest Resources: Use and over-exploitation, deforestation (K3, K4)
- 1.5 Water Resources: Use and over-utilisation of surface and ground water (K1, K2)
- 1.6 Mineral Resources: Use and exploitation, environmental effects of extracting and Food resources (K2,K3)

### **UNIT II: Ecosystem: (6 hours)**

- 2.1 Concept of an Ecosystem (K2, K3)
- 2.2 Structure and functions of an Ecosystem (K1, K3)
- 2.3 Energy flow in the ecosystem-Water cycle and carbon cycle (K4)
- 2.4 Food chain, food web and ecological pyramids (K3)
- 2.5 Structure and functions of forest and grassland ecosystem (K2,K3)
- 2.6 Structure and functions of desert and aquatic ecosystem (K1,K3)

### **UNIT III: Biodiversity and its Conservation: (6 hours)**

- 3.1 Definition: Genetic, Species, Ecosystem Diversity ( K1, K2)
- 3.2 Biogeographic classification of India (K1, K2)
- 3.3 Value of biodiversity: consumptive, productive use, social, ethical, aesthetic (K2, K4)
- 3.4 Hot spots of Biodiversity, Endangered and Endemic species of India (K2,K3)
- 3.5 Threats to Biodiversity:habitat loss, poaching of wildlife, man-wildlife conflicts( K3, K4)
- 3.6 Conservation of Biodiversity: in-situ and ex-situ (K3, K4)

### **UNIT IV: Environmental pollution:(6 hours)**

- 4.1 Definition, causes, effects and control measures of air, water, soil and noise pollution (K2, K3)
- 4.2 Solid waste management: causes, effects and control measures of urban and industrial waste (K2,K3)
- 4.3 Climate change, global warming, (K3)
- 4.4 Acid rain, ozone layer depletion (K3)
- 4.5 Disaster management: floods, earthquakes, cyclones, landslides (K1,K3)
- 4.6 Rainwater harvesting (K1,K2)

### **UNIT V: Human Population and Environment: (6 hours)**

- 5.1 Environmental acts- Environment Protection Act (1986), (K1, K3)
- 5.2 Air (Prevention and Control of Pollution Act 1981), Water (Prevention and Control of Pollution Act 1976 (K2, K3)
- 5.3 Wildlife Protection Act (1972), Forest Conservation Act (1980) (K2)
- 5.4 Population explosion – family welfare program (K1,K3)
- 5.5 Infectious diseases and Water related diseases (K2, K3)
- 5.6 Role of information technology in Environmental conservation. (K1,K2)

**TEXT BOOKS:**

1. Dr. V. Balu – Environmental Studies. 2004.
2. N. Arumugam – Concepts of Ecology, 2014.

**REFERENCE BOOKS:**

1. Verma and Agarwal – Environmental Biology, 2015.
2. Anubha Kaushik & Kaushik .C .P(2008)-Perspectives in Environmental studies (3rd Edition )New age International publishers.
3. Environmental studies, Edition: Periyar EVR college, Trichy, Jazym Publications,Trichy, 2004.

**OPEN EDUCATIONAL RESOURCES (OER):**

1. <https://youtu.be/PwmSa09Cl6E>
2. <https://youtu.be/brFORWJyx9w>
3. [https://youtu.be/76K\\_5SrYyM4](https://youtu.be/76K_5SrYyM4)
4. <https://youtu.be/PqxMzKLYrZ4>

## UG MICROBIOLOGY

### UCMBK18 - MICROBIAL ECOLOGY AND SOIL MICROBIOLOGY

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: VI	UCMBK20	Microbial Ecology and Soil Microbiology	Theory	Core	5	5	100

**Course Objective:** To facilitate students understanding on the microorganisms present in their environments and their habitat, microbial interaction, biogeochemical cycling and waste management.

#### Course Outcomes (CO):

At the end of the course, the learners will be able to;

**CO1:** Compare the role of microbial communities in the environment and discuss on the significance of Aero and Water Microbiology

**CO2:** Assess on the microbiological aspects of management of sewage and design the treatment procedures.

**CO3:** Outline on the importance of bioremediation and biodegradation of xenobiotic compounds.

**CO4:** Familiarize with microorganisms of soil and their role in biogeochemical cycle.

**CO5:** Comprehend the importance of plant- microbe interactions.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	M	L	M
CO2	H	H	H	L	L	M
CO3	H	M	M	H	M	M
CO4	H	M	H	H	M	M
CO5	H	M	H	M	M	M

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	H	H	L	M
CO2	H	L	H	M	L	M
CO3	H	M	H	L	L	M
CO4	H	H	H	M	L	L
CO5	H	L	H	L	L	M

- H – HIGH (3)**  
**M – MODERATE (2)**  
**L – LOW (1)**

## **COURSE SYLLABUS**

### **UNIT I: Aero Microbiology and Water Microbiology. (15 hours)**

- 1.1 Microbes of air, Droplet, Droplet nuclei, aerosol. Assessment of air quality, solid- liquid impingement method. (K1,K2,K3,K4)
- 1.2 Brief account of air borne transmission of microbes and diseases. (K1,K2)
- 1.3 Microbiology of water – Types of water- potability of water (K1,K2)
- 1.4 Microbial assessment of water quality. (K1,K2,K3,K4)
- 1.5 Brief account on water borne diseases. (K1,K2)
- 1.6 Municipal water treatment method process. (K1,K2,K3,K4)

### **UNIT II: Sewage treatment. (15 hours)**

- 2.1 Sewage– Chemical and Microbiological characteristic of sewage. (K1,K2)
- 2.2 Types of wastes - Characterization of solid and liquid waste (K1,K2)
- 2.3 Sewage treatment methods– Primary treatment. (K1,K2,K3)
- 2.4 Sewage treatment - Secondary, anaerobic – methanogenesis, aerobic – trickling filters , activated sludge, oxidation pond. (K1,K2,K3)
- 2.5 Tertiary treatment- sewage disinfection. (K1,K2,K3)
- 2.6 Utilization of solid and liquid wastes- saccharification – gasification – composting. (K1,K2,K3)

### **UNIT III: Biodeterioration and remediation. (15 hours)**

- 1.1 Bioaugmentation, recalcitrants/xenobiotic compounds -Bioremediation, biodeterioration- Definition. (K1,K2)
- 1.2 Deterioration of paper. (K1,K2,K3)
- 1.3 Deterioration of leathers. (K1,K2,K3)
- 1.4 Deterioration of wood. (K1,K2,K3)
- 1.5 Deterioration of textiles /fabrics. (K1,K2,K3)
- 1.6 Metal corrosion – Biocorrosion. (K1,K2,K3)

### **UNIT IV: Microbiology of soil. (15 hours)**

- 1.1 Microorganisms in soil – qualitative and quantitative microflora of different soils. (K1,K2,K3)



- 1.2 Role of microorganisms in soil fertility. Enumeration of microorganisms in soil. (K1,K2,K3)
- 1.3 Factors affecting soil microflora – moisture, pH, temperature, organic matter, agronomic practices. (K1,K2,K3)
- 1.4 Bio-Geo chemical cycles – Nitrogen cycle (K1,K2)
- 1.5 Phosphorus cycle and sulphur cycle. (K1,K2)
- 1.6 Carbon cycle and iron cycle. (K1,K2)

#### **UNIT V: Plant - Microbe interactions. (15 hours)**

- 1.1 Overview on Plant Microbe interactions. (K1,K2)
- 1.2 Inter relationships between plants and Microorganisms – Rhizosphere, Rhizoplane, Phyllosphere, Spermosphere – their importance in plant growth. (K1,K2)
- 1.3 Mycorrhiza – ecto and endo mycorrhiza – AM fungi – distribution and importance. (K1,K2, K3)
- 1.4 Lichens and their role. (K1,K2)
- 1.5 Symbiotic Nitrogen fixation - Root nodule bacteria. (K1,K2, K3)
- 1.6 Non- symbiotic nitrogen fixation (K1,K2,K3)

#### **TEXT BOOKS:**

1. Vijaya Ramesh K (2004). Environmental Microbiology. 1<sup>st</sup> edition, MJP publishers. Chennai
2. Joseph C. Daniel (1999). Environmental aspects of Microbiology. 1<sup>st</sup> edition, Bright Sun publications, Chennai.
3. Subba Rao N.S (2004). Soil Microbiology. 4<sup>th</sup> edition, Oxford and BH Publishing Co.Pvt. Ltd., New Delhi.

#### **REFERENCE BOOKS:**

1. Murugesan A.G and Rajakumari C (2005). Environmental Science and Biotechnology. 1<sup>st</sup> edition, MJP Publishers, Chennai.
2. Singh D.P and Dwivedi S.K (2005). Environmental Microbiology and Biotechnology. 1<sup>st</sup> edition, New Age International (P) Ltd., New Delhi.
3. Mishra RR (2004). Soil Microbiology. 1<sup>st</sup> edition, CBS Publishers and distributors, New Delhi.
4. Rangaswami G and Mahadevan A (2002). Disease of Crop Plants in India. 4<sup>th</sup> edition, PHI Learning (P) Ltd., New Delhi.

5. Atlas R.M. and Bartha R (1992). Microbial Ecology, Fundamental and Application, 3<sup>rd</sup> edition, Bengamin and Cummings. United States.

**OER:**

**E- CONTENT FOR LEARNING:**

1. <http://www.learnerstv.com/>
2. <http://webcast.berkeley.edu/>
3. <http://cosmolearning.org/>
4. <http://www.world-lecture-project.org/>
5. <http://cec.nic.in/>
6. <http://epgp.inflibnet.ac.in/>
7. <http://www.co-learn.in/>

**UAMBB20- ALLIED IV: MICROBIOLOGY – II**

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: IV	UAMBB20	Allied IV: Microbiology-II	Theory	Allied	4	4	100

**Course Objective:** To make the students know about the third major component of the biotic system and provide a detailed insight on the significance microbes in different environments.

**Course Outcomes (CO):**

At the end of the course, the learners will be able to;

**CO1:** Discuss the role of microorganisms in soil and biogeochemical cycles.

**CO2:** Disseminate knowledge on the potability of water, purification of municipal water supplies and sewage treatment process

**CO3:** Communicate sources of airborne pathogens and the diseases caused.

**CO4:** Explain Food borne diseases and outline on the contamination, spoilage and preservation of food.

**CO5:** Compile on different types of fermentation and fermented microbial product.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	H	H	L	M
CO2	H	H	H	M	L	M
CO3	H	H	H	L	L	M
CO4	H	H	H	L	L	M
CO5	H	H	H	L	L	H

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	H	H	L	M
CO2	H	H	H	M	L	M
CO3	H	H	H	L	L	M
CO4	H	H	H	L	L	M
CO5	H	H	H	L	L	H

**H – HIGH (3)**

**M – MODERATE (2)**

**L – LOW (1)**

## **COURSE SYLLABUS**

### **UNIT I: Microbiology of soil and Biogeochemical cycle. (12 hours)**

- 1.1 Microbiology of soil - Microbes in soil. (K1,K2)
- 1.2 Rhizosphere, rhizoplane and phylloplane. (K1,K2)
- 1.3 Nitrogen fixation (symbiotic and non-symbiotic) - nitrifying and denitrifying bacteria. (K1,K2)
- 1.4 Biogeochemical cycle – Carbon cycle, Nitrogen cycle. (K1,K2)
- 1.5 Sulphur cycle and phosphorus cycle. (K1,K2)
- 1.6 Phosphate solubilizers and sulphur bacteria -Bacterial Biofertilizers. (K1,K2)

### **UNIT II: Microbiology of water. (12 hours)**

- 1.1 Microbiology of water – types of water – potable water. (K1,K2)
- 1.2 Municipal water purification. (K1,K2)
- 1.3 Sewage treatment process – An overview. (K1,K2)
- 1.4 Primary, Secondary and tertiary treatment process. (K1,K2)
- 1.5 Sewage disinfection and disposal. (K1,K2)
- 1.6 Water borne diseases. (K1,K2)

### **UNIT III: Aero Microbiology. (12 hours)**

- 1.1 Microbiology of air- An overview. (K1,K2)
- 1.2 Indoor and outdoor microflora. (K1,K2)
- 1.3 Distribution and source of airborne organisms – Droplet, Droplet nuclei and Infectious dust. (K1,K2)
- 1.4 Assessment of air quality. (K1,K2, K3)
- 1.5 Air sanitation. (K1,K2, K3)
- 1.6 Airborne diseases. (K1,K2)

### **UNIT IV: Food Microbiology (12 hours)**

- 1.1 Food Microbiology – An introduction. (K1,K2)
- 1.2 Food preservation techniques- asepsis, high temperature and low temperature. (K1,K2,K3)
- 1.3 Food preservation techniques – drying, radiation and food additives. (K1,K2, K3)
- 1.4 Microbial spoilage of food - vegetables and fruits, cereal and cereal products. (K1,K2)
- 1.5 Microbial spoilage of food – meat and meat products, milk and milk products. (K1,K2)
- 1.6 Food borne diseases. (K1,K2)

## **UNIT V: Fermentation and Industrial production. (12 hours)**

- 5.1 Fermentation- types of fermentation. (K1,K2)
- 5.2 Fermentor- structure and types. (K1,K2)
- 5.3 Industrial production – Antibiotic (Penicillin). (K1,K2)
- 5.4 Industrial production - alcohol (Ethanol). (K1,K2)
- 5.5 Industrial production - organic acid (acetic acid). (K1,K2)
- 5.6 Industrial production - Vitamin (B12). (K1,K2)

### **TEXT BOOKS:**

1. Frazier W.C. and West Hoff D.C (2008). Food Microbiology. 4<sup>th</sup> edition. Mc Graw Hill, New York.
2. Joseph C. Daniel (1999). Environmental aspects of Microbiology. 1<sup>st</sup> edition, Bright Sun publications, Chennai.
3. Subba Rao NS (2004). Soil Microbiology. 4<sup>th</sup> edition, Oxford and BH Publishing Co.Pvt. Ltd., New Delhi.

### **REFERENCE BOOKS:**

1. Vijaya Ramesh K (2004). Environmental Microbiology. 1<sup>st</sup> edition, MJP publishers. Chennai
2. Casida, J.E (1986), Industrial Microbiology. 1<sup>st</sup> edition. Wiley Eastern publishers. UK
3. Patel A.H (2001). Industrial Microbiology. 3<sup>rd</sup> edition. Mac Millan India ltd, Chennai.

### **OER:**

#### E-books

1. [www.gutenberg.org](http://www.gutenberg.org)
2. [www.free-ebooks.net](http://www.free-ebooks.net)
3. [www.e-booksdirectory.com](http://www.e-booksdirectory.com)

#### Video lessons

1. [www.learnerstv.com](http://www.learnerstv.com)
2. [www.webcast.berkeley.edu](http://www.webcast.berkeley.edu)
3. [www.cosmolearning.org](http://www.cosmolearning.org)

**UGMBB20 – NON MAJOR ELECTIVE: WASTE WATER MICROBIOLOGY**

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: V & VI	UGMBB20	Waste water Microbiology	Theory	Non Major Elective	3	2	100

**Course Objective:** To provide in depth knowledge on the significance of waste water and on waste water and its treatment cum recycling methods.

**Course Outcomes (CO):**

At the end of the course, the learners will be able to;

**CO1:** Use the available technologies for physical, chemical and biological treatment of municipal water.

**CO2:** Demonstrate the microbiological analysis of potable water and brief out water borne diseases.

**CO3:** Outline bioremediation of pesticides, heavy metals and oil spills.

**CO4:** Explain the sewage treatment process.

**CO5:** Utilization of solid and liquid waste.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	L	H	L	L	H
CO2	H	M	H	M	L	M
CO3	H	H	H	L	M	H
CO4	H	L	H	L	L	M
CO5	H	L	H	L	L	M

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	L	L	M
CO2	H	M	H	L	M	M
CO3	H	M	H	L	H	H
CO4	H	H	H	L	M	H
CO5	H	M	H	L	M	M

**H – HIGH (3)**

**M – MODERATE (2)**

**L – LOW (1)**

## **COURSE SYLLABUS**

### **UNIT I: Microbiology of water and treatment of municipal water supplies. ( 9 hours)**

- 1.1 Microbiology of water. (K1,K2)
- 1.2 Types of water. (K1,K2)
- 1.3 Potability of water. (K1,K2)
- 1.4 Sources of drinking water. (K1,K2)
- 1.5 Treatment method of municipal water supplies – Sedimentation and filtration. (K1,K2)
- 1.6 Disinfection of water- chlorination. (K1,K2)

### **UNIT II: Detection of potability of water and water borne diseases. ( 9 hours)**

- 2.1 Indicators of faecal contamination. (K1, K2)
- 2.1 Methods to detect potability of water samples: Standard qualitative procedure: Most Probable Number test. (K1,K2, K3)
- 2.2 Membrane filtration technique. (K1,K2, K3)
- 2.3 Water-borne diseases- An overview. (K1,K2)
- 2.4 Bacterial, viral and Protozoal water borne diseases- their etiological agents and clinical symptoms. (K1,K2)
- 2.5 Prevention and control measures. (K1,K2, K3)

### **UNIT III: Water pollution. ( 9 hours)**

- 3.1 Water Pollution – Definition, sources of water pollution. (K1, K2)
- 3.2 Pollution of water bodies by heavy metals. (K1, K2)
- 3.3 Removal of heavy metals by biosorption. (K1, K2)
- 3.4 Removal of pesticides. (K1, K2)
- 3.5 Marine oil spill pollution. (K1, K2)
- 3.6 Removal of oil spills by using microorganisms. (K1, K2)

### **UNIT IV: Sewage treatment process. ( 9 hours)**

- 1.1 Characteristics of sewage and objectives in sewage treatment. (K1, K2)
- 1.2 Biological treatment of sewage: preliminary treatment. (K1, K2)
- 1.3 Secondary treatment - activated sludge process. (K1, K2)
- 1.3 Trickling filters. (K1, K2)
- 1.4 Anaerobic sludge digestion. (K1, K2)
- 1.5 Household waste water treatment. (K1, K2, K3)

## **UNIT V: Utilization of solid and liquid waste. ( 9 hours)**

5.1 Utilization of solid and liquid waste: Industrial re-use of effluents. (K1, K2)

5.2 Municipal reuse of effluent. (K1, K2)

5.3 Agricultural reuse of effluent (crop irrigation). (K1, K2)

5.4 SCP production. (K1, K2)

5.5 Composting (fertilizer). (K1, K2)

5.6 Aquaculture. (K1, K2)

### **TEXT BOOKS:**

1. Vijaya Ramesh K (2004). Environmental Microbiology. 1<sup>st</sup> edition, MJP publishers. Chennai.
2. Atlas R.M. and Bartha R (1992). Microbial Ecology, Fundamental and Application, 3<sup>rd</sup> Edition, Bengamin and Cummings. United States.

### **REFERENCE BOOKS:**

1. Joseph C. Daniel (1999). Environmental aspects of Microbiology. 1<sup>st</sup> edition, Bright Sun publications, Chennai.
2. Murugesan A.G and Rajakumari C (2005). Environmental Science and Biotechnology. 1<sup>st</sup> edition, MJP Publishers, Chennai.

### **OER:**

### **DIGITAL LIBRARIES:**

1. <http://www.loc.gov/>
2. <http://library.clark.edu/>
3. <http://www.dli.ernet.in/>
4. <http://www.loc.gov/education/>
5. <http://www.pdfdrive.com>



**FOCUS: ENVIRONMENTAL SUSTAINABILITY (NEEDS)**

**UG B.Sc VISUAL COMMUNICATION**

**SEMESTER IV – PAPER IV**

**UCVCG20 - MEDIA, CULTURE AND SOCIETY**

<b>Year: II</b>	<b>Course Code:</b>	<b>Title of the Course:</b>	<b>Course Type:</b>	<b>Course Category:</b>	<b>H/W</b>	<b>Credits</b>	<b>Marks</b>
<b>Sem: IV</b>	UCVCG20	Media culture and society	Theory	Core	6	4	100

**Objective:**

- To enable the students to understand the theories of media and the impact of media on society and culture

**Course Outcomes (CO)**

The Learners will be able to

CO1: Report and Restate the elements of society and its theories.

CO2: Illustrate the characteristics of culture and its models.

CO3: Analyze the various models of media and Categories the ecological perspective of media audience

CO4: Analyze the various models of media.

CO5: Evaluate the social issues of media.

<b>CO</b>	<b>PSO</b>					
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>CO1</b>	H	H	H	M	H	H
<b>CO2</b>	H	H	H	M	H	H

<b>CO3</b>	H	H	H	H	H	H
<b>CO4</b>	H	H	M	H	H	H
<b>CO5</b>	H	H	H	H	H	H

**(Low - L, Medium – M, High - H)**

**Course Syllabus:**

**Unit I: Concepts of society (18 hours)**

- 1.1. The definition of society (K1, K2)
- 1.2. Essential elements of society (K1, K2)
- 1.3. Understanding Mass Media (K1, K2, K3)
- 1.4. Theories of society: the mass society theory, functionalism, uses and Gratification theory, social construction theory (K2, K3, K4)
- 1.5. Communication technology determinism (K3, K4)
- 1.6. The information society. (K3, K4)

**Unit II: Concept of culture (18 hours)**

- 2.1. The definition of culture, characteristics of culture, (K1, K2)
- 2.2 Components of culture, functions of culture. (K1, K2, K3)
- 2.3. Media and popular culture,(K1, K2, K3)
- 2.4. Mass media culture and development (K1, K2, K3)
- 2.5. Development communication, modernization, (K1, K2, K3)

2.6. Models of development, dependency/structuralism model.(K1, K2, K3, K4 )

**Unit III: Media Audience (18 hours)**

3.1. Reception, (K1, K2)

3.2. Audience positioning, (K1, K2,K3)

3.3. Subjectivity, Pleasure (K1, K2)

3.4. Audience dynamics (K3, K4)

3.5. Impact of Media on Society (K1, K2,K3)

3.6. Ecological perspectives.(K3, K4)

**Unit IV: Media Analysis: (18 hours)**

4.1. Media Text, (K1, K2)

4.2. Media Ideology, (K1, K2, K3)

4.3. Media and Realism (class, Gender, Race, Age, Minorities, children),(K1, K2, K3, K4)

4.4. Approaches to Media Analysis (K1, K2, K3)

4.5. Marxist theory, semiotics, (K1, K2, K3)

4.6. Psychoanalytic.(K1, K2 K3, K4)

**Unit V: Alternate Media (18 hours)**

5.1. Alternative approaches to developments, (K1, K2, K3)

5.2. Revival of modernization models, (K1, K2, K3)

5.3. Peculiarity of Indian Society, Media in Indian society, (K1, K2, K3, K4)

5.4. Internet initiatives for rural development,(K1, K2, K3, K4)

5.5. Communication for development (K1, K2, K3)

5.6. Sensationalism, 4G, VR, gaming, mobile addiction.(K1, K2, K3, K4)

**Books for Study and Reference:**

1. Mukul Sahay – A Textbook of Communication Media and Society – Wisdom Press, Delhi, 2013.
2. KevalJ.Kumar - Mass Communication in India, 4<sup>rd</sup> Edition - Jaico Publication, 2011.
3. Graeme Burton - Media and Society Critical Perspectives, 2<sup>nd</sup> Edition - Tata McGraw Hill, 2010
4. PaulHodkinson,Media,Culture and Society:An Introduction,SAGE Publication Ltd,2010.
5. Michael O’Shaughnessy,JaneStadler,Media and Society an Introduction,Oxford University press,2005
6. Amos Owen Thomas - Media, Culture and Politics Across India, Sage Publication, 2005
7. McQuail Denis – Mass Communication Theory, 4<sup>th</sup> and 5<sup>th</sup> Edition - Sage Publication, 2000.
8. Silverstone rogers – Why study Media? –sage Publications- 1999
9. Berger, AsaAuthur,- Media Analysis Techniques- Sage Publications -1998.

### **SEMESTER V –PROJECT -1**

#### **UCVCN20 - DOCUMENTARY PRODUCTION**

<b>Year: III</b>	<b>Course Code: UCVCN20</b>	<b>Title of the Course: Documentary Production</b>	<b>Course Type: Project</b>	<b>Course Category: Core Elective</b>	<b>H/W 3</b>	<b>Credits 5</b>	<b>Marks 100</b>
<b>Sem: V</b>							

**Objective:**

- To train students in short-film making or documentary making by putting into practice the techniques learned in television production and script writing through team work.

Students will specialize in Television production and prepare a group project on any chosen theme. The editing of the project should be done with the editing software that is taught to the students during the course. The master copy of the production in a DVD format must be submitted along with the script and the storyboard.

**Course Outcomes (CO)**

**The Learners will be able to**

CO1: Analyzing the Concepts of Documentary production.

CO2: Implementing the Pre-Production process of Documentary.

CO3: Executing the Production process of Documentary.

CO4: Compile the Post Production Activities according to the Script.

CO5: Presenting the Documentation with Master Copy.

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

(Low - L, Medium – M, High - H)

**Exercise:** Documentary - 5 to 7 minutes

1. Proposal Format to be given (5 hours)
2. Script Approval (10 hours)
3. Story Board (15 hours)
4. Documentation (15 hours)

Cognitive Level: K1, K2, K3, K4.

The Internal Evaluation (40 marks) is based on the production process and the model viva.

The Semester Evaluation (60 marks) is based on the Viva-voce and the quality of the production presented for the Examination.

## SEMESTER VI – PROJECT – 2

### UCVCR20 - SHORT FILM PRODUCTION

<b>Year: III</b>	<b>Course Code: UCVCR20</b>	<b>Title of the Course: Short Film Production</b>	<b>Course Type: Project - 2</b>	<b>Course Category: Core</b>	<b>H/W</b> 4	<b>Credits</b> 5	<b>Marks</b> 100
<b>Sem: VI</b>							

**Objective:**

- To train students in short-film making or documentary making by putting into practice the techniques learned in television production and script writing

Students will specialize in Television/Radio Production and prepare an individual project on Documentary / short film on any chosen theme. The master copy of the production must be submitted along with the script.

**Course Outcomes (CO)**

The Learners will be able to

CO1: Identifying the Concepts of Short film production.

CO2: Implementing the Pre-Production process of Short film.

CO3: Executing the Production process of short film.

CO4: Compile the Post Production Activities according to the Script.

CO5: Presenting the Documentation with Master Copy.

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

**(Low - L, Medium – M, High - H)**

**Course Syllabus:**

**Exercises:**

1. Produce a short film with a good concept not exceeding 10 minutes with suitable visual transitions and sound effects.

(Cognitive Level: K1, K2, K3, K4)

The Internal Evaluation (40 marks) is based on the production process and the model viva.

The Semester Evaluation (60 Marks) is based on the Viva-Voce and the quality of the production.

**UCZOK20- ENVIRONMENTAL BIOLOGY**

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
III	VI	UCZOK20	Environmental Biology	Theory	Core	4	3	100

**Objectives:**

- To understand the network of the surrounding and other organism.
- To protect the environment and to use the resources sustainably.

**Course Outcomes:**

**On completion of the course the student will be able to...**

**CO1:** Explain ecology its branches and abiotic and biotic components of ecosystem.

**CO2:** Discuss animal association, biogeochemical cycle and Ecosystem and its functions.

**CO3:** Discuss the structure and functions of terrestrial and aquatic ecosystems.

**CO4:** Describe the Characteristics of population, Community and Ecological Succession

**CO5:** Discuss the causes of pollution their control measures and wildlife management.

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	M	M
CO2	H	H	M	H	H	M
CO3	H	H	M	H	H	M
CO4	H	H	M	H	H	M
CO5	H	H	M	H	H	H

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6



<b>CO1</b>	H	M	H	H	M	M
<b>CO2</b>	H	H	H	H	H	M
<b>CO3</b>	H	H	H	H	H	M
<b>CO4</b>	H	H	H	H	H	M
<b>CO5</b>	H	H	H	H	H	H

### **Unit 1: (12 Hours)**

- 1.1: Definition, Branches- Autecology – Synecology- Integrated. (K1, K2, K3)
- 1.2: Abiotic factors: Temperature-Thermal stratification. Range of Temperature tolerance, Effect of temperature on Plants and animals. (K1, K2, K3)
- 1.3: Light-Biological effects of light on plants and animals. (K1, K2, K3)
- 1.4: Water-Types and properties. (K1, K2, K3)
- 1.5: Soil- Soil profile-Pedogenesis. (K1, K2, K3)
- 1.6: Atmosphere- layers and functions. (K1, K2, K3)

### **Unit 2:(12 Hours)**

- 2.1: Biotic factors: Intra and inter specific animal associations. (K1, K2, K3)
- 2.2: Biogeochemical cycles- Water, Carbon, Nitrogen, Phosphorus. (K1, K2, K3)
- 2.3: Structure of Ecosystem and functions. (K1, K2, K3, K4)
- 2.4: Energy flow, Productivity-primary and secondary. (K1, K2, K3, K4)
- 2.5: Ecological pyramids, food chain and food web. (K1, K2, K3, K4)
- 2.6: Decomposition and homeostasis.

### **Unit 3:(12 Hours)**

- 3.1: Terrestrial habitat-characters of biome, Tundra, Forest, Deserts. (K1, K2, K3)
- 3.2: Fresh water habitat-physico chemical nature. (K1, K2, K3, K4)
- 3.3: Adaptation of animals in lentic and lotic habitat. (K1, K2, K3)
- 3.4: Marine ecology-Characteristics, Zonation and stratification. (K1, K2, K3)
- 3.5: Inter-tidal zone (Rocky, Sandy & Muddy shore). (K1, K2, K3)
- 3.6: Mangroves. (K1, K2, K3)

### **Unit 4:(12 Hours)**

- 4.1: Definition, characteristics-Density, Natality, Mortality. (K1, K2, K3)
- 4.2: Survivorship curves, Age pyramids. (K1, K2, K3)
- 4.3: Carrying capacity, Fluctuations, Equilibrium. (K1, K2, K3)
- 4.4: Population growth, Population dispersal, Density dependent factors. (K1, K2, K3)
- 4.5: Ecotone and Edge effect. (K1, K2, K3)
- 4.6: Ecological succession. (K1, K2, K3)

### **Unit 5: (12 Hours)**

- 5.1: Pollution- Causes and control- Air. (K1, K2, K3, K4)
- 5.2: Water, soil pollutions. (K1, K2, K3, K4)
- 5.3: Greenhouse effect, Global warming, Acid rains. (K1, K2, K3, K4)
- 5.4: Water treatment. (K1, K2, K3, K4)
- 5.5: Wild life conservation and its Management. (K1, K2, K3, K4)
- 5.6: Red data book, National parks and Wild life sanctuaries. (K1, K2, K3, K4)

### **Books for Study and Reference:**

#### **Textbooks:**

1. Verma, P.S. and V.K. Agarwal- Environmental Biology, S. Chand & Co. Ltd, 1986.
2. Rastogi V.B. and M.S. Jayaraj- Animal Ecology and distribution of animals, Kedar Nath Ram Nath, Meerut-250 001, 1988-89.

**Reference Books:**

3. Clarke, G.L.- Elements of Ecology, John Wiley & Sons Inc, New York, London, 1954.
4. Eugene P. Odum- Fundamentals of Ecology, Saunders International Student Edition, W. B Saunders Company, Philadelphia, London, Toronto,1971.
5. Kotpal, R.L and N.P- Basic Concepts of Ecology, Vishal Publications, Delhi,1986.
6. Biswarup Mukherjee - Environmental Biology, Tata McGraw-Hill Publishing Company Ltd. New Delhi,1997.
7. Asthana, D.K. and Asthana, M- Environmental problems and solutions. S. Chand and Co., New Delhi, 2001.

**E-Resources:**

<http://www.enviroindia.net>

<http://aelsindia.com>

<http://environment-ecology.com>

## SEMESTER- VI

### UCBIR20 - E –COMMERCE, E BANKING AND TALLY

<b>Year: III</b> <b>SEM: VI</b>	<b>Course Code:</b> UCBIR20	<b>Title of The Course:</b> E –Commerce, E Banking and Tally	<b>Course Type:</b> Theory	<b>Course Category:</b> Core	<b>H/W</b> 6	<b>CREDITS</b> 4	<b>MARKS</b> 40+60
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#### Course Objectives:

- To understand and learn about various activities and Components of E- Commerce
- To provide knowledge about application of Mobile Commerce
- To learn various e banking technologies
- To make aware of emerging trends in banking
- To create awareness on preparation of various accounts in TALLY

#### Course Outcomes (CO):

The Learners will be able to

- Logically observes and experience the activities of E –Commerce
- Able to access various mobile applications and mobile payments
- Able to make e payment
- Able to transact through new technologies
- Apply knowledge and work on tally software

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

**H- HIGH M-MEDIUM L-LOW**

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

## COURSE SYLLABUS:

### Unit I: (15 Hours)

- 1.1 Concept – elements – E-Commerce in Indian Scenario – Economic potential of E-Commerce (K1, K2, K3)
- 1.2 M-Commerce – Implementation of E-Commerce (K1, K2, K3)
- 1.3 Creation of website – technology – constraints on implementation (K1, K2, K3)
- 1.4 Advantages of E-Commerce (K1, K2, K3)
- 1.5 Business models of E-Commerce – B2B, B2C (K1, K2, K3, K4)
- 1.6 C2B, G2B and E-Governance. (K1, K2, K3, K4)

### Unit II: (15 Hours)

- 2.1 Mobile Commerce- Introduction – Factors that drive M-Commerce (K1, K2, K3)
- 2.2 Difference between E-Commerce and M-Commerce – Growth of M-Commerce in India (K1, K2, K3)
- 2.3 Advantages of mobile commerce (K1, K2, K3)
- 2.4 Technology behind Mobile commerce (K1, K2, K3)
- 2.5 Application of M-Commerce – Types of mobile payment (K1, K2, K3, K4)
- 2.6 Future of mobile commerce. (K1, K2, K3, K4)

### Unit III: (15 Hours)

- 3.2 E-Banking- Meaning – Benefits – Internet banking services – mobile banking (K1, K2, K3)
- 3.2 Tele banking – call Centre banking – features – ATM, credit card, debit card, smart card (K1, K2, K3)

- 3.3 Biometric and MICR Cheques – Benefits (K1, K2, K3)
- 3.4 Electronic clearing system – RBI Guidelines – benefits – Cheque transactions – E-Cheques (K1, K2, K3)
- 3.5 E-Money – digital cash – benefits to banker and customer (K1, K2, K3)
- 3.6 Single window – concept and benefits. (K1, K2)

**Unit IV: (15 Hours)**

- 1.1 Emerging trends in banking – E-Banking (K1, K2, K3)
- 1.2 Centralized Online Realtime Electronic Banking CORE – Core banking solutions CBS (K1, K2, K3, K4)
- 1.3 Electronic clearing service ECS – Electronic fund transfer (K1, K2, K3, K4)
- 1.4 EFT – Realtime gross settlement RTGS (K1, K2, K3)
- 1.5 National electronic fund transfer NEFT (K1, K2, K3)
- 1.6 Society for worldwide interbank financial telecommunication SWIFT (K1, K2, K3, K4)

**Unit V: (15 Hours)**

- 1.1 Introduction to Tally: Accounting and inventory – an outline – ledger and accounts – Trial balance (K1, K2, K3)
- 1.2 Trading and Profit and Loss account – Balance sheet (K1, K2, K3)
- 1.3 Fundamental of inventory – Account creation, Account information – Groups Introduction to GST - Enable GST feature in Tally - Structure of GST- (CGST – SGST – UTGST & IGST) - (K1,K2,K3)
- 1.4 Multiple groups – Ledger ( Multiple ledger). (K1,K2,K3)
- 1.5 Inventory master creation: Stock groups and stock items – entering vouchers and invoices: Different types of accounting vouchers and inventory vouchers (K1,K2,K3)
- 1.6 Reports in tally – Balance sheet, Profit and Loss account – Trial Balance – Day book – Ratio analysis – Reconciliation of bank account. (K1,K2,K3)

**BOOK**

Study material will be provided to the students.

**WEB RESOURCE**

1. [www.ecommerceguide.com](http://www.ecommerceguide.com)
2. [www.bigcommerce.com](http://www.bigcommerce.com)
3. [www.ibef.org](http://www.ibef.org)
4. [www.businessinsider.in](http://www.businessinsider.in)
5. ECommerce Academy

Department of Botany

ENVIRONMENTAL SUSTAINABILITY (NEEDS)

SEMESTER-IV

II Year- B.A / B.Sc. / B.Com / B.B.A / BCA

UNEVS20– ENVIRONMENTAL STUDIES

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II Years IV Sem	UNEVS20	Environmental Studies	Theory	General Paper	2	2	40+60=100

### COURSE OUTCOMES (CO):

On completion of the course, the students will be able to,

1. Gain knowledge on multidisciplinary nature of environmental studies
2. Understand the Ecosystem, its structure and function
3. Understand the conservation of biodiversity
4. Gain knowledge on Environmental pollution, causes and its effects
5. Apply the laws in prevention of environment.

### UNIT I: Multidisciplinary nature of environmental studies: (6 hours)

- 1.1 Definition, scope and importance (K2, K3)
- 1.2 Need for public awareness (K1, K3)
- 1.3 Natural resources: Renewable and non-renewable resources (K3, K4)
- 1.4 Forest Resources: Use and over-exploitation, deforestation (K3, K4)
- 1.5 Water Resources: Use and over-utilisation of surface and ground water (K1, K2)
- 1.6 Mineral Resources: Use and exploitation, environmental effects of extracting and Food resources (K2,K3)

### UNIT II: Ecosystem: (6 hours)

- 2.1 Concept of an ecosystem (K2, K3)
- 2.2 Structure and functions of an ecosystem (K1, K3)
- 2.3 Energy flow in the ecosystem-Water cycle and carbon cycle (K4)
- 2.4 Food chain, food web and ecological pyramids (K3)
- 2.5 Structure and functions of forest and grassland ecosystem (K2,K3)
- 2.6 Structure and functions of desert and aquatic ecosystem (K1,K3)

### **UNIT III: Biodiversity and its Conservation: (6 hours)**

- 3.1 Definition: Genetic, Species, Ecosystem Diversity ( **K1, K2**)
- 3.2 Biogeographic classification of India (**K1, K2**)
- 3.3 Value of biodiversity: consumptive, productive use, social, ethical, aesthetic (**K2, K4**)
- 3.4 Hot spots of biodiversity, Endangered and endemic species of India (**K2,K3**)
- 3.5 Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts( **K3, K4**)
- 3.6 Conservation of biodiversity: in-situ and ex-situ (**K3, K4**)

### **UNIT IV: Environmental pollution:(6 hours)**

- 4.1 Definition, causes, effects and control measures of air, water, soil and noise pollution (**K2, K3**)
- 4.2 Solid waste management: causes, effects and control measures of urban and industrial waste (**K2,K3**)
- 4.3 Climate change, global warming, (**K3**)
- 4.4 Acid rain, ozone layer depletion (**K3**)
- 4.5 Disaster management: floods, earthquakes, cyclones, landslides (**K1,K3**)
- 4.6 Rainwater harvesting (**K1,K2**)

### **UNIT V: Human Population and Environment: (6 hours)**

- 5.1 Environmental acts- Environment Protection Act (1986), (**K1, K3**)
- 5.2 Air (Prevention and Control of Pollution Act 1981), Water (Prevention and Control of Pollution Act 1976 (**K2, K3**)
- 5.3 Wildlife Protection Act (1972), Forest Conservation Act (1980) (**K2**)
- 5.4 Population explosion – family welfare program (**K1,K3**)
- 5.5 Infectious diseases and Water related diseases (**K2, K3**)
- 5.6 Role of information technology in environmental conservation. (**K1,K2**)

#### **TEXT BOOKS:**

1. Dr. V. Balu – Environmental Studies. 2004.
2. N. Arumugam – Concepts of Ecology, 2014.

#### **REFERENCE BOOKS:**

1. Verma and Agarwal – Environmental Biology, 2015.
2. Anubha Kaushik & Kaushik .C .P(2008)-Perspectives in Environmental studies (3rd Edition )New age International publishers.
3. Environmental studies, Edition: Periyar EVR college, Trichy, Jazym Publications,Trichy, 2004.

#### **OPEN EDUCATIONAL RESOURCES (OER):**

1. <https://youtu.be/PwmSa09C16E>
2. <https://youtu.be/brF0RWJyx9w>

3. [https://youtu.be/76K\\_5SrYyM4](https://youtu.be/76K_5SrYyM4)
4. <https://youtu.be/PqxMzKLYrZ4>



## PCENI20 - ROMANTIC AND VICTORIAN LITERATURE

<b>Year : II Sem III</b>	<b>Course Code :</b> PCENI20	<b>Title Of The Course :</b> Romantic and Victorian Literature	<b>Course Type :</b> Theory	<b>Course Category :</b> Core	<b>H/W</b> <b>6</b>	<b>Credits</b> <b>4</b>	<b>Marks</b> <b>100</b>
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### Course Outcomes (CO)

On Completion of the Course the Learners will be able to:

1. Explain the nature of Industrial Revolution, the subsequent scientific and material progress and to explore a society that was being re-organized around Science, Factories and Business.
2. Connect the works of the Romantics and Victorians to their social and historical backgrounds and evaluate it
3. Analyse and appreciate the interconnectedness of human life and nature as reflected in works written during the Romantic period.
4. Differentiate the traits of Romanticism and Victorianism in English literature with emphasis on concepts of self, imagination, and the unconscious.
5. Evaluate the impact of Romanticism and Victorianism on the development of English literature, with emphasis on development of literary forms and literary modes of expression.

CO/PSO	PSO					
	1	2	3	4	5	6
<b>CO1</b>	H	H	M	M	M	M
<b>CO2</b>	H	H	H	H	M	M
<b>CO3</b>	H	H	H	H	H	M
<b>CO4</b>	H	H	H	H	H	M
<b>CO5</b>	H	H	H	H	H	M

**H - High – (3), M - Moderate (3), L - Low (1)**

**Unit I****K1 – K6****(18 hours)**

- 1.1 Introduction to Key Concepts and Ideas of Romantic age Didacticism, Hellenism, Philosophic Content
- 1.2 William Wordsworth      The World is too much with us (Detailed Romantic Poetry)
- 1.3 Robert Browning      Fra Lippo Lippi (Lines 1- 60) (Detailed Victorian Poetry)
- 1.4 Charles Lamb      Dream Children (Detailed Romantic Prose)
- 1.5 Emily Bronte (Romantic)
- 1.6 Jane Austen (Romantic)

**Unit II****K1-K5****(18 hours)**

- 2.1 Mysticism, Pathetic Fallacy, Pastoral Elegy
- 2.2 S. T. Coleridge      Kubla Khan (Detailed Romantic Poetry)
- 2.3 Matthew Arnold      Dover Beach (Detailed Victorian Poetry)
- 2.4 William Hazlitt      On Going a Journey (Detailed Romantic Prose)
- 2.5 P.B. Shelley      The Cenci (ND Romantic Drama)
- 2.6 Oscar Wilde      The Importance of Being Earnest (Detailed Victorian Drama)

**Unit III****KI - K5****(18 hours)**

- 3.1. Cult of Beauty, Love of Nature, Supernatural Elements
- 3.2. Elizabeth Barrett Browning      Sonnets from the Portuguese (ND Victorian Poetry)
- 3.3 Thomas De Quincey  
    These preliminary confessions, or introductory narrative... Than tempt her to do ought may merit praise  
    From Preliminary Confession From De Quincey's  
    Confessions of an English Opium-eater  
    (ND Romantic Prose)
- 3.4 John Ruskin      Unto the Last: Chapter 1 The Roots of Honour  
(ND Victorian Prose)

- 3.5 Thomas Carlyle Hero Worship: On Poets (Detailed Victorian Prose)
- 3.6 Walter Scott (Romantic)

**Unit IV** **K1-K5** **(18hours)**

- 4.1 Negative Capability, Humanitarianism, Lyricism
- 4.2 John Keats Ode on a Grecian Urn (Detailed Romantic Poetry)
- 4.3 Christina Rossetti The Goblin Market (ND Victorian Poetry)
- 4.4 Charles Lamb New Year's Eve (Detailed Romantic Prose)
- 4.5. Formal Elements of Fiction: Plot Construction, Narrative point of View, Characterization
- 4.6 Charles Dickens (Victorian)

**Unit V** **K1 – K5** **(18 Hours)**

- 5.1 References to Distant Lands and Past Ages, Melancholy, Truth of Life and Sensuous Imagery
- 5.2 Tennyson Morte D'Arthur (Detailed Victorian Poetry)
- P. B. Shelley To a Skylark (Detailed Romantic Poetry)
- 5.3 Reading and Interpreting fiction, Setting, Tone, Style, Symbolism and Irony
- 5.4 Oscar Wilde The Importance of Being Earnest (Detailed Victorian Drama)
- 5.5 Thomas Hardy (Victorian)
- 5.6 George Eliot (Victorian)

**Books for Study:**

1. Raymond Wilson Ed., *A Coleridge Selection*. London: Macmillan Ltd., 1988.
2. John Beeg Ed., *Coleridge Poems*. An Everyman Paperback Publication, New York, 1973.
3. Edmund Blunden Ed., *The Poems of John Keats*. New Delhi: Rupa Publication, 2000.
4. Philip Wayne Ed., *William Wordsworth's Poems*. London: J. Moeent & Sons Ltd., 1907.
5. Jane Austen, *Persuasion*. New Delhi: Rupa Co. Publication House, 2000.
6. Thomas Hardy, *Far From the Madding Crowd*. New York: Oxford University Press, 2008.
7. George Eliot, *Middlemarch*. London: Macmillan, 1972.

8. Charles Lamb, *Essays of Elia*. Bombay: Macmillan, 1895.
9. Charles Dickens, *Oliver Twist*. London: Thomas Nelson & Sons Ltd, 1958.
10. John Holloway, *Selected Poems of Percy Bysshe Shelley* – Ed Heinemann. London: Publication, 1960.

### Books for Reference:

1. Geoffrey Durant *William Wordsworth* — Cambridge: Cambridge University Press, 1969.
2. Kelvin Everest, *John Keats* — New Delhi: Atlantic Publication, 2002.
3. J.M. Johri, *Shelley's Adonais* –, Bareilly: Prakash Book Depot, 1996
4. *Critical Essays on the poetry of Tennyson*, Ed by John Killbam, Roritledge & Kegan Paul. London: 1960.
5. Geoffrey H. Hartman, *Hopkins: A Collection of Critical Essays*, Ed by. New Delhi: Prentice-Hall of India Pvt Ltd., 1980.
6. Birjadesh Prasad, *Arnold's Thesis*, Bombay: B.I. Publication, 1982.
7. Andrew H. Wright, *Jane Austen's Novels*. A Peregrine Book, Middlesex: Penguin Books Ltd., 1953.
8. Rod Mengham, *Charles Dickens*. New Delhi: Atlantic Publishers, 2001.
9. R.T. Jones, *British Authors, Introductory Critical Studies, George Eliot*. London: Cambridge University Press, 1970.
10. Graham Handley, *Middlemarch by George Eliot*. Hampshire: Palgrave Macmillan, 1985.
11. Lance St. John Butler, *Studying Thomas Hardy*. Essex: Longman York Press – 1986.

### PIENH20 - INDEPENDENT ELECTIVE–IV B: LITERATURE AND ENVIRONMENT

<b>Year: II</b> <b>SEM : IV</b>	<b>Course Code:</b> PIENH20	<b>Title Of The Course:</b> Literature And Environment	<b>Course Type :</b> Theory	<b>Course Category :</b> Core	<b>H/W</b>	<b>Credits</b>	<b>Marks</b> 100
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### Course Outcomes (CO)

On Completion of the Course the Learners will be able to:

1. Explore various eco-critical perspectives through nature studies
2. Engage with environmental issues through literary narratives
3. Understand about the ecological degradation and various natural calamities that affect the planet earth due to the reckless nature of human beings
4. Develop critical awareness about sustainability practices
5. Identify environmental issues via historical narratives

CLO/PSO	PSO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	M
CO2	H	H	H	H	H	H
CO3	H	H	H	H	M	M
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H

**H - High – (3), M - Moderate (3), L - Low (1)**

**Unit I Detailed Poems      K1, K2, K3      (18 Hours)**

- 1.1 Admiration of Nature and Deforestation
- 1.2 William Wordsworth      The Education of Nature
- 1.3 Coleridge      To the Nightingale
- 1.4 G.M.Hopkins      Spring
- 1.5 Gieve Patel      On killing a Tree
- 1.6 Robert Frost      Tree at my Window

**Unit II Non Detailed Poems      K1, K4, K5,K6      (18 Hours)**

- 2.1 Global Warming and Climate Change
- 2.2 Nissim Ezekiel      After Rain
- 2.3 Eunice De Souza      Landscape
- 2.4 Hilda Doolittle      Heat
- 2.5 Wilfred Campbell      The Winter Lakes
- 2.6 H.W.Longfellow      Nature

**Unit III: Prose      K2-K6      (18 Hours)**

- 3.1. Conservation of Water and Protection of Animals
- 3.2. ThakazhiSivasankaraPillai      In the Flood
- 3.3. Rabindranath Tagore      The Horse
- 3.4. Sir.J.ArthurThomas      The Donkey (Detailed)
- 3.5. C. Rajagopalachari      The Tree Speaks (Detailed)
- 3.6. C.V.Raman      Water: The Elixir of Life (Detailed)

**Unit IV: Short Stories**                      **K2-K6**                      **(18 Hours)**

4.1. History of Nature	
4.2. Rudyard Kipling	How the Leopard got his spots
4.3. Jim Corbett	The Kanda Man-Eater
4.4. Sufi Saints	When the Waters were changed
4.5. Ruskin Bond	The Cherry Tree
4.6. Ruskin Bond	Dust on the Mountain

**Unit V: Fiction**                      **K2-K6**                      **(18 Hours)**

5.1. Ecological Study	
5.2. Timothy Morton	Without Nature
5.3. Barbara Kingsolver	Prodigal Summer
5.4. Mamang Dai	The Black Hill
5.5. Upton Sinclair	The Jungle
5.6. 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. RadhaAchar Macmillan Publishers India Ltd, New Delhi, 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. Ltd, Madras, 1971.
10. R.Parthasarathy. Twentieth Century Indian Poets. Oxford University Press, Delhi, 1976.
11. Satpathy, Sumanyu. Ed. Early Modern Poetry. Macmillan India Limited, Chennai, 1999.

## PESWA20 -ELECTIVE I A - SOCIAL PROBLEMS

Year	SEM	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
I	I	PESWA20	Elective I A: Social problems	Theory	Elective	5	4	100

### COURSE OBJECTIVES

- To expose the students to various social problems.
- To give them knowledge about the weaker sections.
- To develop an understanding on various theories of social problems.

### COURSE OUTCOME

After completion of the course the students will be able to attain the following outcomes,

**CO1:** Bring changes in the social structure without violence and coercion.

**CO2:** Modify the malfunctioning of the social and economic institutions.

**CO3:** Analyze social problems and highlight the significance of social work intervention in the Indian context.

**CO4:** Understand and keep in pace with the disasters and find ways to handle or manage disasters.

**CO5:** Critically analyze the impact of social problems on the society.

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
<b>CO1</b>	H	H	M	H	H	M
<b>CO2</b>	H	M	H	H	M	H
<b>CO3</b>	M	H	H	M	H	H
<b>CO4</b>	H	H	M	H	H	M
<b>CO5</b>	H	M	H	H	H	M



CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	M	H	M	H	H
CO2	H	M	H	M	M	H
CO3	H	H	H	H	H	H
CO4	M	H	H	M	H	H
CO5	H	M	H	H	H	H

(Low - L, Medium – M, High - H)

**Unit I:**

**(15 hours)**

- 1.1 Social Disorganization : Definition and concept (K1,K2)
- 1.2 Social Pathology : Meaning, and concept (K1,K2)
- 1.3 Social problems : Meaning, definition and concept (K1,K2)
- 1.4 Social Deviance: concepts, nature, cause (K1,K2)
- 1.5 Characteristics of social problems and social deviance(K3,K2)
- 1.6 Problems resulting from catastrophes: fire, drought, flood, earthquake, war and influx of refugees. (K2,K4,K3)

**Unit II:**

**(15 hours)**

- 2.1 Theories of social deviance: biogenic, Psychogenic and sociological (K6, K4,K5,K3)
- 2.2 Deviant Sub-culture and their interactions with normal society.( K5,K4,K3)
- 2.3 Poverty- concepts, causes, strategies effective measures for poverty alleviation (K6,K5,K4,K2)
- 2.4 Over population-Causes, effects, policy (K6,K5,K4)
- 2.5 Illiteracy--causes, National policy on education, Adult Education Program— (K5,K4,K3,K2)
- 2.6 Unemployment and underemployment- types, causes,consequences and measures taken (K5,K4,K6,K2)

**Unit III:**

**(15 hours)**

- 3.1 Problems of vulnerable groups-Women, Child, Youth and Aged (K5,K4,K2)
- 3.2 Problems of ill housing and slums—(K5,K4,K3)
- 3.3 Morbidity and mortality-(K6,K2,K4,K5)
- 3.4 Communicable diseases-(K6,K2,K4)

3.5 AIDS- (K6, K4,K2)

3.6 Malnourishment and nutritional disorders (K6,K4,K3)

**Unit IV:**

**(15 hours)**

4.1 Specially challenged meaning and concepts (K4,K5,K2)

4.2 Problems of the differently abled and the services available (K6,K5,K4)

4.3 Crime and correctional administration (K6,K4,K2)

4.4 Delinquency nature, Types and prevention (K6,K5,K4,K2)

4.5 Female infanticide—(K5,K4,K3)

4.6 Common problems street children, beggary,prostitution, LGBT-( K5,K4)

**Unit V:**

**(15 hours)**

5.1 Problems of social stratification Scheduled caste, Tribe and denotified communities—  
(K6,K5,K4),

5.2 Alcoholism (K6,K5,K4,K3)

5.3 Drug addiction—(K6,K5,K4,K3)

5.4 Suicide ( K6,K5,K3)

5.5 Corruption --- (K6,K4,K5)

5.6 Impact of social media---(K6,K5,K4,K2)

**Books for Study and Reference**

1. D. Rajasekar - Poverty Alleviation, Strategies of NGOs - Concept Publication Company, New Delhi.
2. G.L. Sharma – Caste and Class and Social Inequality in India - Mangal Deep Publishers, Jaipur, 2003
3. Manoranjan Mohanty – Class, Caste, Gender - Sage Publishers, New Delhi, 2004
4. Stephen P. Marks, Harvad University - The Right to Development, Sage Publishers - New Delhi, 2004.
5. G.R.Madan – Indian Social problems – Allied publishers, 1966.

**SEMESTER I**  
**PISWA20 - IEC- DISASTER MANAGEMENT**

Year	SEM	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
I	I	PISWA20	Disaster Management	Theory	Core			100

**COURSE OBJECTIVES**

- To provide students an exposure to disaster management, their significance and types.
- To enhance the awareness of institutional processes in disasters.
- To ensure the students to understand the relationship between vulnerability, disaster, disaster prevention and risk reduction.
- To gain preliminary knowledge of Disaster Risk Reduction(DRR)
- To develop ability to respond to their surroundings with disaster response where they live.

**COURSE OUTCOMES**

After completion of the course the students will be able to attain the following outcomes

**CO1 :**Understanding of the process of Disaster Management and the various types of disasters.

**CO2:** Enhance the students to acquire knowledge on response to disasters and disaster cycle

**CO3:** Practice the role of the Social Worker in Disaster Management and legislation related to it

**CO4:** Equip themselves to work in disaster situations and Expose knowledge on the impact of disaster on individual and community

**CO5:** Develop skills to analyze the factors leading to disaster

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
<b>CO1</b>	H	H	H	M	H	M
<b>CO2</b>	M	H	M	H	M	H
<b>CO3</b>	H	H	H	H	H	H
<b>CO4</b>	H	M	H	H	L	H
<b>CO5</b>	M	M	H	M	H	M

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	M	M	H	H
CO2	M	H	H	M	H	H
CO3	M	H	H	H	H	H
CO4	M	H	H	H	H	H
CO5	M	M	H	H	H	H

(Low - L, Medium – M, High - H)

### Unit I: Concept of Disaster Management

- 1.1 Basic concepts of disaster management (K2,K1)
- 1.2 Definition: Disaster, Hazards, Vulnerability, Risks (K2,K1)
- 1.3 Disaster Types of disaster- natural and manmade disasters-(K3,K2)
- 1.4 Disaster risk Management (K2,K1)
- 1.5 Risk analysis techniques(K6,K5,K3)
- 1.6 Process and steps of Risk assessment. (K4,K2)

### Unit II: Response to Disaster Management

- 2.1 Emergency Response (K3,K2)
- 2.2 Crisis management (K2,K3)
- 2.3 Hazards vulnerability, (K2,K3)
- 2.4 Disaster Risk mitigation (K2,K1)
- 2.5 Response, Relief, Reconstruction, Rehabilitation. (K6,K4,K1)
- 2.6 Disaster cycle - Phase,Culture safety, Prevention, Mitigation and Preparedness.(K5,K3)

### Unit III : Legislation

- 3.1 Government intervention (K5,K3,K1)
- 3.2 Institutional Mechanisms of Disaster Components of disaster. (K4,K3)
- 3.3 Water, Food, Sanitation, Shelter, Health Institutional Arrangements(K4,K2)
- 3.4 Disaster relief Management Acts (K5,K4,K3)
- 3.5 Policies, Plan for relief (K3,K2,K1)
- 3.6 Programmes and legislation.(K5,K3,K2)

#### **Unit IV: Disaster risk management**

- 4.1 Hazards risk management Climate Changes and variability **(K2,K1)**
- 4.2 causes, impacts of climate changes **(K2,K1)**
- 4.3 Pollution - Air Pollution, Water Pollution, Soil Pollution. **(K2,K1)**
- 4.4 Relevance and Disaster risk **(K2,K4)**
- 4.5 Urban rural risk management**(K5,K2,K1)**
- 4.6 Role and Responsibilities of community, Panchayat raj institution/ Urban Local bodies. **(K6,K4,K3,K2)**

#### **Unit V: Risk Assessment**

- 5.1 Industrials Hazards risk management process, **(K4,K2,K1)**
- 5.2 Natural hazard/ risk assessment, **(K4,K2,K1)**
- 5.3 Understanding climate risk, Mapping of risk assessment, **(K6,K2,K1)**
- 5.4 Decision making for risk reduction, Problems in risk assessment, **(K5,K2)**
- 5.5 Activities and roles of the community action on Risk reduction, **(K3,K2)**
- 5.6 Participatory risk assessment ,Participatory risk assessment methods.**(K6,K2)**

#### **Books and Reference:**

1. Singhal J.P Disaster Management, Laxmi Publication,2010.
2. Tushar Bhattacharya, Disaster Mangment and science,McGraw Hill India Education Pvt.Ltd., 2012
3. Gupta Anil K, Sreeja S.Nair. Environmental Knowledge for Disater Risk Management,NIDM,New Delhi, 2011
4. Kapur Anu Vulnerable India :A Geographical Study of disaters, IAS.
5. Govt.of India: Disaster Management Act, Government of India, New Delhi, 2005
6. Government of India, National Disaster Management Policy, 2009.

#### **SEMESTER IV – SPECIALIZATION II D**

#### **PSHRD20 – ORGANIZATIONAL BEHAVIOUR**

Year	SEM	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II	IV	PSHRD20	Organizational Behaviour	Theory	Core	5	4	100

#### **COURSE OBJECTIVES**

- To help students build a knowledge base appropriate to understand the human behavior in an organization.
- To enable the students to perceive the attitudes required for the successful applications of organizational behavior.
- To present a new perspective for management.

## COURSE OUTCOME

After completion of the course the students will be able to attain the following outcomes,

**CO1 :** Analyse individual and group behavior and understand the implications of organizational behavior on the process of management.

**CO2 :** Identify different motivational theories and evaluate motivational strategies used in a variety of organisational settings.

**CO3 :** Evaluate the appropriateness of various leadership styles and conflict management strategies used in organizations.

**CO4 :** Explore managerial and interpersonal skills in presenting a new perspective for management.

**CO5 :** Explain how organizational change and culture affect working relationships within organization..

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	H	M
CO2	H	M	H	H	M	H
CO3	M	H	H	M	H	H
CO4	H	H	M	H	H	M
CO5	H	M	H	H	H	M

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	H	M	H	M
CO2	M	H	H	M	M	H
CO3	H	M	H	H	H	H
CO4	M	H	H	M	H	H
CO5	H	M	H	H	H	H

**(Low - L, Medium – M, High - H)**

**UNIT I - INTRODUCTION TO ORGANIZATIONAL BEHAVIOUR (15hours)**

- 1.1 History, definition, concept(**K2,K1**)
- 1.2 Need and importance of organizational behaviour (**K2,K1**)
- 1.3** Key elements of organizational behaviour (**K2,K1**)
- 1.4 Nature and scope (**K4,K2,K1**)
- 1.5 Frame work (**K4,K2**)
- 1.6 Organizational behaviour models. (**K3,K2**)

**UNIT II - INDIVIDUAL BEHAVIOUR (15hours)**

- 2.1 Concept of Individual Behaviour – Factors affecting Individual behaviour (**K4,K2,K1**)
- 2.2 Personality – types – Factors influencing personality – Theories(**K3,K2,K1**)
- 2.3 Learning – Types of learners – The learning process – Learning theories – Organizational behaviour modification - Misbehaviour – Types – Management Intervention. (**k5,K4,K2,K1**)
- 2.4 Emotions - Emotional Labour – Emotional Intelligence – Theories. Attitudes – Characteristics – Components – Formation – Measurement- Values. (**K4,k3,K2,K1**)
- 2.5 Perceptions – Importance – Factors influencing perception – Interpersonal perception (**K3,K2,K1**)
- 2.6 Impression Management Motivation – importance – Types – Effects on work behavior – Stress – management of stress. (**K5,K4,K2**)

**UNIT III - GROUP BEHAVIOUR (15hours)**

- 3.1 Organization structure – Formation (**K2,K1**)
- 3.2 Groups in organizations – Influence (**K4,K3**)
- 3.3 Group dynamics – Emergence of informal leaders and working norms (**K4,K5**)
- 3.4 Group decision making techniques (**K4,K2,K1**)
- 3.5 Group Cohesion - Team building - Interpersonal relations – Communication – Control. (**K5,K4,K6**)

**UNIT IV - LEADERSHIP AND POWER (15hours)**

- 4.1 Meaning (**K2,K1**)
- 4.2 Importance (**K2,K1**)

- 4.3 Leadership styles – Theories (K4,K2,)
- 4.4 Leaders Vs Managers – Sources of power (K4,K2,K3)
- 4.5 Power centers (K5,K2)
- 4.6 Power and Politics. (K3,K2)

## **UNIT V – DYNAMICS OF ORGANIZATIONAL BEHAVIOUR (15 hours)**

### **5.1**

5.1 Organizational culture and climate – Factors affecting organizational climate – Importance. (K4,K3)

5.2 Job satisfaction – Determinants – Measurements – Influence on behavior. (K4,K2,K1)

5.3 Organizational change – Importance – the change process – Resistance to change – Managing change. (K4,K2,K3)

5.4 Stability Vs Change – Proactive Vs Reaction change (K3,K4)

5.5 Stress – Work Stressors – Prevention and Management of stress – Balancing work and Life. (K4,K2)

5.6 Organizational development – Characteristics – objectives – Organizational effectiveness. (K5,K2,K3)

### **Books for Study and Reference:**

1. P.K.Agarwal – Management Process and Organizational Behaviour – Vrinda Publications (P) Ltd., 2<sup>nd</sup> Edition, New Delhi, 2009.
2. J.Jayashankar – Organizational Behaviour – Margham Publications, Chennai, 1<sup>st</sup> Edition, 2006.
3. M.N.Mishra - Organizational Behaviour – Vikas Publishing House Pvt. Ltd., New Delhi, 2001.
4. Uma Sekaran - Organizational Behaviour – 2<sup>nd</sup> Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2009.
5. Nirmal Singh - Organizational Behaviour – Deep & Deep Publications (P) Ltd, New Delhi, 1<sup>st</sup> Edition, 2009.
6. Jayantee Mukherjee Saha – Organizational Management and Behaviour – Anurag Jain Excel Books, New Delhi, 2006.
7. P.K.Agarwal, Management Process and Organisational Behaviour – 2<sup>nd</sup> Edition, Vrinda Publications, New Delhi, 2008.
8. Dr.H.L.Kaila – Organisational Behaviour and HRM – 3<sup>rd</sup> edition, AITBS Publishers, New Delhi, 2011.
9. Wendell L. French, Cecil H. Bell – Organizational Development – 6<sup>th</sup> Edition, Dorling Kindersley



## INDEPENDENT ELECTIVE PAPER - 2

### PIBAB20 – DISASTER

### MANAGEMENT

Year/ Sem	Course Code	Title of the Course	Course type	Course Category	H/ W	Credits	Marks
I / I	PIBAB20	Disaster Management	Theory	Independent Elective	-	2	100

#### OBJECTIVES

1. To gain knowledge about the concept of disaster
2. To attain in depth understanding of the various dimensions and typology of disasters
3. To acquire the knowledge different National & International Agencies for disaster Management in India
4. To acquire the knowledge and information related to Disaster Mitigation, Preparedness & Planning
5. To empower and inhibit the knowledge about the Disaster Rehabilitation & Futuristic Sustainable Measures adopted

#### COURSE OUTCOMES

The learners will be able to

CO1: Understand the knowledge about the concept of Disaster

CO2: Attain in depth understanding of the various dimensions and typology of disasters

CO3: Acquire the knowledge different National & International Agencies for disaster Management in India

CO4: Acquire the knowledge and information related to Disaster Mitigation, Preparedness & Planning

CO5: Empower and inhibit the knowledge about the Disaster Rehabilitation & Futuristic Sustainable Measures adopted.

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

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

**H-HIGH(3), M-MODERATE(2), L-LOW(1)**

### **Unit I - Concepts of Disaster**

- 1.1: Disaster (K1)
- 1.2: Hazards – Emergency vulnerability (K1, K2)
- 1.3: Courses and impact of disaster – Levels of disaster (K2)
- 1.4: Effects of disaster (K2, K3)
- 1.5: Causal factors of disaster (K2, K3)
- 1.6: Phases of disaster (K1, K2, K3)

### **Unit II - Various dimensions and typology of Disasters**

- 2.1: Calamities – Meteorological – Hydrological (K1, K2)
- 2.2: Calamities - Geological – Extra Terrestrial (K1, K2)
- 2.2: Typology of Disaster – Earthquakes – Tsunami – Volcanoes – Landslides – Cyclones – Floods – Droughts (K1, K2, K3, K4)
- 2.3: Environment Pollution (K1, K2, K3)
- 2.4: Deforestation (K1, K2, K3)
- 2.5: Desertification (K1, K2, K3)

### **Unit III - National & International Agencies for Disaster Management in India**

- 3.1: National Crisis Management Committee (NCCM) – The Disaster management Act 2005 – National Civil Defence Organization - Department for Humanitarian Affairs (DHA) (K1, K2)
- 3.2: Inter – Agency Standing Committee (IASC) – Office for the Coordination of Humanitarian Affairs (OCHA) – Food and Agricultural Organization (FAO) (K1, K2, K3)

3.3: United Nations Development Programs (UNDP) – United Nations High Commissioner for Refugees (UNHCR) – World Food Programme (WFP) (K1, K2, K3)

3.4: World Health Organization (WHO) – International Committee of the Red Cross (ICRC) (K1, K2, K3)

3.5: International Federation of Red Cross & Red Crescent Societies (IFRC) – International Organization for Migration (IOM) (K1, K2, K3)

3.6: International Atomic Energy Agency (IAEA) – United Nations Sahelian Office (UNSO) – The UN and the role of NGOs (K1, K2, K3, K4)

#### **Unit IV - Disaster Mitigation, Preparedness and Planning**

4.1: Disaster Mitigation – Meaning – Impact – Menu of mitigation agents (K1, K2, K3)

4.2: Disaster management cycle – Classification of mitigation measures – Investing in disaster mitigation (K1, K2, K3)

4.3: Disaster Preparedness – Objectives - Principles of disaster planning – Involvement (K1, K2, K3)

4.4: Disaster Risk Assessment – Concepts – Factors – Assessing risk – Phases – Steps (K1, K2, K3, K4)

4.5: Disaster risk management (K1, K2)

4.6: Disaster insurance (K1, K2)

#### **Unit V - Disaster Rehabilitation and Futuristic Sustainable Measures**

5.1: Meaning – Issues in rehabilitation – Hindrances to normalization (K1, K2)

5.2: Rehabilitation approaches (K1, K2)

5.3: Rehabilitation from shelter to housing (K1, K2, K3)

5.4: Material distribution for rehabilitation (K1, K2, K3)

5.5: Role of building Materials and services banks (K1, K2, K3, K4)

5.6: Keys to sustainable measures in disaster management (K1, K2, K3)

**Note:** Case studies for all Units (K5, K6)

#### **Text Books**

1. Modh Satish, Introduction to Disaster Management, Macmillan Publishers India Private Limited, Reprint 2012, New Delhi

#### **Reference Books**

1. Ayaz Ahmad, Disaster Management: Through the New Millennium, Anmol Publications, 1<sup>st</sup> Edition, New Delhi, 2003

#### **Websites**

1. [www.corsera.org](http://www.corsera.org)

### INDEPENDENT ELECTIVE PAPER - 3

#### PIBAC20 - INDUSTRIAL SAFETY AND POLLUTION MANAGEMENT

Year/ Sem	Course Code	Title of the Course	Course type	Course Category	H/W	Credits	Marks
I / I	PIBAC20	Industrial Safety and Pollution Management	Theory	Independent Elective	-	2	100

#### OBJECTIVES

1. To Acquaint the Students about Safety Management, Responsibilities of Safety, Safety Officer & Committee
2. To Gain Insight on Industrial Accidents
3. To Imbibe the Methods of Maintaining Harmony within the Industry
4. To Ascertain the Procedures of Environmental Safety
5. To Inhibit Knowledge on Environmental Pollution Act

#### COURSE OUTCOMES (CO)

The learners will be able to

**CO1:** Acquire Knowledge on Industrial safety Management

**CO2:** Understand the formation and need for insight on Industrial Accidents

**CO3:** Attain knowledge in the requisites of legal provisions towards Safety

**CO4:** Understand the concepts of Environmental Management

**CO5:** Acquires knowledge on Environmental Pollution Act.

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

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

**H-HIGH (3), M-MODERATE (2), L-LOW (1)**

### **Unit I: Management of Safety in Industry**

- 1.1 Concept (K1, K2)
- 1.2 Applicable areas - Unsafe actions and Conditions (K1, K2)
- 1.3 Responsibility of Safety – Society, Government, Management, Union and Employees Appointment (K1, K2, K3)
- 1.4 Qualification (K1, K2)
- 1.5 Duties of Safety Officer (K1, K2)
- 1.6 Safety Committee – Membership - Functions –Scope of Safety – Training of employees for Safety in Industrial Operations (K1, K2, K3, K4)

### **Unit II: Industrial Accidents**

- 2.1 Causes & effects of Industrial Accidents (K1, K2)
- 2.2 Accident Ratio Theory (K1, K2, K3)
- 2.3 Cost of Accidents (K1, K2)
- 2.4 Impact of Accidents on employees (K1, K2, K3)
- 2.5 Responsibility in the prevention of Accidents (K1, K2, K3)
- 2.6 Union, Management, Society and their role.(K1, K2,K3,K4)

### **Unit III: Legal Provisions Regarding Safety**

- 3.1 Legal provisions regarding safety (K1, K2)
- 3.2 Accident Prevention & Compensation under Factories Act -1948 (K1, K2, K3)
- 3.3 Fatal Accident Act (K1, K2)
- 3.4 Functions of National Safety Council –Accidents – Recording – Investigation – Analysis and Reporting (K1, K2, K3, K4)
- 3.5 Workmen Compensation Act 1923 (K1, K2, K3)
- 3.6 ESI Act Public Liabilities Insurance Act – 1991 (K1, K2, K3)

### **Unit IV: Industrial Enchantment for Environmental Safety**

- 4.1 Environmental Protection Act 1986 (K1, K2)
- 4.2 Definition (K1, K2,)
- 4.3 Occupier (K1, K2)

- 4.4 Handling of Hazardous Substance (K1, K2, K3, K4)
- 4.5 Offences by Companies (K1, K2, K3)
- 4.6 Penalties for the Contravention of the Act (K1, K2, K3)

#### **UNIT V: Environmental Pollution Act**

- 5.1 Air Pollution Act 1942- Definition – Air Pollution (K1, K2)
- 5.2 Chimney – Approval & Its Role (K1, K2, K3)
- 5.3 Fuel – Emission, Powers & Functions of Central & State Boards (K1, K2, K3)
- 5.4 Water Pollution Act 1974 – Definition – Sewage & Trade effluent – Outlet stream  
Offences by Companies, Penalties & Procedures (K1, K2, K3, K4)
- 5.5 Noise Pollution Act – Definition of Sound & Noise – Sources of Noise –  
Measurement of Noise – Effect of Noise (K1, K2, K3)
- 5.6 Physiological, Psychological & Behavioral – Noise Control (K1, K2, K3)

**Note:** Case studies for all Units .(K5.K6)

#### **Text Books**

- 1. Donald Hanter , Health in Industry Penguin, London; 1st Edition edition (1959)

#### **Reference Books**

- 1. P. K. Trivedi Environmental Protections and Law Neha Publishers & Distributors (1994)

#### **Websites**

- 1. [www.coursera.org](http://www.coursera.org)

**SEMESTER – I**  
**PCBCA20 BIOMOLECULES**

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks 100
I/I	PCBCA20	Biomolecules	Theory	Core	6	5	40+60=100

**Objective:**

To understand the salient features of biomolecules in the organization of life.

**Course Outcome (CO)**

On completion of the course, the students will be able to;

1. Outline the structural features, properties and biological importance of carbohydrates
2. Attain idea on the structural and biological aspects of proteins
3. Examine the structure of nucleic acids, its isolation and sequencing techniques
4. Gain knowledge on the structure, different forms and significance of lipids in the system
5. List out the significance of vitamins, its deficiency diseases and about the porphyrin ring containing molecules in living system

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	M	M	M	H	M
CO 2	H	M	M	H	H	M
CO 3	H	H	M	H	H	M
CO 4	H	H	M	H	H	M
CO 5	H	H	L	L	H	L
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	M	M	M	M	H
CO 2	H	M	H	M	H	H
CO 3	H	H	H	H	M	H
CO 4	H	M	M	M	M	M
CO 5	H	H	M	M	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit I:**

**(18 Hours)**

- 1.1 Carbohydrates: Monosaccharides (Glucose, Fructose, Galactose, Mannose)- Structure, Functions. (K1, K2, K3)
- 1.2 Polysaccharides - Occurrence, structure, isolation, properties and functions of homoglycans - starch, glycogen, cellulose, dextrin, inulin, chitins, xylan, arabinans, galactans (K1, K2, K3, K4, K5)
- 1.3 Occurrence, structure, properties, and functions of heteroglycans - bacterial cell wall

polysaccharides, glycosamino glycans (K1, K2, K3)

- 1.4 Occurrence, structure, properties, and functions of agar, alginic acid, pectin, amino sugars and deoxy sugars, blood group substances and sialic acids. (K1, K2, K3)
- 1.5 Glycoprotein and their biological applications. (K1, K2, K3)
- 1.6 Lectins structure and functions. (K1, K2, K3)

**Unit II:**

**(18 Hours)**

- 2.1 Proteins: Classification of proteins on the basis of solubility and shape, structure, and biological functions. (K1, K2, K3)
- 2.2 Isolation, fractionation and purification of proteins. (K1, K2, K3)
- 2.3 Denaturation and renaturation of proteins. Primary structure - determination of amino acid sequence of proteins (K1, K2, K3)
- 2.4 Peptide bond: Ramachandran plot. (K1, K2, K3)
- 2.5 Secondary structure - weak interactions involved- alpha helix and beta sheet and beta turns structure. Pauling and Corey model for fibrous proteins. Collagen triple helix. Super secondary structures - helix-loop-helix. (K1, K2, K3)
- 2.6 Tertiary structure - alpha and beta domains. Quaternary structure - structure of hemoglobin. Solid state synthesis of peptides. (K1, K2, K3)

**Unit III:**

**(18 Hours)**

- 3.1 Nucleic acids: Watson - Crick model of DNA structure. (K1, K2, K3)
- 3.2 A, B and Z - DNA Cruciform structure in DNA, formation and stability of cruciforms, miscellaneous alternative conformation of DNA, slipped mispaired DNA, parallel stranded, anisomorphic DNA (K1, K2, K3)
- 3.3 Palindrome, secondary and tertiary structure of DNA (K1, K2, K3)
- 3.4 Methods for nucleic acid sequence determination, denaturation, strand separation, fractionation, isolation and purification of DNA (K1, K2, K3, K4, K5, K6)
- 3.5 Cot curve, hypochromic effect, DNA-protein interactions. Molecular hybridization. (K1, K2, K3, K4)
- 3.6 Structure and functions of mRNA, rRNA and tRNA, Heterogenous nuclear RNA (HnRNA) (K1, K2, K3)

**Unit IV:**

**(18 Hours)**

- 4.1 Lipids: Lipids – classification-simple, compound, derived. (K1, K2, K3)
- 4.2 Fatty acids: saturated and unsaturated fatty acids. (K1, K2, K3, K4)
- 4.3 Phospholipids - classification, structure and functions. (K1, K2, K3)
- 4.4 Amphipathic lipids -membranes, micelles, emulsions and liposomes. (K1, K2)
- 4.5 Steroids - structure and biological role of cholesterol, bile acids and bile salts. (K1, K2, K3)
- 4.6 Eicosanoids – Structure and Functions of Prostaglandins, thromboxanes, leukotriens. Types and functions of plasma lipoproteins. (K1, K2, K3)



**Unit V: (18 Hours)**

5.1 Vitamins - Sources, structure, daily requirements, biochemical functions and deficiency diseases of water-soluble vitamins (K1, K2, K3, K4)

5.2 Vitamins - Sources, structure, daily requirements, biochemical functions and deficiency diseases of fat -soluble vitamins. (K1, K2, K3)

5.3 Porphyrins – Biosynthesis (K1, K2, K3)

5.4 Porphyrins- the porphyrin ring system of chlorophyll (K1, K2, K3)

5.5 Porphyrins- the porphyrin ring system of hemoglobin and myoglobin (K1, K2, K3)

5.6 Porphyrin ring system of Cytochrome (K1, K2, K3)

[Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create]

**Text Books:**

1. David L. Lehninger's Principle of Biochemistry. Nelson and Michael M. Cox. W. H. Freeman; 4<sup>th</sup> edition, 2004.
2. Voet and Voet. Fundamentals of Biochemistry. John Wiley and sons NY, 2<sup>nd</sup> edition, 2002.

**Reference Books:**

1. Martin David W, Harper, Harold A - Harper's review of Biochemistry- 31<sup>st</sup>edition, 2018.
2. Stryer L. Biochemistry. W.H. Freeman and Co. 5<sup>th</sup> edition, 2002.
3. Thomas. M. Devlin. Text Book of Biochemistry with clinical correlation. John Wiley-Liss, Hoboken NJ publishers, 2006.
4. West, Todd, Mason, Vanbruggen - Textbook of Biochemistry, Oxford Publishers, - 4<sup>th</sup>edition,2000.
5. Eric E Conn, P.K Stumpf, G. Brueins and Ray H Doi, John. Outlines of Biochemistry. Wiley and Sons. 5<sup>th</sup> edition, 2005.

**Open Educational Resources (OER):**

1. <https://youtu.be/N64RAIG49rY>
2. <https://youtu.be/Nh0Km4bv18>
3. <https://youtu.be/eb5PPWFZzxl>
4. <https://youtu.be/Sh3eolzdrdl>
5. <https://youtu.be/Qv-KExGKAYw>

**SEMESTER – I**  
**PCBCB20 - HUMAN PHYSIOLOGY AND NUTRITION**

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
I / I	PCBCB20	Human Physiology and Nutrition	Theory	Core	6	5	40+60= 100

**Objective:**

**To study about the Physiological system of human body and Nutrients with their deficiencies.**

**Course Outcomes (CO)**

On completion of the course, the students will be able to:

1. Outline the physiological system of the human body
2. Describe the general function of each organ system
3. Assess the activities of organs for maximum efficiency
4. Explain the physiology of muscle and neurotransmitters
5. Utilize knowledge on nutrients with their deficiencies

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	H	H	H	M
CO 2	H	H	H	H	M	M
CO 3	H	H	L	H	M	M
CO 4	H	H	H	H	M	M
CO 5	H	L	H	H	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	H	H	H	M
CO 2	H	H	H	L	M	M
CO 3	H	H	H	H	M	M
CO 4	H	H	H	H	M	M
CO 5	H	H	L	H	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit I:**

**(18 Hours)**

- 1.1 Composition and functions of blood and plasma. Blood groups (K1, K2, K3, K4)
- 1.2 Blood coagulation - mechanism, fibrinolysis, anticoagulants (K2, K3, K4)
- 1.3 Hemoglobin - structure, abnormal types of Hemoglobin (K2, K3, K4)
- 1.4 Structure of heart, cardiac cycle, heart sounds, E.C.G (elementary knowledge) (K2, K3)

- 1.5 Vasomotor circulation, coronary circulation, blood pressure (K2, K3)  
1.6 Spleen, Lymph-composition and function of lymph -lymph Organs. (K2, K3)

**Unit II: (18 Hours)**

- 2.1 Composition, functions and regulation of saliva, gastric, pancreatic, intestinal and bile secretions (K1, K2, K3, K4)  
2.2 Digestion and absorption of carbohydrates and lipids (K2, K3, K4)  
2.3 Digestion and absorption of proteins (K2, K3, K4)  
2.4 Excretory system - structure of Kidney and nephron (K2, K3)  
2.5 Formation of urine - glomerular filtration (K2, K3, K4)  
2.6 Tubular reabsorption of glucose, water and electrolytes, tubular secretion. (K2, K3, K4)

**Unit III: (18 Hours)**

- 3.1 Structure and functions of organs of respiration. (K2, K3, K4)  
3.2 Mechanism and regulation of respiration Transport of gases - O<sub>2</sub> and CO<sub>2</sub>. (K2, K3)  
3.3 Acid-base balance: Acidosis and alkalosis - Fluid electrolyte balance - regulation of water balance and sodium balance, Role of renin-angiotensin and ADH. (K2, K3, K4)  
3.4 Structure and Function of Male and Female reproductive organs (K2, K3, K4)  
3.5 Menstruation (K3, K4)  
3.6 Physiology of pregnancy, parturition and lactation (K2, K3, K4)

**Unit IV: (18 Hours)**

- 4.1 Chemical composition and metabolic adaptation, neurotransmitters and cAMP, biochemical aspects of learning and memory, enkephalins and endorphins. (K2, K3)  
4.2 Structure and function of nerves, neurons, resting and action potential. (K2, K3, K4)  
4.3 Transmission of nerve impulses, synaptic transmission, compounds affecting synaptic transmission and neuromuscular junction. (K2, K3)  
4.4 Composition and functions of cerebrospinal fluid. (K2, K3, K4)  
4.5 Structure of muscle cells, muscle contraction and molecular organization of muscle (K2, K3, K4)  
4.6 Proteins of contractile element - their organization and role in contraction (K2, K3)

**Unit V: (18 Hours)**

- 5.1 Basal metabolism- basal metabolic rate, factors affecting BMR, determination of BMR - direct and indirect method. (K1, K2, K3, K4)  
5.2 Respiratory quotient - biological oxygen demand, their importance in nutrition (K2, K3)

5.3 Nutrition at different stages of life - during infancy, adolescence, pregnancy and Geriatrics. (K2, K3)

5.4 Role of fiber in diet and role of essential amino acids (K2, K3, K4)

5.5 Protein Malnutrition: Marasmus and Kwashiorkor. (K2, K3)

5.6 Minerals- macro and micro elements, [Fe, Cu, Zn, I, Ca, Na, Cl, K, P, Mg] daily requirements, functions and deficiency manifestations. (K2, K3)

**Text Books:**

1. Ross & Wilson- Anatomy and Physiology in Health and illness- Elsevier-13<sup>th</sup> Edition,2018
2. C.C. Chatterjee- Human Physiology- CBS publishers-12<sup>th</sup> Edition,2018

**Reference Books:**

1. Ganong's Review of Medical physiology- McGraw Hill Education-25<sup>th</sup> Edition,2016
2. Guyton and Hall -Textbook of Medical Physiology- Elsevier- 13<sup>th</sup> Edition,2016
3. Davidson -Human Nutrition and Dietetics- Churchill Livingstone- 8<sup>th</sup> Edition,2008
4. M.E. Skilis and V.R. Young-Modern Nutrition and Health Diseases,2008
5. M.S. Swami Nathan- Principles of Nutrition- New Age Publications-5<sup>th</sup> Edition ,2011

**Open Educational Resources (OER):** 1. <https://www.youtube.com/watch?v=BxV06Zn0Kck>  
2. <https://www.youtube.com/watch?v=tXXEn6IdLPY> 3. <https://www.youtube.com/watch?v=HI-R8uAh2fl>  
4. <https://www.youtube.com/watch?v=YKULwuxgUE05> 5. [https://www.youtube.com/watch?v=LKZZrJl\\_NI](https://www.youtube.com/watch?v=LKZZrJl_NI)

**SEMESTER – I**  
**PCBCC20 - CELL BIOLOGY**

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks 100
I / I	PCBCC20	Cell Biology	Theory	Core	5	4	40+60=100

**Objectives:**

To understand the Cell, Cell organelles structure, function and metabolism.

**Course Outcome (CO):**

On completion of the course, the students will be able to:

1. Relate cell as basic unit of life, its structure, organization and importance of molecular motors
2. Discuss about the various sub-cellular components of cells and its functions in the biological system
3. Assess the knowledge on techniques adopted for the identification of cellular components and cancerous cell
4. Identify the different types of cell-cell communication and its significance
5. Describe clearly about the mechanism of cell signalling and cell death

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	M	M	H	L
CO 2	H	H	H	H	L	M
CO 3	H	H	H	L	H	H
CO 4	H	H	L	H	H	M
CO 5	H	H	H	M	H	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	M	M	H	L
CO 2	H	M	H	H	H	M
CO 3	H	H	H	H	L	H
CO 4	H	L	M	H	H	M
CO 5	H	H	H	M	H	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit I:**

**(15 Hours)**

1.1 Scope of cell Biology- History of cell Biology - Cell Theory – Cell Diversity: Size,

- Shape, Internal organization - Cell types: Prokaryotic and Eukaryotic (K1, K2, K3)
- 1.2 Functions of Cell – Prokaryotic cell: Structural Organization with the examples: Mycoplasma, *E. Coli*, Cyanobacteria (K1, K2, K3)
  - 1.3 Eukaryotic cell: Structural Organization - Plant cell and Animal Cell (K1, K2, K3)
  - 1.4 Plasma membrane – Structure – Molecular Model of Plasma membrane – Functions (K1, K2, K3)
  - 1.5 Specializations of cell membrane – microvilli, Desmosomes, Gap junction, Tight junctions, Plasmodesmata - Cell wall – Structure – pits – functions (K1, K2, K3)
  - 1.6 Structure, Composition and function of Cilia – Flagella – Filaments - Microtubules – Centrioles - Basal bodies (K1, K2, K3)

**Unit II: (15 Hours)**

- 2.1 Cellular organelles: Morphology and functions of Cytoplasm, Nucleus and nucleolus (K1, K2, K3)
- 2.2 Morphology and functions of Endoplasmic reticulum (K1, K2, K3)
- 2.3 Morphology and functions of Golgi apparatus (K1, K2, K3)
- 2.4 Morphology and functions of Mitochondria (K1, K2, K3)
- 2.5 Morphology and functions of Plastids (K1, K2, K3)
- 2.6 Morphology and functions of Lysosomes and Microbodies (K1, K2, K3)

**Unit III: (15 Hours)**

- 3.1 Cell-cell interaction - Cell adhesion proteins - Cell surface of plant, animal and cancer cells (K1, K2, K3)
- 3.2 Overview of membrane protein - peripheral and integral, molecular model of cell membrane: fluid mosaic model and membrane fluidity (K1, K2, K3)
- 3.3 Transport systems: passive and active transport by ATP powered pumps. (K1, K2, K3)
- 3.4 Chromosome – Structure and Functions (K1, K2, K3)
- 3.5 Cell cycle - phases of cell cycle - Cell division - Mitosis, (K1, K2, K3)
- 3.6 Cell division: Meiosis - Regulation of cell growth (K1, K2, K3)

**Unit IV: (15 Hours)**

- 4.1 Cell aging and death - necrosis and apoptosis (K1, K2, K3)
- 4.2 Mitochondrial and death receptor pathway (K1, K2, K3)
- 4.3 Cell signaling –Types of cell signaling-Ion channel linked; G-protein coupled receptors (K1-K5)

- 4.4 Receptor tyrosine kinases and Ras, MAP kinase pathways (K1, K2, K3)
- 4.5 Insulin receptor pathway (K1, K2, K3)
- 4.6 Functions of cell surface receptors, pathways of intracellular signal transduction (K1, K2, K3)

**Unit V: (15 Hours)**

- 5.1 Methods in cell biology: Microscopy – fluorescence, electron microscopy and phase contrast microscope. (K1, K2, K3)
- 5.2 Methods for disrupting tissues and cells, organ and tissue slice techniques
- 5.3 Isolation of clones, tissue culture techniques (Animal and Plant) (K1, K2, K3)
- 5.4 Cell fixation -fluid fixatives, freezing and section drying, fixation for electron microscopy - buffered osmium solutions, fixation of organic and inorganic substances (K1, K2, K3)
- 5.5 Staining techniques acid and basic, fluorescent and radioactive dyes, staining of lipids, steroids, nucleic acids, proteins and enzymatic reaction products. (K1, K2, K3)
- 5.6 Histopathological studies - organ specific morpho histological examination, identification of morphological changes related to pathology. (K1, K2, K3)

**Textbooks:**

- 1. A.K Berry. A text book of Cell Biology. Emkey Publication,2014.
- 2. The Cell: A Molecular Approach by Cooper G.M and Hausman, 6<sup>th</sup> edition, Sinauer Associates, Inc, 2013.

**Reference Books:**

- 1. Becker, Klein smith and Harden. The World of the Cell. Academic Internet Publishers; 5<sup>th</sup> edition, 2015.
- 2. Geoffrey M. Cooper and Robert E Hausma. The Cell: A Molecular Approach. Oxford University Press,7<sup>th</sup> edition, 2015.
- 3. Gerald Karp. Cell and Molecular Biology by concepts and experiments John Wiley sons &Inc, 2016.
- 4. Harvey Lodish. Molecular cell Biology. W. H. Freeman; Sol edition, 2007.
- 5. J. Brachet and A. E. Mirsky. The Cell - Biochemistry, physiology and morphology, Academic Press, 2014.

**Open Educational Resources (OER):**

- 1. <https://m.ypotube.com/watch?v=bRcjB11hDCU>
- 2. <https://m.youtube.com/watch?v=ZyWYID2cTK0>
- 3. <https://youtu.be/qAoa94WBaIc>
- 4. <https://m.youtube.com/watch?v=J5pWH1r3pgU>
- 5. <https://m.youtube.com/watch?v=jRZHDhHf3tA>

## SEMESTER – I

### PEBCA20 ELECTIVE I A: BIOPHYSICAL CHEMISTRY

Year/ Sem I / I	Course Code PEBCA20	Title of the Course Biophysical Chemistry	Course Type  Theory	Course Category Elective I A	H/W  3	Credits  3	Marks  40+60=100
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#### Objective:

To make the students to understand the concepts of bioenergetics and techniques.

#### Course Outcome (CO):

On completion of the course, the students will be able to,

1. Demonstrate the concept of bioenergetics and its importance
2. Describe the spectroscopic techniques – NMR, UV and MS
3. Define and recognize covalent bonding between atoms in molecules.
4. Classify organic molecules by their functional groups
5. Compare the isomeric relationship

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	H	H	H	M
CO 2	H	H	H	H	M	M
CO 3	H	H	L	H	M	M
CO 4	H	H	H	H	M	M
CO 5	H	L	H	H	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	H	H	H	M
CO 2	H	H	H	L	M	M
CO 3	H	H	H	H	M	M
CO 4	H	H	H	H	M	M
CO 5	H	H	L	H	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

#### Unit I:

**(9 hours)**

1.1 Bioenergetics: Thermodynamics - basic concepts (K1, K2)

1.2 First, second and third laws of thermodynamics (K2, K3)

1.3 Enthalpy and entropy, exothermic and endothermic reactions - Free energy (K1, K3)

1.4 Measurement of free energy in chemical reactions (K1, K2, K3)

1.5 Equilibrium for biochemical reactions (K1, K2)

1.6 High energy phosphates, Redox reactions and free energy changes in biological reactions (K2, K3)



**Unit II:** (9 hours)

- 2.1 Spectroscopy and structural elucidation (K1, K2)
- 2.2 Regions of the spectrum (K2, K3)
- 2.3 Basic principles of UV, NMR and mass spectrometry and their biological applications (K3, K4)
- 2.4 FT-NMR Nuclear overhauser effect (K3)
- 2.5 Use of X-ray crystallography in the study of proteins and nucleic acids (K1, K3)
- 2.6 Use of CD in the study of proteins and nucleic acids (K1, K2)

**Unit III:** (9 hours)

- 3.1 Atomic structure and chemical bonds (K1, K2)
- 3.2 Atomic orbitals, quantum numbers. Shapes of s, p and d orbitals (K3)
- 3.3 Aufbau principle, Pauli exclusion principle and Hund's rule (K2, K3)
- 3.4 Electronic configuration of atoms (K2)
- 3.5 Formation of chemical bonds, octet rule (K1, K3)
- 3.6 Ionic bond, covalent bond and co-ordinate bonds with examples (K1, K2)

**Unit IV:** (9 hours)

- 4.1 Functional groups and reactions - Classification of organic compounds based on functional groups and their nomenclature (K1, K2, K3)
- 4.2 Biologically important organic compounds (names and structures) (K3)
- 4.3 Homolytic and heterolytic cleavage of covalent bonds (K1, K3)
- 4.4 Reactive species: electrophiles, nucleophiles and radicals (K1, K2)
- 4.5 Types of organic reactions with examples (K2, K3)
- 4.6 Inductive effect and resonance (K3)

**Unit V:** (9 hours)

- 5.1 Isomerism - Isomerism in organic compounds. Types of isomerism (K2, K3)
- 5.2 Tautomerism with special reference to lactic acid (K1, K2)
- 5.3 Stereoisomerism-Geometric isomerism with special reference to maleic acid and unsaturated fatty acids (K2, K3)
- 5.4 Partial double bond character of C-N bonds in amides. Geometrical isomerism in such compounds (K2, K3)

5.5 Optical isomerism, optical activity, enantiomers, diastereomers. Meso and dl forms. R-S and D-L notations in amino acids and sugars (K2, K4)

5.6 Conformational analysis, conformations of ethane and cyclohexane (K3)

**Text Books:**

1. K. Wilson and I. Walke - Practical Biochemistry - Cambridge University press - 5 th edition, 2000
2. David L. Nelson and Michael M- Lehninger's Principle of Biochemistry - Cox. W. H. Freeman - 7 th edition, 2017

**Reference Books:**

1. Victor Rodwell and David Bender- Harper's Illustrated Biochemistry - 31 st edition, 2018
2. E. S. West, W. R. Todd, H.S. Mason and J. T. V. Bruggen - Text book of Biochemistry - Oxford and IBH publishing - 4 th edition, 2017
3. Kensal E. Van Holde - Physical Biochemistry- 2 nd edition, 2006
4. Principle of Instrumental Analysis – Dougals A- 6 th edition, 2017.
5. Robert D. Braun - Introduction to Instrumental Analysis - Pharma Book Syndicate - 1 st edition, 2006

**Open Educational Resources (OER):**

1. <https://youtu.be/CiXDXpw9HyM?list=PLWPirh4EWFpHTPJZ7ATErCFsKxN0C7St7>
2. [https://youtu.be/AwKqO4Lg8\\_U](https://youtu.be/AwKqO4Lg8_U)
3. <https://youtu.be/5bhQXC6Uklo>
4. [https://youtu.be/JO8w\\_BnX-w4](https://youtu.be/JO8w_BnX-w4)
5. [https://youtu.be/3\\_H3YU5EbeY](https://youtu.be/3_H3YU5EbeY)

**SEMESTER – I**  
**PEBCB20 - ELECTIVE I B: PHARMACEUTICAL BIOCHEMISTRY**

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
I / I	PEBCB20	Pharmaceutical Biochemistry	Theory	Elective I B	3	3	40+60=100

**Objective:**

**To make the students aware of uses and abuse of drugs.**

**Course Outcome (CO)**

On completion of the course, the students will be able to,

1. Outline the basic scientific concepts related to mechanism of drug action
2. Assess the drug tolerance and the factors that modify the effect of drugs
3. Explain the use of genetically engineered methods on novel drug delivery systems
4. Discuss the mechanism of action of drugs in the therapy of specific diseases
5. Use the medicinal plants in drugs as a curative

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	H	H	H	M
CO 2	H	H	H	H	M	M
CO 3	H	H	M	H	M	M
CO 4	H	H	H	L	M	M
CO 5	H	L	H	H	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	H	H	H	M
CO 2	H	H	H	M	M	M
CO 3	H	H	H	H	M	M
CO 4	H	H	H	H	L	M
CO 5	H	H	L	H	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit-I: (9 hours)**

- 1.1 Drug - Structural feature and pharmacology activity (K1, K2, K4)
- 1.2 Prodrug concept (K1, K3)
- 1.3 Absorption -first –pass effect & distribution (K2, K4)
- 1.4 Metabolism- Phase I, II reactions, action of cytochrome p450 (K1, K2, K4)
- 1.5 Drug receptor- localization, type and subtypes, models and their drug (K2, K3)
- 1.6 Receptor interaction, agonist & antagonist (K2, K3)

**Unit-II: (9 hours)**

- 2.1 Adverse response to drugs and drug tolerance (K1, K3)
- 2.2 Idiosyncrasy (pharmacogenesis) and drug allergy - Tachyphylaxis (K2, K3, K4)
- 2.3 Drug abuse and vaccination against infection (K1, K3, K4)
- 2.4 Factor that modifies the effect of drug (K2, K3)
- 2.5 Assay of drug potency- Bioassay and immunoassay (K3, K4)
- 2.6 Plasma therapy (K1, K2, K3)

**Unit-III: (9 hours)**

- 3.1 Biotechnology and pharmacy: Genetically engineered protein and peptide agents (K2,K4)
- 3.2 Novel drug delivery systems (K1, K2, K4)
- 3.3 Non conventional routes of administration (K3, K4)
- 3.4 Anti-AIDS drug development (K1, K2, K4)
- 3.5 Oncogenes ras target for drugs (K1, K2)
- 3.6 Multi-drug resistance (K2, K3)

**Unit-IV: (9 hours)**

- 4.1 Mechanism of action of drugs used in therapy of: Respiratory system – cough, bronchial – asthma, pulmonary tuberculosis (K1, K2, K3)
- 4.2 GIT – Digestants, appetite suppressants, Hypolipidemic agents, vomiting, constipation and peptic ulcer (K2, K3)
- 4.3 Cardiovascular drugs - Structure and action of cardiac glycosides- Digoxin and Digitoxin (K2, K3)
- 4.4 Antimicrobial drugs – sulfonamides, trimethoprim, cotrimoxazole, penicillin, Aminoglycosides, Cephalosporin and bacterial resistance and macrolides (K1, K2, K3, K4)
- 4.5 Insulin and oral diabetic drugs (K2, K3, K4)
- 4.6 Antifertility and ovulation inducing drugs (K1, K2, K3)

**Unit-V: (9 hours)**

- 5.1 Drugs of plant origin: Drug dependence and abuse (K1, K3)
- 5.2 Management of self poisoning cancer (K2, K4)
- 5.3 Chemotherapy - Cytotoxic drug (K1, K2)
- 5.4 Immuno suppressive drug therapy (K3, K4)

### 5.5 New Biological Targets for Drug Development (K1, K3, K4)

### 5.6 Novel Drug Screening Strategies (K2, K3)

#### **Text Books:**

1. R. S. Satoskar. S. D. Bhandhakar and S.S. Anilapure - Pharmacology and pharmacotherapeutics - Popular Prakashar Bombay - 24<sup>th</sup> edition, 2015.
2. Goodman and Gillman, Mc Graw Hill - The pharmacology Vol I and II - 13<sup>th</sup> edition, 2017

#### **Reference Books:**

1. William O.F - Principles of Medicinal Chemistry- B.I waverks Pvt Ltd, New Delhi- 4<sup>th</sup> edition, 2016
2. D. G. Burgers- Medicinal Chemistry & Drug Discovery - Oxford textbook of Clinical Pharmacology and Drug therapy - 3<sup>rd</sup> edition, 2008
3. Michael Pakmer and Alice Chan - Biochemical Pharmacology – Wiley Publications – 1<sup>st</sup> edition - 2012
4. Katzung and Bertram - Basic & Clinical Pharmacology - McGraw-Hill Publishers – 14<sup>th</sup> edition - 2018
5. Charles P. Woodbury - Biochemistry for the Pharmaceutical Sciences- 1<sup>st</sup> edition, 2011.

#### **Open Educational Resources (OER):**

1. <https://youtu.be/oCPRi5JFMdg>
2. <https://youtu.be/GPoDNQhP0Mg>
3. <https://youtu.be/SZ7lgFb-KqM>
4. <https://youtu.be/j6J9cBGix-s>
5. [https://youtu.be/k8xat-XzgEA?list=RDQM2AXP\\_m3A14s](https://youtu.be/k8xat-XzgEA?list=RDQM2AXP_m3A14s)
6. <https://youtu.be/7O0V3ocMiAQ>

**SEMESTER II**  
**PCBCD20 - ANALYTICAL BIOCHEMISTRY**

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
I / II	PCBCD20	Analytical Biochemistry	Theory	Core	5	5	40 + 60 =100

**Objectives:**

To understand the principles and applications of analytical techniques. .

**Course Outcome (CO)**

On completion of the course, the students will be able to;

1. Identify the behavior of molecules and prioritize related analytical tools
2. Interpret and use the results from a given chromatographic technique
3. Apply the electrophoretic techniques for the separation of proteins and nucleic acids
4. Pursue knowledge about centrifugation and radioactivity and critically assess advances with in the field
5. Categorize, evaluate and implement a suitable technique for a given analytical problem

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	M	M	M	H	M
CO 2	H	M	M	H	H	M
CO 3	H	L	M	L	H	M
CO 4	H	H	M	H	H	M
CO 5	H	H	M	L	H	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	M	M	M	M	H
CO 2	H	M	H	M	H	L
CO 3	H	L	H	H	L	H
CO 4	H	M	M	M	M	M
CO 5	H	H	M	M	L	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit-I:**

**(15 Hours)**

- 1.1 Principle - electrochemical cells (K1, K2, K3)
- 1.2 Henderson - Hasselbalch equation - Buffer capacity (K1, K2, K3)
- 1.3 pH measurement- Glass electrode: Principle and application (K1, K2, K3, K4)

- 1.4 Ion-selective electrodes: Principle and application (K1, K2, K3, K4)  
1.5 Gas sensing electrodes - Oxygen electrode: Principle and application (K1, K2, K3, K4)  
1.6 Biosensors. (K1, K2, K3)

**Unit-II: (15 Hours)**

- 2.1 Planar and Column chromatography: Principle and application (K1, K2, K3, K4)  
2.2 Ion – exchange chromatography: Principle and application (K1, K2, K3, K4)  
2.3 Molecular exclusion chromatography: Principle and application (K1, K2, K3, K4)  
2.4 Gas – liquid chromatography: Principle and application (K1, K2, K3, K4)  
2.5 HPLC (Normal phase & Reverse phase): Principle and application (K1, K2, K3, K4)  
2.6 Chromatofocusing - Immunoaffinity and Capillary electrochromatography. (K1, K2, K3, K4)

**Unit-III: (15 Hours)**

- 3.1 General principles - Support media for Electrophoresis (K1, K2, K3)  
3.2 Electrophoresis of proteins: SDS – PAGE, 2D – PAGE (Native gels & Gradient gels) (K1, K2, K3, K4, K5)  
3.3 Isoelectric focusing: Principle and application (K1, K2, K3, K4)  
3.4 Cellulose acetate electrophoresis: Principle and application (K1, K2, K3, K4)  
3.5 Detection, estimation and recovery of proteins in gels - Protein blotting (K1, K2, K3, K4)  
3.6 Electrophoresis of nucleic acids: Agarose gel electrophoresis - DNA sequencing gels - pulsed field gel electrophoresis. (K1, K2, K3, K4)

**Unit-IV: (15 Hours)**

- 4.1 Centrifugation - Basic principles (K1, K2, K3)  
4.2 Preparative ultracentrifugation: Differential and Density gradient centrifugation. (K1, K2, K3, K4)  
4.3 Analytical centrifugation: Applications - Determination of molecular mass and purity of macromolecules. (K1, K2, K3, K4)  
4.4 Radioactivity, Nature of radioactivity: Stable and Radioactive isotopes - Units and interaction of radioactivity with matter. (K1, K2, K3)  
4.5 Detection and measurement of radioactivity - GM counter - Solid and Liquid

scintillation counter - Autoradiography and Cerenkov counting. (K1, K2, K3, K4, K5)

#### 4.6 Applications of radioisotopes in the Biological sciences. (K1, K2, K3)

### Unit-V:

(15 Hours)

5.1 Laws of Absorption and Absorption spectrum - UV-VIS -IR spectrophotometer:

Principle, instrumentation and Applications (K1, K2, K3, K4)

5.2 Luminometry: Principle and applications (K1, K2, K3, K4)

5.3 Flame Emission Spectrophotometer: Principle, instrumentation, operation and applications. (K1, K2, K3, K4)

5.4 Atomic flame and flameless spectrophotometer: Principle and applications (K1, K2, K3, K4)

5.5 NMR, MS, MALDI: Principle, and applications. (K1, K2, K3)

5.6 Use of lasers for spectroscopy. (K1, K2, K3, K4)

### Text Books:

1. Keith Wilson and John Walker – Principles and Techniques of Practical Biochemistry Cambridge University - 7<sup>th</sup> Edition, 2010
2. Upadhyay - Upadhyay and Nath - Biophysical Chemistry – Principles and Techniques - Himalaya Publishing House, 4<sup>th</sup> Ed, 2022

### Reference Books:

1. Chatwal Anand – Instrumental methods of Analysis – Himalaya Publishing House, 2011
2. Galen Wood Ewing McGraw - Instrumental methods of Chemical Analysis - Hill College - 5<sup>th</sup> Ed. 2015
3. Robert D. Braun - Introduction to Instrumental Analysis – Pharma Book Syndicate, 2006
4. David Frifelder - Physical Biochemistry - W.H. Freeman 4<sup>th</sup> Ed, 2017
5. Shawney SK and Randhir Singh - Practical Biochemistry - Alpha Science, 2005

### Open Educational Resources (OER):

1. <https://youtu.be/P1wRXTI2L3I>
2. <https://youtu.be/VOSkyj1dtbc>
3. <https://youtu.be/5obiHqeYEc0>
4. [https://youtu.be/\\_-YT44KP3do](https://youtu.be/_-YT44KP3do)
5. <https://youtu.be/tbUx-RaZS7M>



**SEMESTER II**  
**PCBCE20 ENZYMOLOGY**

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
I / II	PCBCE20	Enzymology	Theory	Core	5	5	40 + 60=100

**Objectives:**

To learn the methodology involved in assessing the enzyme activity and mechanism of enzyme action.

**Course Outcomes (CO)**

On completion of the course, the students will be able to,

1. List the enzyme properties, nomenclature and purification of enzymes
2. Apply the biochemical calculation for enzyme kinetics
3. Compare methods for enzyme catalysis and various methods of inhibition
4. Outline the effect of coenzymes and isoenzymes in enzyme catalysis
5. Explain various industrial and clinical applications of enzymes as a catalyst in industries and also as a therapeutic aid

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	M	H	H	M	H
CO 2	H	H	H	H	H	M
CO 3	H	M	H	H	H	H
CO 4	H	M	H	M	M	H
CO 5	H	M	H	H	M	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	M	M	M	H
CO 2	H	H	H	H	H	H
CO 3	H	H	M	M	M	H
CO 4	H	H	H	M	M	M
CO 5	H	H	H	H	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit-I:**

**(15 hours)**

- 1.1 Nomenclature, classification, isolation and purification of enzymes (K1, K2)
- 1.2 Determination of enzymes by different methods, criteria of purity – specific activity (K2, K3)
- 1.3 Enzyme units - Katal, IU and turnover number (K1, K2)

- 1.4 Measurement of enzyme activity – Coupled kinetic assay, kinetic assay using radio labelled substrates (K1, K2, K4)
- 1.5 Active site - determination of active site amino acids- chemical probe, affinity label, and site-directed mutagenesis, intrinsic and extrinsic regulations (K1, K3)
- 1.6 Investigation of 3-D structure of active site and a brief account of nonprotein enzymes - ribozymes and DNA enzymes (K3, K4)

**Unit-II: (15 hours)**

- 2.1 Kinetics of single substrate enzyme - catalyzed reactions - Michaelis - Menten equation, importance of  $V_{max}$ ,  $K_m$  (K2, K4)
- 2.2 MM equation; Lineweaver - Burk plot, Eadie - Hofstee plot (K1, K2, K4)
- 2.3 Hanes - Woolf plot and Eisenthal and Cornish - Bowden plot (K2, K3)
- 2.4 Pre steady - state kinetics and relaxation kinetics (K1, K2, K4)
- 2.5 Kinetics of Allosteric enzymes - MWC and KNF models Hill equation coefficient (K2, K3)
- 2.6 Kinetics of multi - substrate enzyme - catalyzed reactions - Ping-pong bi-bi, random order and compulsory order mechanism (K1, K2, K3, K4)

**Unit-III: (15 hours)**

- 3.1 Mechanism of enzymic action - general acid-base catalysis, covalent catalysis (K2, K3)
- 3.2 Role of metal ion in enzyme catalysis (K1, K3)
- 3.3 Mechanism of serine proteases - Chymotrypsin, Lysozyme, Carboxy peptidase A and Ribonuclease (K1, K2, K3)
- 3.4 Reversible inhibition - competitive, uncompetitive, noncompetitive, mixed, (K1, K3)
- 3.5 Allosteric inhibition (K1, K2)
- 3.6 Irreversible inhibition – suicide inhibition (K1, K2)

**Unit-IV: (15 hours)**

- 4.1 Coenzymes - prosthetic group, classification - vitamin and nonvitamin coenzymes, thiamine pyrophosphate (K1, K2)
- 4.2 Mechanism of oxidative and nonoxidative decarboxylation, transketolase reaction (K2, K3)
- 4.3 FMN and FAD - flavoprotein enzymes -mechanism of oxidation and reduction of flavin enzymes, NAD and NADP role in enzyme catalysis (K1, K2, K3)
- 4.4 PALP and PAMP - role of PALP in transamination and decarboxylation reaction, Coenzyme A involved reactions (K2, K3)
- 4.5 Biotin - carboxylation reaction, folate coenzymes, coenzyme role of vitamin B<sub>12</sub> and vitamin C, metabolite and non-vitamin coenzymes, lipoic acid, coenzyme Q, nucleoside triphosphate and S-adenosyl methionine (K1, K2, K4)
- 4.6 Isoenzymes -Abzymes (K1, K2, K3)

**Unit-V: (15 hours)**

- 5.1 Industrial uses of enzymes - sources of industrial enzymes, thermophilic enzymes, amylases, glucose isomerases, cellulose degrading enzymes, lipases, proteolytic enzymes in meat and leather industry, detergents and cheese production (K2, K3, K4)
- 5.2 Clinical enzymology – Enzymes as thrombolytic agents, anti-inflammatory agents, digestive aids (K2, K3)
- 5.3 Therapeutic use of Asparaginases (K1, K2)
- 5.4 Therapeutic use of Streptokinase (K1, K2)
- 5.5 Enzymes and isoenzymes in diagnosis - LD, CK, Transaminases, Phosphatases, Amylase and Cholinesterase (K2, K3)
- 5.6 Immobilization of enzymes and their applications (K1, K2, K4)

**Text Books:**

1. Trevor Palmer – Enzymes: Biochemistry, Biotechnology and Clinical Chemistry- Albion; Reprint edition - 4<sup>th</sup> Reprint Edition, 2004
2. Athel Cornels- Bowden, Fundamentals of Enzymes Kinetics - 4<sup>th</sup> edition, 2012

**Reference Books:**

1. Bowden A C - Fundamentals of Enzyme Kinetics- Medtech Publishers – 3<sup>rd</sup> edition - 2017
2. Enzymes by Boyer - Academic Press - 3<sup>rd</sup> edition, 1983
3. Metzler – Text of Biochemistry - Academic Press, 2000
4. T.D.H Bugg - Introduction to Enzymes & coenzyme chemistry, 3<sup>rd</sup> edition, 2012
5. Stewen - Diagnostic Enzymology, 2<sup>nd</sup> edition, 2014

**Open Educational Resources (OER):**

1. <https://youtu.be/1rfwsCNfLCs>
2. <https://youtu.be/l4s1TGGnT28>
3. <https://youtu.be/WfYawcKzyAM>
4. <https://youtu.be/pzджg3iG4oM>
5. <https://youtu.be/Wrz7AISR8xY>

**SEMESTER II**  
**PCBCF20 INTERMEDIARY METABOLISM**

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
I / II	PCBCF20	Intermediary Metabolism	Theory	Core	5	4	40 + 60=100

**Objective:**

To make the students to understand the reactions catalyzed by different enzymes and their metabolic pathways.

**Course Outcome (CO)**

On completion of the course, the students will be able to;

1. Restate in own words how reduced electron carriers are used to generate ATP via Electron Transport System in Mitochondria
2. Translate the reactions catalyzed by different Enzymes in metabolic pathway
3. Compare the important characteristics of metabolic pathways and assess their regulation
4. Analyze complex chemical reactions and draw logical conclusion by interrelating metabolism
5. Interpret how plants convert energy to nourish themselves

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	H	H	H	M
CO 2	H	H	H	H	M	M
CO 3	H	H	L	H	L	M
CO 4	H	H	H	H	M	M
CO 5	H	M	H	H	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	H	H	H	M
CO 2	H	H	H	M	M	M
CO 3	H	H	H	H	L	M
CO 4	H	H	H	H	M	M
CO 5	H	H	L	H	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit-I:**

**(15 Hours)**

- 1.1 Free energy and entropy - Enzymes involved in redox reactions (K1, K2, K3)
- 1.2 Electron Transport Chain (K1, K2, K3)
- 1.3 Oxidative Phosphorylation ATPase: Structure and mechanism of action (K1, K2)

- 1.4 Chemiosmotic theory – mechanism (K1, K2)
- 1.5 Inhibitors of respiratory chain and oxidative phosphorylation – Uncouplers (K1, K2, K3, K4)
- 1.6 Mitochondrial transport systems - ATP/ADP exchange - Malate and Glycerophosphate shuttle. (K1, K2)

**Unit-II: (15 Hours)**

- 2.1 Glycolysis - Citric acid cycle: Pathway, Key enzymes and regulations. (K1, K2, K3)
- 2.2 Metabolism of Glycogen: Pathway, Key enzymes and regulations. (K1, K2, K3)
- 2.3 Gluconeogenesis (Cori cycle): Pathway, Key enzymes and regulations. (K1, K2, K3)
- 2.4 Pentose phosphate pathway: Pathway, Key enzymes and regulations. (K1, K2, K3)
- 2.5 Uronic acid pathway: Pathway, Key enzymes and regulations. (K1, K2, K3)
- 2.6 Metabolism of galactose and fructose - Glyoxylate cycle: Pathway, Key enzymes and Regulations. (K1, K2, K3)

**Unit-III: (15 Hours)**

- 3.1 Oxidation of fatty acids - Alpha, Beta and Omega oxidation (K1, K2, K3)
- 3.2 Biosynthesis of fatty acids (K1, K2, K3)
- 3.3 Metabolism of ketone bodies - Biosynthesis of triglycerides (K1, K2, K3)
- 3.4 Metabolism of phospholipids and sphingolipids (K1, K2, K3)
- 3.5 Cholesterol – Biosynthesis and regulation (K1, K2, K3)
- 3.6 Cholesterol – Transport and excretion (K1, K2, K3)

**Unit-IV: (15 Hours)**

- 4.1 Overview of biosynthesis of nonessential amino acids (K1, K2, K3)
- 4.2 Catabolism of amino acid - Transamination, Deamination and ammonia formation (K1, K2, K3)
- 4.3 Urea cycle - Disorders of the urea cycle – Decarboxylation (K1, K2, K3)
- 4.4 Catabolism of carbon skeletons of amino acids: Phenyl alanine, Tyrosine and Histidine (K1, K2, K3)
- 4.5 Catabolism of carbon skeletons of amino acids: Methionine and Cysteine (K1, K2, K3)
- 4.6 Detoxification: Oxidation, Reduction, Hydrolysis and Conjugation (K1, K2, K3)

**Unit-V: (15 Hours)**

5.1 Interrelationship of carbohydrates, proteins and fat metabolism. (K1, K2, K3, K5)

5.2 Purine anabolism: De novo and salvage pathways for biosynthesis - Purine catabolism (K1, K2, K3)

5.3 Biosynthesis and catabolism of pyrimidines (K1, K2, K3)

5.4 Photosynthesis - Photosynthetic apparatus - light reaction - cyclic and noncyclic photophosphorylation (K1, K2, K3)

5.5 Dark reaction - Calvin cycle - Hatch-Slack pathway (K1, K2, K3)

5.6 Photorespiration - Starch biosynthesis and degradation -Bioluminescence (K1, K2, K3)

**Text Books:**

1. David L. Nelson Michael M. Cox - Lehninger's Principles of Biochemistry - W H Freeman & co - 7<sup>th</sup> Edition, 2017
2. Robert K. Murray, et al. - Harper's Illustrated Biochemistry - McGraw Hill - 31<sup>st</sup> Edition, 2018

**Reference Books:**

1. Lippincott Williams and Wilkins - Davidson and Sittman Biochemistry NMS - 4<sup>th</sup> Edition
2. Donald Voet - Judith G. Voet – Biochemistry - Wiley - 4<sup>th</sup> edition
3. Jeremy M. Berg, John L. Tymoczko and Lubert Stryer – Biochemistry - W H Freeman - 7<sup>th</sup> edition, 2011
4. Christopher K. Mathews, K.E Van Holde, Kevin G. Ahern – Biochemistry –Pearson Education - 3<sup>rd</sup> Edition, 2000
5. U. Satyanarayana – Biochemistry - Elsevier - 5<sup>th</sup> Edition, 2019

**Open Educational Resources (OER):**

1. <https://youtu.be/nCr3iCzX4lc>
2. <https://youtu.be/ydhr0QAyxYg>
3. [https://youtu.be/Dc3\\_LLXsguw](https://youtu.be/Dc3_LLXsguw)
4. <https://youtu.be/fJScSmrR1MI>
5. <https://youtu.be/v-G-d27C1TU>

**SEMESTER: II****PEBCC20 – ELECTIVE II A: ECOLOGY, EVOLUTION AND DEVELOPMENTAL BIOLOGY**

<b>Year/ Sem</b>	<b>Course Code</b>	<b>Title of the Course</b> Ecology, Evolution and Developmental Biology	<b>Course Type</b> Theory	<b>Course Category</b> Elective II A	<b>H/W</b> 3	<b>Credits</b> 3	<b>Marks</b> 40+60=100
I /II	PEBCC20						

**Objective:**

The course enables the students to understand and analyze the role of ecological and evolutionary modifications in the development of organisms and their survival.

**Course Outcome (CO)**

On completion of the course, the students will be able to,

1. Outline the concept of ecosystem and its interaction
2. Apply the concept of evolution in population genetics
3. Describe the structures and the development of the embryo at different stages
4. Explain the insight on morphogenesis and organogenesis in plants
5. Schematize pedigree analysis and genetic mapping

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	M	M	M	H	H
CO 2	L	H	H	H	M	M
CO 3	M	H	L	M	H	H
CO 4	L	M	M	L	M	L
CO 5	H	H	L	M	H	L
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	M	H	M	H	H
CO 2	L	H	M	H	M	M
CO 3	H	M	H	L	H	M
CO 4	M	L	M	M	M	H
CO 5	M	H	L	H	L	L
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit I:** (9 hours)

- 1.1 Physical environment, biotic environment, biotic and abiotic interaction (K1, K2, K3, K4)
- 1.2 Concept of habitat and niche, niche width and overlap, fundamental and realized niche (K1, K2, K3, K4, K5, K6)
- 1.3 Characteristic of a population, population growth curves, population regulation (K1, K2, K3, K4, K5, K6)
- 1.4 Nature of communities, community structure and attributes, level of species diversity and its measurement. (K1, K2, K3, K4, K5, K6)
- 1.5 Types and mechanism of succession, concept of climax. (K1, K2, K3, K4)
- 1.6 Types of interaction, interspecific competition, herbivory, carnivory, pollination, symbiosis. (K1, K2, K3, K4)

**Unit II:** (9 hours)

- 2.1 Lamarck; Darwin concept of variation, adaptation, natural selection. (K1, K2, K3)
- 2.2 Origin of basic biomolecule; Abiotic synthesis of organic monomers and polymers (K1, K2, K3)
- 2.3 Concept of neutral evolution, molecular divergence and molecular clock (K1, K2, K3, K4)
- 2.4 Population genetics -Populations, gene pool, gene frequency, Hardy-Weinberg Law (K1, K2, K3, K4, K5, K6)
- 2.5 Adaptive radiation, Isolating mechanisms, Speciation, Allopatricity and Sympatricity (K1, K2, K3, K4, K5, K6)
- 2.6 Convergent evolution, Sexual selection, Co-evolution (K1, K2, K3, K4)

**Unit III:** (9 hours)

- 3.1 Production of gametes (K1, K2, K3)
- 3.2 Cell surface molecules in sperm-egg recognition in animals (K1, K2, K3, K4, K5, K6)
- 3.3 Embryo sac development (K1, K2, K3, K4)
- 3.4 Double fertilization in plants (K1, K2, K3, K4)
- 3.5 Mammalian cleavage, gastrulation (K1, K2, K3, K4)
- 3.6 Programmed cell death (K1, K2, K3, K4, K5, K6)

**Unit IV:** (9 hours)

- 4.1 Organization of shoot and root apical meristem (K1, K2, K3, K4)
- 4.2 Shoot and root development (K1, K2, K3, K4, K5, K6)
- 4.3 Leaf development and phyllotaxy (K1, K2, K3, K4, K5, K6)
- 4.4 Transition to flowering, floral meristems (K2, K3)
- 4.5 Floral development in Arabidopsis (K3, K4)
- 4.6 Antirrhinum (K1, K2, K3, K4)

**Unit V:** (9 hours)

- 5.1 Linkage maps, mapping with molecular markers (K1, K2, K3, K4, K5, K6)
- 5.2 Mapping by using somatic cell hybrids, development of mapping population in plants.



(K1, K2, K3, K4, K5, K6)

5.3 Pedigree analysis (K1, K2, K3)

5.4 LOD score for linkage testing (K1, K2, K3)

5.5 Karyotypes. Polygenic inheritance, heritability and its measurements (K1, K2, K3, K4)

5.6 QTL mapping (K1, K2, K3)

**Textbooks:**

1. David C- Advanced Molecular Biology, Delve Publishing LLC, 2015.
2. William H. Elliot & Daphne C. Elliott - Biochemistry and Molecular biology, Oxford University Press, 2018.

**Reference Books:**

1. Gilbert S.F - Developmental Biology-Sinacer Associates Inc, Massachusetts–11<sup>th</sup> edition, 2016
2. Balinsky B.I - An Introduction to Embryology - W.B. Saunders Publishing Company - 5<sup>th</sup> edition, 2014.
3. Ridley Mark- Evolution-John Wiley and Sons Ltd, 2007.
4. Charles J.Krebs. Ecology-Pearson Publication, 6<sup>th</sup> edition, 2016.
5. Hugh Fletcher- Instant notes in genetics - Verlag publishers, 2012.

**Open Educational Resources (OER):**

1. <https://youtu.be/ZeATszO-6e0>
2. <https://youtu.be/7ww5T7hCdn4>
3. [https://youtu.be/\\_fN1H2VnHUs](https://youtu.be/_fN1H2VnHUs)
4. <https://youtu.be/5e9RcEGbvm4>
5. <https://youtu.be/f2dvh0YNDwM>

## SEMESTER II

### PEBCD20 - ELECTIVE II B: TOXICOLOGY

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
I / II	PEBCD20	Toxicology	Theory	Elective II B	3	3	40+60=100

#### Objective:

The course gives a detailed understanding and identification of toxic substances, dose-response, tests conducted and its impact on cellular activities.

#### Course Outcomes (CO)

On completion of the course, the students will be able to,

1. Outline the scope and factors influencing toxicology
2. Explain the clinical and laboratory findings in the treatment of acute toxic exposures
3. Assess various methods of toxicity testing
4. Discuss the effects of toxic substances on molecular and cellular levels
5. Use the knowledge of air pollutants in the assessment of occupational hazards

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	M	M	H	M	M	H
CO 2	H	H	M	H	H	M
CO 3	H	M	M	M	H	H
CO 4	H	H	H	M	H	H
CO 5	H	H	H	H	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	M	M	H	M	M	H
CO 2	H	H	H	M	H	M
CO 3	M	M	M	H	M	H
CO 4	H	M	M	M	H	M
CO 5	M	H	H	H	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

#### Unit-I:

(9 hours)

- 1.1 Eco-toxicology and its environment significance toxic effects (K1, K2, K3, K4)
- 1.2 Basis for general classification & nature, dose - response relationship (K1, K2, K3)
- 1.3 Synergism and Antagonism (K1, K2)

- 1.4 Determination of ED<sub>50</sub> & LD<sub>50</sub> (K1, K2, K3, K4, K5 K6)
- 1.5 Acute and chronic exposures (K1, K2, K3, K4, K5 K6)
- 1.6 Factors influencing toxicity. Pharmacodynamics & Chemo dynamics (K1, K2, K3, K4)

**Unit-II: (9 hours)**

- 2.1 Regulators guidelines, mammalian systems affected & the clinical signs of systemic toxicity (K1, K2, K3, K4)
- 2.2 Factors affecting acute toxicity studies (K1, K2, K3, K4)
- 2.3 Biochemical basis of toxicity, Mechanism of toxicity: disturbance of excitable membrane function altered calcium homeostasis. (K1, K2, K3, K4, K5, K6)
- 2.4 Covalent binding to cellular macromolecules (K1, K2, K3)
- 2.5 Genotoxicity (K1, K2)
- 2.6 Tissue specific toxicity (K2, K3)

**Unit-III: (9 hours)**

- 3.1 Test Protocol, Genetic Toxicity Testing & Mutagenesis Assays: In vivo test systems (K1, K2, K3)
- 3.2 Bacterial Mutation Tests: Reversion Tests, Ames test, Fluctuation Tests & Eukaryote Mutation Tests (K1, K2, K4)
- 3.3 In Vivo Mammalian Mutation Tests – host mediated assay & dominant lethal test (K2, K3, K4, K5, K6)
- 3.4 Use of drosophila in toxicity testing (K3, K4, K5, K6)
- 3.5 DNA repair assays. Chromosome damage test (K3, K4, K5, K6)
- 3.6 Toxicological Evaluation of Recombinant DNA –Derived Proteins (K2, K3, K4)

**Unit-IV: (9 hours)**

- 4.1 Toxicology of food additives (K1, K2, K3)
- 4.2 Metal toxicity: Toxicology of Arsenic, Mercury, Lead and Cadmium (K2, K3)
- 4.3 Environmental Factors Affecting Metal Toxicity- Effect of Light, Temperature & P<sup>H</sup> (K1, K2)
- 4.4 Diagnosis of toxic changes in liver and kidneys (K3, K4, K5, K6)
- 4.5 Metabolism of Haloalkanes (K2, K3)
- 4.6 Haloalkenes & Paracetamol with their toxic effects on tissues (K2, K3, K4, K5, K6)

**Unit-V:****(9 hours)**

- 5.1 Air pollution & ozone (K2, K3, K4)
- 5.2 Air pollution due to chlorofluorocarbons (CFCS) and asbestos (K1, K2, K3, K4)
- 5.3 Occupational toxicology and assessment of occupational hazards: industrial effluent toxicology & environmental health (K2, K3, K4, K5, K6)
- 5.4 An overview of regulatory agencies: responsibilities of regulatory agencies (K3, K4, K5)
- 5.5 Management of toxicological risks (K3, K4, K5, K6)
- 5.6 Regulatory approaches. Regulatory systems and organizations (K3, K4, K5, K6)

**Text Books:**

1. G. Tyler Miller and Scott E. Spoolman - Environmental Science - Cengage learning - 15<sup>th</sup> edition, 2016
2. George Tyler Miller, Jr. and Scott Spoolman - Living in the Environment – Principles, Connections and Solutions, Brooks/Cole, USA - 17<sup>th</sup> edition, 2012.

**Reference Books:**

1. Casarett and Doull's – Toxicology - Mc Graw Hill Education – 9<sup>th</sup> edition, 2013
2. Raymond D and Marie M - Industrial Toxicology - Wiley Publications – 6<sup>th</sup> Ed, 2015
3. Hayes A W-Principles and methods of Toxicology- CRC press New York, 6<sup>th</sup> Ed, 2014
4. Stepham M and Robert C –Principles of Toxicology - Wiley-Interscience – 3<sup>rd</sup> Ed, 2015
5. Anil Agarwal - Textbook of Forensic Medicine and Toxicology - Avichal Publishing Company - 1<sup>st</sup> edition, 2017

**Open Educational Resources (OER):**

1. <https://youtu.be/eIZr7M-kt2s>
2. <https://youtu.be/YnsN1LozlEc>
3. <https://youtu.be/v4jmPpTcdxQ>
4. [https://youtu.be/dBcS\\_-WrTIE](https://youtu.be/dBcS_-WrTIE)
5. <https://youtu.be/hYgma4mYM0w>

**SEMESTER – III**  
**PCBCJ20 - ADVANCED IMMUNOLOGY**

Year/Sem	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
II / III	PCBCJ20	Advanced Immunology	Theory	Core	6	5	40+60=100

**Objectives:**

To help the students to understand the components of immune system and it's functioning.

**Course Outcomes (CO)**

On completion of the course, the students will be able to;

1. Identify various mechanisms that regulate immune response
2. Compare and contrast innate and adaptive immunity
3. Outline the cell types and organ present in the immune response
4. Discuss the reason for different vaccination
5. Communicate the adverse effect of immunodeficiency disorder

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	M	H	H	M	M
CO 2	H	H	H	M	H	M
CO 3	M	H	M	H	H	M
CO 4	H	M	H	M	H	M
CO 5	H	H	H	H	M	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	M	M	L	H
CO 2	H	M	H	H	H	M
CO 3	H	H	M	M	L	M
CO 4	H	M	M	M	L	M
CO 5	H	H	M	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit I:**

**(18 Hours)**

- 1.1 Lymphoid system-Definition, Central lymphoid organs-Thymus, Bone marrow (K1, K2, K3, K4, K5, K6)
- 1.2 Peripheral lymphoid organs-Lymph node, Spleen & MALT ( K1, K2, K3, K4, K5, K6)

- 1.3 Cells involved in immune system-Lymphocytes, Mononuclear phagocytes, Granulocytes, Mast cells, NK cells (K1, K2, K3, K4, K5, K6)
- 1.4 Antigen, Haptens, adjuvants, antigenicity, Epitopes (K1, K2, K3, K4, K5, K6)
- 1.5 Immunoglobulins - basic structure, classification & functions, allotypes and idiotypes. Theories of antibody formation- side chain (K1, K2, K3, K4, K5, K6)
- 1.6 Clonal selection theory (K1, K2, K3, K4, K5, K6)

**Unit II: (18 Hours)**

- 2.1 Immunity: Types of immunity - innate and acquired immunity (K1, K2, K3, K4, K5, K6)
- 2.2 Antitoxic, antibacterial and antiviral immunity (K1, K2, K3, K4, K5, K6)
- 2.3 Humoral and cell mediated immunity (K1, K2, K3, K4, K5, K6)
- 2.4 Antigen recognition - T cell and B cell receptor complexes, antigen processing and presentation (K1, K2, K3, K4, K5, K6)
- 2.5 Interaction of T and B cells, cytokines. Immunological memory (K1, K2, K3, K4, K5, K6)
- 2.6 Cytotoxicity - immunotolerance, immunosuppression (K1, K2, K3, K4, K5, K6)

**Unit III: (18 Hours)**

- 3.1 Complement system -Nomenclature, activation of complement –classical & alternative pathway (K1, K2, K3, K4, K5, K6)
- 3.2 Complement fixation test (K1, K2, K3, K4, K5, K6)
- 3.3 Immunological techniques- Immunoprecipitation, RIA, ELISA (K1, K2, K3, K4, K5, K6)
- 3.4 Avidin-biotin mediated assay (K1, K2, K3, K4, K5, K6)
- 3.5 Immunohistochemistry and immuno electrophoresis (K1, K2, K3, K4, K5, K6)
- 3.6 Immunoblotting (K1, K2, K3, K4, K5, K6)

**Unit IV: (18 Hours)**

- 4.1 Vaccines - killed, attenuated organisms, toxoids, recombinant vector vaccines (K1, K2, K3, K4, K5, K6)
- 4.2 Subunit vaccines, anti-idiotypic vaccines (K1, K2, K3, K4, K5, K6)
- 4.3 MHC complex – MHC genes - HLA genes, class I and II antigens-Structure and function (K1, K2, K3, K4, K5, K6)
- 4.4 Histocompatibility testing -cross matching (K1, K2, K3, K4, K5, K6)
- 4.5 Transplantation – types (K1, K2, K3, K4, K5, K6)
- 4.6 Genetics of transplantation - graft versus host reactions (K1, K2, K3, K4, K5, K6)

**Unit V: (18 Hours)**

- 5.1 Hypersensitivity - Definition, classification and factors influencing hypersensitivity (K1, K2, K3, K4, K5, K6)
- 5.2 Type I-hypersensitivity-mechanism (K1, K2, K3, K4, K5, K6)

5.3 Type II, III, IV and V hypersensitivity-mechanism, diagnosis and treatment (K1, K2, K3, K4, K5, K6)

5.4 Immunodeficiency disorders - B cell deficiencies (K1, K2, K3, K4, K5, K6)

5.5 Immunodeficiency disorders - T cell deficiencies (K1, K2, K3, K4, K5, K6)

5.6 AIDS, COVID -pathogenesis, diagnosis & Treatment (K1, K2, K3, K4, K5, K6)

**Text Books:**

1. Dulsi Fathima & Arumugam-Immunology- Saras Publications- 4<sup>th</sup> Edition, 2014

2. Ivo Roitt- Essential Immunology -Blackwell Publishing-13<sup>th</sup> Edition, 2017

**Reference Books:**

1. Abul K. Abbas, Andrew Lichtman-Cellular and Molecular Immunology-Saunders Publishers -9<sup>th</sup> Edition, 2017

2. Kubly J. – Immunology-W H Freeman Company, New York- 7<sup>th</sup> Edition-2013.

3. Tizard L R –Immunology-Saunders Publishers-13<sup>th</sup> Edition, 2017

4. Frank C. Hay, Olwyn M. R. Westwood, Paul N. Nelson, and Leslie Hudson-Practical Immunology -Blackwell Publishing, Incorporated- 4<sup>th</sup> Edition, 2008

5. D. M. Weir- Immunological Techniques -13<sup>th</sup> Edition, 2002

**Open Educational Resources (OER):**

1. <https://www.youtube.com/watch?v=O-r7FFkiItk>

2. <https://www.youtube.com/watch?v=sYjtMP67vyk>

3. <https://www.youtube.com/watch?v=YJ0-qQslqqQ>

4. <https://www.youtube.com/watch?v=mH8IoSuh64o>

5. <https://www.youtube.com/watch?v=uW96-mBFGag>

**SEMESTER – III**  
**PCBCK20 - ADVANCED BIOTECHNOLOGY**

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II / III	PCBCK20	Advanced Biotechnology	Theory	Core	5	4	40+60=100

**Objective:**

To learn how to apply the knowledge of genetic engineering in problem solving and in practice.

**Course Outcome (CO)**

On completion of the course, the students will be able to;

1. Illustrate the tools and strategies used in genetic engineering
2. Apply the knowledge of genetic engineering in problem solving and in practice
3. Categorize how plant and animal cells are cultured and genetically manipulated in laboratory
4. Make use of the various steps in the development of a biotechnology derived products
5. Report the applications of genetic engineering technique in basic and applied experimental biology

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	H	H	H	M
CO 2	H	H	H	H	M	M
CO 3	H	H	M	L	M	L
CO 4	H	H	H	H	M	M
CO 5	H	M	H	H	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	H	H	H	M
CO 2	H	H	H	H	M	M
CO 3	H	H	H	H	M	M
CO 4	H	H	H	L	M	L
CO 5	H	H	M	H	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit I:**

**(15 Hours)**

- 1.1 Basic principles – Steps involved - Enzymes used in genetic engineering (K1, K2, K3)



- 1.2 Restriction enzymes: Types and target sites (K1, K2, K3)
- 1.3 Cutting and joining of DNA molecules - linkers and adaptors - Homopolymers (K1, K2, K3)
- 1.4 Cloning vehicles and their properties: Natural and Based plasmids (pBR322) (K1, K2, K3)
- 1.5 Cosmid vectors (K1, K2, K3, K5)
- 1.6 Shuttle vectors. (K1, K2, K3, K5)

**Unit II: (15 Hours)**

- 2.1 DNA library: cDNA and Genomic libraries (K1, K2, K3, K5)
- 2.2 Recombinant selection and screening methods - Expression of cloned genes - Problems and solutions (K1, K2, K3)
- 2.3 DNA sequencing strategies - Sanger's and Maxam - Gilbert's methods (K1, K2, K3, K4)
- 2.4 Applications of PCR and DNA hybridization (K1, K2, K3, K5)
- 2.5 Southern and Northern blotting (K1, K2, K3, K4, K5)
- 2.6 Western blotting. (K1, K2, K3, K4, K5)

**Unit III: (15 Hours)**

- 3.1 Culturing explants and haploids - Protoplasts fusion and Embryoids (K1, K2, K3, K4, K5, K6)
- 3.2 Methods of gene transfer to plants, animals and bacteria- Transfection, Electroporation, shotgun and others (K1, K2, K3, K4)
- 3.3 Transgenic plants, GM foods and biopesticides, gene knockouts (K1, K2, K3, K4)
- 3.4 Transgenic animals, animal pharming and xenografting (K1, K2, K3, K4, K5)
- 3.5 Biodegradation, stimulation and its applications (K1, K2, K3, K4, K5)
- 3.6 Bioleaching. (K1, K2, K3)

**Unit IV: (15 Hours)**

- 4.1 Industrial biotechnology – fermentors (K1, K2, K3)
- 4.2 Ethanol and Citric acid production: Principle, types, product recovery and purification (K1, K2, K3, K4)
- 4.3 Vitamin B<sub>12</sub> and Streptomycin production: Principle, types, product recovery and purification (K1, K2, K3, K4)
- 4.4 Enzyme biotechnology-production and uses of industrially important enzymes such as protease (K1, K2, K3, K4)
- 4.5 Immobilization of enzymes and their applications (K1, K2, K3, K4)
- 4.6 Waste treatment, bioenergy and biogas production. (K1, K2, K3, K4)

**Unit V: (15 Hours)**

- 5.1 Gene therapy (somatic): Principle and approaches. (K1, K2, K3, K4)
- 5.2 Potential hazards - Biological weapons - Biosafety of GM foods and GMOs - substantial equivalence and safety testing - Gene drain - Tangled genes (K1, K2, K3)

- 5.3 Human genome research – the objectives and approaches, genomics and genome prospecting - the controversies (K1, K2, K3, K4)
- 5.4 Issues of biotechnology-social and scientific – technology protecting systems and the terminator (K1, K2, K3, K4)
- 5.5 IPR: concepts and conditions (K1, K2, K3)
- 5.6 Patenting of genes, cells and life forms - evaluation of life patenting. (K1, K2, K3, K5, K6)

**Text Books:**

- 1. William J. Thieman, Michael A. Palladino - Introduction to Biotechnology –Pearson New international Edition, 2013
- 2. Bourgaise Jewell, Buiser– Biotechnology - Pearson Education – 2<sup>nd</sup> Edition, 2004

**Reference Books:**

- 1. R.C. Dubey - A Text book of Biotechnology - S. Chand Publishing - 5<sup>th</sup> edition
- 2. Lewin B - Genes – VIII - Pearson - 2004
- 3. Glick & Pasternak - Molecular Biotechnology - 4<sup>th</sup> Edition, 2010
- 4. T.A. Brown-Gene Cloning & DNA Analysis–an introduction-6<sup>th</sup> Edition Wiley-Blackwell
- 5. U. Satyanarayana - Biotechnology – 12<sup>th</sup> Edition, 2019

**Open Educational Resources (OER):**

- 1. [https://www.youtube.com/watch?v=1lqQn3\\_PvMs](https://www.youtube.com/watch?v=1lqQn3_PvMs)
- 2. [https://youtu.be/Ll\\_7z4YS2Ak](https://youtu.be/Ll_7z4YS2Ak)
- 3. <https://youtu.be/aSb5PNwrRx0>
- 4. <https://www.slideshare.net/mobile/DineshS50/citric-acid-production-74641179>
- 5. <https://youtu.be/-hryHoTIHak>

**SEMESTER-III & IV**  
**PCBCN20 – MAIN PRACTICAL – III**  
 [Endocrinology, Immunotechniques, Biotechnology]

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II/ III & IV	PCBCN20	Main Practical - III	Practical	Core	5	4	40+60 =100

**Objective:**

The course is aimed to enable the student interpret hormonal imbalance and clinical conditions and also to provide in-depth practical knowledge and skill in performing immune-techniques and cell culture techniques.

**Course Outcome (CO)**

On completion of the course, the students will be able to,

1. Analyse the prevalence and impact of endocrine hormone in regulating health
2. Use the practical skill for diagnosing immunological reaction in relation to disease condition
3. Apply tissue culture technique and fermentation process for various applications

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	M	L	M	H
CO 2	L	H	H	H	H	L
CO 3	H	H	L	H	M	L
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	1	2	3	4	5	6
CO 2	H	H	M	H	M	M
CO 3	H	L	H	L	H	H
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

## **Endocrinology**

### **Case Studies (Identification of diseases based on patient history)**

#### **Immunotechniques:**

1. Blood film preparation and identification of cells.
2. Demonstration of immuno reaction
  - Blood group
  - Widal test
  - Pregnancy test
  - Coombs test
  - ELISA
  - Antigen antibody reaction
  - Ouchterlony double diffusion, Immunoelectrophoretic, Immunoblotting, Immunostaining, Immunofluorescent
3. Antibody sensitivity test
4. Measurement of antibodies - Serial dilution
5. Determination MIC

#### **Biotechnology**

1. Preparation of Culture media & Reagents - Media composition, Nutrition, Hormones. Tissue Culture – Callus culture, Cell suspension.
2. Organ Micro-culture - Shoot tip, excised root, Leaf culture Plant micro-propagation – micro-culture of plants.
3. Basic sterilization techniques required for Media preparation & Cytological techniques Preparation of Slides.
4. Staining of Slides.
5. Image analysis & Karyotyping.
6. Preparation of alcohol using fermentation process.

#### **Reference Books:**

1. Shirlyn B McKenzie- Clinical Laboratory Haematology- Pearson Publication, 2009
2. Hrudayanath Thatol, Supriya Dash, Swagat Kumar Das- Practical Biotechnology: Principles and Protocols- I K International Publishing House Pvt, 2017.
3. Robert H Smith. Plant tissue Culture- Techniques and Experiments- Academic Press, 3<sup>rd</sup> Edition, 2012.
4. Ivan Roitt, Jonathan Brostoff, David Male, David Roth- Immunology-Mosby Publication. 7<sup>th</sup> Edition, 2006
5. Charles GD Brook and Nicholas J Marshall- Essential Endocrinology - New Age International Publishers, 4th Edition, 2006

***\*ONE WEEK HANDS ON TRAINING IN ANY INDUSTRY***

**SEMESTER-III & IV SEMESTER – III**  
**PEBCE20 - ELECTIVE III A: MICROBIOLOGY**

<b>Year/ Sem</b> II / III	<b>Course Code</b> PEBCE20	<b>Title of the Course</b> Microbiology	<b>Course Type</b> Theory	<b>Course Category</b> Elective III A	<b>H/W</b> 3	<b>Credits</b> 3	<b>Marks 100</b> 40+60=100
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**Objective:**

To understand the importance of applications of microorganisms.

**Course Outcome (CO)**

On completion of the course, the students will be able to;

1. Recall the taxonomy, morphological features and division process of microbes
2. Outline the microbial growth and its metabolism
3. Apply the microbial culture technique
4. Gain knowledge on the replication processes in microbes
5. Identify the various infectious diseases, its causative agents and antimicrobial drugs

<b>CO / PO</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>
<b>CO 1</b>	H	H	M	H	H	L
<b>CO 2</b>	H	L	M	H	M	L
<b>CO 3</b>	H	H	H	H	H	M
<b>CO 4</b>	H	H	H	M	L	M
<b>CO 5</b>	H	H	H	L	M	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO 1</b>	H	M	M	M	H	M
<b>CO 2</b>	H	M	M	M	M	M
<b>CO 3</b>	H	H	M	H	H	L
<b>CO 4</b>	H	H	M	M	M	M
<b>CO 5</b>	H	H	H	H	H	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit I: (9 Hours)**

- 1.1 Morphology and Ultrastructure of bacteria, fungi, algae and protozoa. (K1, K2)
- 1.2 Classification of microbes, molecular taxonomy, cell walls of eubacteria – peptidoglycan and related molecules (K1, K2)
- 1.3 Structure and synthesis of cell wall and cell membrane of gram – positive and negative bacteria (K1, K3)
- 1.4 Flagella and motility. Cell inclusion bodies. (K1, K2)
- 1.5 Blue and green bacteria. Budding and appendaged bacteria, spirilla, spirochaetes, gliding and sheathed bacteria, pseudomonas, lactic and propionic acid bacteria. (K1, K2, K3)
- 1.6 Endospore forming rods and cocci, myobacteria, rickettsia and mycoplasma. Archaeobacteria (K1, K2, K3)

**Unit II: (9 Hours)**

- 2.1 Microbial growth – Definition. Mathematical expression of growth, growth curve, measurement of growth and factors affecting growth. (K1, K2, K3)
- 2.2 Microbial metabolism – Overview, photosynthesis in microbes. Role of chlorophylls, carotenoids and phycobilins, Calvin cycle. (K1, K2, K3, K4)
- 2.3 Chemolithotrophy: hydrogen ion – nitrite oxidizing bacteria: nitrate and sulfate reduction: methanogenesis and acetogenesis (K1, K2, K3)
- 2.4 Fermentations – diversity, syntrophy – role of anoxic decompositions (K1, K2, K3)
- 2.5 Nitrogen metabolism, nitrogen fixation (K1, K2)
- 2.6 Hydrocarbon transformation (K1, K2, K4)

**Unit III: (9 Hours)**

- 3.1 Methods in microbial identification. Pure culture techniques (K1, K2, K3, K4)
- 3.2 Theory and practice of sterilization (K2, K2, K3, K4)
- 3.3 Principles of microbial nutrition (K1, K2)
- 3.4 Construction of culture media (K1, K2, K3, K4)
- 3.5 Enrichment culture techniques for isolation of hemoautotrophs (K1, K2, K3, K4)
- 3.6 Chemoheterotrophs and photosynthetic microbes. (K1, K2, K3, K4)

**Unit IV: (9 Hours)**

- 4.1 Bacteria, plant, animal and tumour viruses (K1, K2)
- 4.2 Classification and structure of viruses. Lytic cycle and lysogeny (K1, K2)
- 4.3 DNA viruses: positive and negative strand (K1, K2)
- 4.4 Double stranded RNA viruses (K1, K2, K3)
- 4.5 Replication: example of Herpes, Adenoviruses (K1, K2)
- 4.6 Replication: example Retrovirus, Viroids and Prions (K1, K2)

**Unit V: (9 Hours)**

- 5.1 Disease reservoirs; Epidemiological terminologies. Infectious disease transmissions. Respiratory infections caused by bacteria and viruses (K1, K2, K3)

- 5.2 Tuberculosis, sexually transmitted diseases including AIDS; Vector borne diseases (K1, K2, K3, K4)
- 5.3 Water borne diseases, Public health and water quality. (K1, K2, K5)
- 5.4 Pathogenic fungi (K1, K2, K3, K4)
- 5.5 Antimicrobial agents, Antibiotics. Penicillin and Cephalosporins, Broad spectrum antibiotics. Antibiotics from Prokaryotes (K1, K2, K3, K4)
- 5.6 Antifungal antibiotics – mode of action, Resistance to antibiotics. (K1, K2, K3, K4)

**Text Books:**

1. Michael J Pelczar, E.C.S Chan and Noel R Krieg Microbiology- McGraw Hill, 5<sup>th</sup> Edition, 2001
2. Ananthanarayan and Paniker- Textbook of Microbiology- Universities Press, 10<sup>th</sup> Edition, 2002.

**Reference Books:**

1. Jawetz, Melnick and Adelberg- Medical Microbiology-Jaypee Medical- 2015.
2. Patrick R Murray- Basic Medical Microbiology- Elsevier, 2019.
3. Robert W Bauman- Microbiology with diseases by Taxonomy- Pearson Publication, 2012.
4. Prescott. Microbiology- McGraw Hill Education, 9<sup>th</sup> Edition, 2013.
5. Jacquelyn G Black-Microbiology- International Student Version, 8<sup>th</sup> Edition, 2012.

**Open Educational Resources (OER)**

1. <https://youtu.be/ei6Z7orCpPk>
2. <https://youtu.be/NYMTeqpr6JI>
3. <https://youtu.be/J5Nz4cQJ2u8>
4. <https://youtu.be/fH1zS7hlW54>
5. <https://youtu.be/202hkf43HXQ>

**SEMESTER III**  
**PEBCF20 - ELECTIVE III B: RESEARCH METHODOLOGY**

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II / III	PEBCF20	Research Methodology	Theory	Elective III B	3	3	40+60=100

**Objective:**

To addresses the issues inherent in selecting a research problem and discuss the techniques and tools to be employed in completing a research project.

**Course Outcome (CO):**

On completion of the course, the students will be able to;

1. Design the research work
2. Gain an idea on the role of biostatistics in research
3. Understand the significance of internet in research
4. Develop the understanding on database management system
5. Practice the concepts of animal studies and CPCSEA guidelines in research

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	H	H	M	L
CO 2	H	H	H	M	M	M
CO 3	H	H	M	H	H	M
CO 4	H	H	H	M	M	L
CO 5	H	H	M	H	M	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	H	H	M	H
CO 2	H	H	H	M	M	M
CO 3	H	H	M	M	M	M
CO 4	H	H	M	M	M	L
CO 5	H	H	M	H	M	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						



**Unit I: (9 Hours)**

- 1.1 Scientific research & writing - Importance and need for research. (K1, K2, K3, K4)
- 1.2 Ethics and scientific research. Formulation of hypothesis. (K1, K2, K3, K4)
- 1.3 Types and characteristic designing a research work. (K1, K2, K3, K4, K6)
- 1.4 Scientific writing - Characteristics - Logical format for writing thesis and papers. (K1, K2, K3, K4, K6)
- 1.5 Essential features of abstract, introduction, review of literature, materials and methods, and discussion. (K1, K2, K3, K4, K6)
- 1.6 Effective illustration - tables and figures. Reference styles - Harvard and Vancouver systems. (K1, K2, K3)

**Unit II: (9 Hours)**

- 2.1 Biostatistics - Collection and classification of data (K1, K2, K3, K4, K6)
- 2.2 Diagrammatic and graphic representation of data measurement of central tendency (K1, K2, K3, K4, K5, K6)
- 2.3 Standard deviation - normal distribution (K1, K2, K3)
- 2.4 Test of significance based on large samples - small samples - Student t test (K1, K2)
- 2.5 Correlation and regression (K1, K2)
- 2.6 Chi square test for independence of attributes - ANOVA. (K1, K2, K3)

**Unit III: (9 Hours)**

- 3.1 Bioinformatics - Introduction to bioinformatics (K1, K2, K3)
- 3.2 Scope of bioinformatics (K1, K2, K3, K4)
- 3.3 Role of computers in biology (K1, K2)
- 3.4 Internet - The World Wide Web. (K1, K2, K3)
- 3.5 Useful search engines - Boolean searching, search engine algorithms. (K1, K2, K3)
- 3.6 Finding scientific articles – PubMed, Science direct. (K1, K2, K3)

**Unit IV: (9 Hours)**

- 4.1 Databases - Data base concepts - database, database system, database management systems - hierarchical, relational and network, database security. (K1, K2, K3, K4)
- 4.2 Biological databases - types, sequence and structure. (K1, K2)
- 4.3 Data submission (K1, K2)
- 4.4 Data retrieval. (K1, K2)
- 4.5 Searching sequence databases - sequence similarity searches, amino acid substitution matrices. (K1, K2, K3, K4, K6)
- 4.6 Database search - FASTA and BLAST, CLUSTAL. (K1, K2, K3, K6)

**Unit V: (9 Hours)**

- 5.1 Bioethics. (K1, K2)
- 5.2 Ethics in animal experimentation. CPCSEA guidelines - Animal care and technical personnel environment, animal husbandry, feed, bedding, water, sanitation and

cleanliness, waste disposal, anesthesia and euthanasia. (K1, K2, K3, K6)

5.3 Composition of (Human) institutional Ethical Committee (IEC) - General ethical issues. (K1, K2, K3)

5.4 Specific principles for chemical evaluation of drugs, herbal remedies and human genetics research (K1, K2, K3)

5.5 Ethics in food and drug safety. (K1, K2, K3)

5.6 Environmental release of microorganisms and genetically engineered organisms. Ethical issues in human gene therapy and human cloning. (K1, K2)

#### **Text Books:**

1. C R Kothari -Research Methodology- Methods and Techniques, 4<sup>th</sup> Edition., 2019.
2. Ranjit Kumar -Research methodology- Pearson education, 2005.

#### **Reference Books:**

1. Bryan Bergeron MD- Bioinformatics Computing- Prentice-Hall of India Pvt.Ltd, 2012.
2. Bergeron BP- Bioinformatics Computing- Printice Hall, 1st Edition, 2002.
3. John M Lachin-Biostatistical Methods- Wiley interscience, 1<sup>st</sup> Edition, 2000.
4. Ethical guidelines for biomedical research on human subjects. ICMR, New Delhi, 2000.
5. Sundar Rao, Jesudian Richard -An Introduction to Biostatistics, 5<sup>th</sup> Edition, 2012.

#### **Open Educational Resources (OER)**

1. <https://youtu.be/3FE5ldiIp6A>
2. <https://youtu.be/Coe0N2xb8kk>
3. [https://youtu.be/Nx\\_E4Z4y8uQ](https://youtu.be/Nx_E4Z4y8uQ)
4. <https://youtu.be/Ap3rUxB4k9Q>
5. <https://youtu.be/kAxTbc6nsFs>

**SEMESTER IV**  
**PCBCL20 MOLECULAR BIOLOGY**

<b>Year/ Sem</b> II / IV	<b>Course Code</b> PCBCL20	<b>Title of the Course</b> Molecular Biology	<b>Course Type</b> Theory	<b>Course Category</b> Core	<b>H/W</b> 6	<b>Credits</b> 5	<b>Marks</b> 40+60=100
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**Objective:**

The course will enable the student to learn the molecular events occurring in gene and its application in field of biomedical and genetic research.

**Course Outcome (CO)**

On completion of the course, the students will be able to;

1. Demonstrate the nature and role of Gene in life activity
2. Describe the blueprint of life and its functions
3. Outline the mechanism of Replication
4. Outline the role of Transcription
5. Demonstrate the features of Genetic code and mechanism of Translation

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	M	H	H	M	M	M
CO 2	H	L	M	H	H	H
CO 3	L	M	M	L	H	M
CO 4	M	M	H	H	M	L
CO 5	H	H	H	H	M	L
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	M	H	H	L	M	M
CO 2	H	L	M	H	H	H
CO 3	M	H	H	M	H	M
CO 4	L	M	H	M	L	H
CO 5	H	H	L	H	M	L
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit I: (18 Hours)**

1.1 Gene arrangements in prokaryotes and eukaryotes (K2, K3, K4, K5)

1.2 Gene structure in eukaryotic organisms, introns, exons, pseudogenes, and gene clusters,

spacers, repetitive sequences (K1, K2, K3, K4)

1.3 Single and multiple copy genes in eukaryotes, eg – Histones, Alu, copia, satellite.

Mapping of human genes – techniques used, assignment of important genes (K2, K3, K4, K5)

1.4 Gene regulatory mechanisms and cell memory- structure of chromatin - nucleosomes and higher orders of organization (K2, K3, K4, K5, K6)

1.5 Chromosome and genes, chromosomal replication, genetic mapping of chromosomes, chromosome banding (K2, K3, K4, K5, K6)

1.6 Transposition in human chromosome and chromosomal abnormalities (K1, K2, K3, K4)

**Unit II: (18 Hours)**

2.1 DNA replication in prokaryotes (K3, K4, K5, K6)

2.2 DNA replication in Eukaryotes (K3, K4, K5, K6)

2.3 Inhibitors of prokaryotic replication (K1, K2, K3, K4)

2.4 Inhibitors of Eukaryotic replication (K2, K3, K4)

2.5 Replication in RNA virus (K2, K3, K4)

2.6 Plasmid replication (x174, nl3 A. DNA) (K1, K2, K3)

**Unit III: (18 Hours)**

3.1 Prokaryotic Transcription- Promoters, foot-printing experiment, DNA - dependent RNA polymerase -Role of Pribnowbox (K2, K3, K4)

3.2 Prokaryotic transcription – mechanism in prokaryotes (K3, K4, K5, K6)

3.3 Eukaryotic transcription (K3, K4, K5, K6)

3.4 Post-transcriptional modifications of eukaryotic RNAs, RNA splicing, introns and splicing reactions (K1, K2, K3, K4)

3.5 Self-splicing introns - group I and group II, exons, spacer sequences, enhancers (K1, K2, K3, K4)

3.6 Reverse transcriptase, retroviruses (K1, K2, K3, K4)

**Unit IV: (18 Hours)**

4.1 Genetic code: Salient features (K1, K2, K3, K4)

4.2 Wobble mechanism and its significance (K1, K2, K3, K4)

4.3 Prokaryotic protein biosynthesis (K3, K4, K5, K6)

4.4 Eukaryotic protein biosynthesis (K3, K4, K5, K6)

4.5 Inhibitors of protein synthesis (K1, K2, K3, K4)

4.6 Post-translational modifications in prokaryotes and eukaryotes (K1, K2, K3, K4)

**Unit V: (18 Hours)**

5.1 DNA repair – types (K1, K2, K3, K4)

5.2 Regulation of gene expression in prokaryotes: Operon concept- lac operon (K3, K4, K5, K6)

5.3 An overview of Genomics - Structural genomics (K1, K2, K3, K4)

5.4 Functional genomics (K3, K4, K5, K6)

5.5 An overview of Proteomics (K1, K2, K3, K4)

5.6 Human Genome Project, chromosome maps – DNA micro arrays (K1, K2, K3, K4)

**Text Books:**

1. Lehninger, David Nelson and M. Chael M. Cox - Principles of Biochemistry-W.H Freeman and Company Ltd- 4<sup>th</sup> Edition,2005
2. David Friefelder - Molecular Biology- Narosa Publishing House-2<sup>nd</sup> Edition,2005.

**Reference Books:**

1. Lodish, Darnell and Baltimore - Molecular Cell Biology-W.H. Freeman & Company-4<sup>th</sup> Edition,2000
2. T. A. Brown. Gene Cloning and DNA analysis- An introduction. John Wiley Publications - 7 edition, 2016.
3. Gerald Karp, Janet Iwasa, Wallace Marshall. Cell and Molecular Biology, Wiley Publications - 9th edition, 2019.
4. Jocelyn E. Krebs, Elliott S. Goldstein and Stephen T. Kilpatrick. Genes XII. Jones and Barlett Publisher - 12th edition, 2017.
5. Rajeev Tyagi. Genetics, Genomics, Proteomics & Bioinformatics. Manglam Publishers & Distributors, 2012.

**Open Educational Resources (OER);**

1. <https://www.youtube.com/watch?v=3wTAEfjo20c>
2. [https://www.youtube.com/watch?v=Dc21ml8-\\_PI](https://www.youtube.com/watch?v=Dc21ml8-_PI)
3. [https://www.youtube.com/watch?v=exJDso2\\_yRQ](https://www.youtube.com/watch?v=exJDso2_yRQ)
4. [https://www.youtube.com/watch?v=fp9x6TZ\\_zEY](https://www.youtube.com/watch?v=fp9x6TZ_zEY)
5. <https://www.youtube.com/watch?v=5paHhTq87Ak>

**SEMESTER - IV**  
**PEBCG20 ELECTIVE – IV A: PLANT BIOCHEMISTRY**

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II / IV	PEBCG20	Plant Biochemistry	Theory	Elective – IV A	3	3	40+60=100
II / IV	PEBCG20	Plant Biochemistry	Theory	Elective – IV A	3	3	40+60=100

**Objective:**

To help the students to understand the plant metabolites and their application in the field of medicine.

**Course Outcomes (CO)**

On completion of the course, the students will be able to;

1. Identify various natural and artificial ways to propagate plants
2. Discuss the function and composition of different plant structures
3. Describe the processes of germination and plant growth
4. Explain the role of plant growth regulators and plant tissue culture
5. Perform the calculations to predict expected plants by experiments

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	M	H	H	M	M
CO 2	H	H	H	M	H	M
CO 3	M	H	M	H	H	M
CO 4	H	M	H	M	H	M
CO 5	H	H	H	H	M	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	M	M	L	H
CO 2	H	M	H	H	H	M
CO 3	H	H	M	M	L	M
CO 4	H	M	M	M	L	M
CO 5	H	H	M	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit I:**

**(9 Hours)**

1.1 Photosynthetic Pigment, Light reaction (K2, K3, K4)

1.2 Dark reactions of photosynthesis (K2, K3, K4)

1.3 Proton gradient and ATP synthesis of chloroplast (K2, K3, K4)

1.4 Regulation of photosynthesis - Mode of action of DCMU (K1, K2, K3, K4)

1.5 Bacterio rhodopsin, CAM metabolism, RUBISCO (K2, K3, K4)

1.6 Regulation of photorespiration and crop productivity (K2, K3, K4)

**Unit II: (9 Hours)**

2.1 Nitrogen cycle Disotropes biochemistry of Symbiotic and Nonsymbiotic nitrogen fixation (K2, K3, K4)

2.2 Assimilation of ammonium, carbon- nitrogen ratio (K1, K2, K3, K4)

2.3 Uride metabolism, Nitrate metabolism, Genetics of nitrogen fixation, Genetic manipulation of Nif genes (K2, K3, K4)

2.4 Biosynthesis, Mode of action, transport, distribution and physiological effect of Auxin, Gibberellin, Cytokinin (K2, K3, K4)

2.5 Biosynthesis, Mode of action, transport, distribution and physiological effect of Abscisic acid (ABA) (K2, K3, K4)

2.6 Biosynthesis, Mode of action, transport, distribution and physiological effect of Ethylene (K2, K3, K4)

**Unit III: (9 Hours)**

3.1 Biochemistry of plant disease, defense mechanism of plants (K3, K4)

3.2 Biosynthesis, distribution and biological functions of industrially important secondary metabolite (K2, K3, K4)

3.3 Principles of plant diseases control (K2, K3)

3.4 Methods in phytochemicals: Extraction, fractionation and characterization (K2, K3, K4)

3.5 General properties of plant proteinase inhibitor (K3, K4)

3.6 Proteinase inhibitors-serine proteinase, acid proteinase and metalloproteinase (K2, K3, K4)

**Unit IV: (9 Hours)**

4.1 Water relations of plant, Mechanism of water absorption (K2, K3)

4.2 Aquaporin Symplast - Apoplast concept (K2, K3)

4.3 Ascent of sap (K2, K3)

4.4 Source and sink relationship, Translocation of Inorganic and Organic substances, Bud and Seed dormancy (K2, K3)

4.5 Senescence and Stress response in plant (K2, K3, K4)

4.6 Phytochromes- Properties, Photochemical, Transformation, Mode of action and physiological effect (K2, K3, K4)

**Unit V: (9 Hours)**

5.1 DNA polymorphism – Importance of RFLP and RAPD in plant breeding management (K2, K3, K4)

5.2 Aspects of plant genetic engineering. Tacking, Mapping and Cloning of plant genes, Selectable markers (K2, K3)

- 5.3 Reporter genes and promoters used in plant vectors. Ti plasmids and Crown gall tumor (K2, K3, K4)
- 5.4 Genetic engineering of plant for disease resistance, Cytoplasmic Male Sterility, Edible oil, Biodegradable plastics (K2, K3)
- 5.5 Delay of fruits ripening -Methods (K2, K3)
- 5.6 Application of plant tissue culture (K2, K3, K4)

**Text Books:**

1. T.W. Goodwin- Introduction to Plant Biochemistry -Pergamon Press- 2<sup>nd</sup> Edition,2005.
2. P.J. Lea, L.L. Castle and Lea-Plant Biochemistry and Molecular Biology- John Wiley & Sons- 2<sup>nd</sup> Editon-2000

**Reference Books:**

1. R.K. Sinha- Modern Plant Physiology- Narosa Publishing House -2<sup>nd</sup> Editon,2004.
2. M.J. Pelczar, E.C.S. Chan and N.R. Kreig, Microbiology Tata McGraw Hill Publishing Co. 7<sup>th</sup> Edition,2013
3. L.M. Prescott, J.P. Harley and D.A. Klein, Microbiology-McGraw Hill Publishers- 6<sup>th</sup> Edition,2004
4. B.D. Davis, R. Dulbecco, H.N. Eisen and H.S. Ginsberg-Microbiology-3<sup>rd</sup> Edition,2008
5. P. M. Dey and J. R. Hardorne- Plant Biochemistry-Elsevier Science,1<sup>st</sup> Edition -2013

**Open Educational Resources (OER):**

1. <https://www.youtube.com/watch?v=VYlsLPwMzFo>
2. <https://www.youtube.com/watch?v=tCrgTV20BD4>
3. [https://www.youtube.com/watch?v=\\_Cbv4MecfA4](https://www.youtube.com/watch?v=_Cbv4MecfA4)
4. [https://www.youtube.com/watch?v=tIy9ZXP\\_oz8](https://www.youtube.com/watch?v=tIy9ZXP_oz8)
5. <https://www.youtube.com/watch?v=AUiP9eH-0NI>



**SEMESTER IV**  
**PEBCH20 ELECTIVE IV- B: HERBAL THERAPY**

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II / IV	PEBCH20	Herbal Therapy	Theory	Elective IV B	3	3	40+60=100

**Objective:**

To help students to understand the concepts in pharmacognosy and the role of medicinal plants.

**Course Outcome (CO)**

On completion of the course, the students will be able to;

1. Describe the concepts of Pharmacognosy
2. Explain the classification of medicinal plants
3. Outline the different parts of plant
4. Predict the Herbal medicines for Human ailments
5. Apply the knowledge on the important metabolic pathways in plants

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	M	H	H	M	M
CO 2	H	H	H	M	H	M
CO 3	M	H	M	H	H	M
CO 4	H	M	H	M	H	M
CO 5	H	H	H	H	M	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	M	M	L	H
CO 2	H	M	H	H	H	M
CO 3	H	H	M	M	L	M
CO 4	H	M	M	M	L	M
CO 5	H	H	M	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

**Unit I:**

**(9 Hours)**

- 1.1 Pharmacognosy - Definition and history (K1, K2, K3)
- 1.2 Indian systems of medicine - Siddha, Ayurveda, and Unani systems (K2, K3, K4)
- 1.3 Taxonomy of locally available medicinal plants (Tulsi, Aloe vera, Neem), their chemical

constituents and medicinal uses (K2, K3, K4)

1.4 Classification of Crude drugs (K2, K3)

1.5 Chemistry of Drugs - Future of pharmacognosy (K2, K3)

1.6 Quality control of drugs of natural origin (K2, K3, K4)

**Unit II: (9 Hours)**

2.1 Classification of medicinal plants - Vernacular name and family (K2, K3)

2.2 Geographical source, cultivation, collection, and processing of crude drugs  
(K1, K2, K3, K4)

2.3 Morphological, histological studies and chemical constituents of crude drugs  
(K2, K3, K4)

2.4 Therapeutic and other pharmaceutical uses of underground stem – ginger and Alpinia  
(K2, K3, K4)

2.5 Therapeutic and other pharmaceutical uses of Roots - Rauwolfia – Belladonna  
(K2, K3, K4)

2.6 Therapeutic and other pharmaceutical uses of Aerial parts - Bark – Cinchona  
(K2, K3, K4)

**Unit III: (9 Hours)**

3.1 Leaves - Adathoda, Eucalyptus - Flower - Clove fruits seeds (K1, K2, K3, K4)

3.2 Nux vomica, Nutmegs and Gooseberry (K2, K3)

3.3 Unorganized drugs - Gum, Acacia and Resin (K2, K3, K4)

3.4 Turpentine, fixed oil and castor oil. (K2, K3)

3.5 Propagation of medicinal plants – Micropropagation (K2, K3, K4)

3.6 Macro propagation conservation of rare medicinal plants (K2, K3)

**Unit IV: (9 Hours)**

4.1 Herbal medicines for Human ailments (K2, K3, K4)

4.2 Drugs Acting on Cardiac Diseases, Cerebral Diseases, Nasal disease (K2, K3, K4)

4.3 Depressants. - Stimulants - Respiration and Drugs (K2, K3)

4.4 Urogenital system and drugs - Psychoactive plants (K2, K3)

4.5 Preparation of herbal infusion (K2, K3)

4.6 Toxicity in herbal drugs and their interactions (K2, K3)

**Unit V: (9 Hours)**

5.1 Role of biotechnology in medicinal plants banks (K2, K3)

5.2 Cultivation of medicinal and aromatic plants (K2, K3, K4)

5.3 Drug adulteration - methods of Drug evaluation (K2, K3).

5.4 Herbal food - Food processing - packaging (K2, K3)

5.5 Herbal sale and Export of medicinal plants (K2, K3, K4)

5.6 Marketing, Intellectual property rights and Export laws (K2, K3, K4)

**Text Books:**

1. T.W. Goodwin-Introduction to Plant Biochemistry- Pergamon Publishers-3<sup>rd</sup> Edition,2007
2. Kumar N.C-An Introduction to Medical Botany and Pharmacognosy- 3<sup>rd</sup> Edition,2005

**Reference Books:**

1. George Edward Trease and W.C. Evans – Pharmacognosy-English Language Books Society, Baelliere Tindall- 12<sup>th</sup> Edition,2008
2. Handa, S.S. and Kapoor V.K-Pharmacognosy -Vallabh Prakashan Publishers, 2<sup>nd</sup> Edition-2004
3. Jain, S.K - Indian Medicinal plants- National book trust -4<sup>th</sup> Edition,2004
4. Kokate, C.K, Durohit, A.P and Gokhale, S.R- Pharmacognosy - Nirali Prakasham Publishers, Pune-12<sup>th</sup> Edition-2011
5. Wallis, T.E-Text book of pharmacognosy- CBS publishers and distributors, New Delhi-5<sup>th</sup> Edition,2008

**Open Educational Resource (OER):**

1. <https://www.youtube.com/watch?v=rde0RSFNuu8>
2. <https://www.youtube.com/watch?v=QPQ9sZuiOb8>
3. <https://www.youtube.com/watch?v=5p4NOvF5EX4>
4. <https://www.youtube.com/watch?v=dOlkogaWF3M>
5. <https://www.youtube.com/watch?v=fhkvXf5t9lo>

## INDEPENDENT ELECTIVE I A: ORGANIC FARMING

Year/ Sem I / I	Course Code PIBCA20	Title of the Course Organic Farming	Course Type Theory	Course Category Independent elective	H/W -	Credits 2	Marks 40+60=100
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### Objective:

To help students to understand the concepts and importance of organic farming and use it as a source of income generation.

### Course Outcomes (CO)

On completion of the course, the students will be able to;

1. Analyze the importance of organic farming
2. Apply the concept of organic farming
3. Relate the importance of plant protection
4. Use the organic methods for plant cultivation
5. Plan the concept of income generation through organic farming and terrace gardening

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	M	H	H	M	M
CO 2	H	L	H	M	H	M
CO 3	M	H	M	L	H	M
CO 4	L	M	H	M	H	M
CO 5	H	H	H	H	M	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	M	M	L	H
CO 2	H	M	H	L	H	M
CO 3	H	L	M	M	L	M
CO 4	H	M	M	M	L	M
CO 5	L	H	M	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

### Unit-I

- 1.1 Introduction: Farming, basic concepts, principles and development of organic farming. (K1, K2)
- 1.2 Scope of organic farming Sustainable agriculture (K1, K2)
- 1.3 Needs for organic farming, types of organic farming (K1, K2)
- 1.4 Requirement of organic farming (K1, K2)
- 1.5 Conventional and organic farming (K1, K2, K3)
- 1.6 Components of organic farming (K1, K2)

### Unit-II

- 2.1 Organic farming system (K1, K2, K3)
- 2.2 Green manuring (K1, K2)
- 2.3 Types and stages of composting- vermicomposting, composite quality and marketing (K1,

- K2, K3, K4, K5)
- 2.4 Preparation of organic manure- Bulky organic manure and concentrated organic manure (K1, K2, K3)
  - 2.5 Biofertilizers: Preparation, applications, advantages and disadvantages (K1, K2)
  - 2.6 Soil tillage, land preparation and mulching (K1, K2, K3)

### **Unit -III**

- 3.1 Plant protection methods- Biopesticides- Formulation- granules, fumigants spray (K1, K2, K3, K6)
- 3.2 Preparation of pesticides from Chrysanthemum, Neem, Tobacco (K1, K2, K3, K4)
- 3.3 Advantages of biopesticides (K1, K2)
- 3.4 Weed management (K1, K2, K3)
- 3.5 Biocontrol agents (K1, K2, K3)
- 3.6 Plant natural predators (K1, K2)

### **Unit-IV**

- 4.1 Organic crop production methods- Rice, Coconut (K1, K2, K4, K5)
- 4.2 Organic crop production methods- Mango, Banana (K1, K2, K4, K5)
- 4.3 Organic crop production methods - Ginger (K1, K2, K4, K5)
- 4.4 Organic crop production methods -Pepper, Cardamom (K1, K2, K4, K5)
- 4.5 Organic crop production methods Medicinal plants- Tulsi (K1, K2, K4)
- 4.6 Livestock components in organic farming (K1, K2)

### **Unit-V**

- 5.1 Quality analysis of organic food (K1, K2)
- 5.2 Organic food and health benefits. (K1, K2)
- 5.3 Farm economy-cost of production system marketing. (K1, K2, K3, K4)
- 5.4 Income generation farming: Terrace farming. (K1, K2, K3, K4)
- 5.5 Income generation farming: Mushroom cultivation. (K1, K2, K3, K4)
- 5.6 Organic standard, organic certification process (K1, K2)

**[Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create]**

### **Recommended Reading:**

1. SR Reddy. Principles of organic farming. Kalyani publications, 2017
2. Dr. Ranjan Kumar Biswas. Organic Farming in India. N D publisher, 2014
3. Mamta Bansal. Basic of Organic farming. CBS Publishers and Distributors Pvt Ltd, 2017
4. Kolay A.K. Manures and Fertilizers. Atlantic Publisher, 2008
5. RK Sharma. Agriculture at a glance. 20<sup>th</sup> revised and enlarged edition, 2018
6. Chaeles L Mohler, Sue Ellen Johnson. Crop rotation on organic farms. NRAES Publisher, 1<sup>st</sup> Edition, 2009

### **Open Educational Resources (OER)**

1. <https://youtu.be/RFBPStyE9l0>
2. <https://youtu.be/U1DyKn3lYVvk>
3. <https://youtu.be/TQEaA7lrvIQ>
4. <https://youtu.be/n1VFLGp1xL8>
5. <https://youtu.be/V-SDjdTB1nw>

## INDEPENDENT ELECTIVE I B: FOOD PRESERVATION

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
I / I	PIBCB20	Food Preservation	Theory	Independent elective	-	2	40+60=100

### Objective:

To enable students to understand the concepts of food preservation and methods involved

### Course Outcomes (CO)

On completion of the course, the students will be able to;

1. Outline the role of microbes in food spoilage and methods adopted to overcome microbial food spoilage
2. Apply the general methods for preserving fruits and vegetables
3. Find the methods of food preservation
4. Explain the methods for identifying food spoilage
5. Use the methods for preserving non-vegetarian foods/ meat products

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	M	M	L	H
CO 2	H	M	H	H	H	M
CO 3	H	H	M	M	L	M
CO 4	H	M	M	M	L	M
CO 5	H	H	M	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	M	M	L	H
CO 2	H	M	H	H	H	M
CO 3	H	H	M	M	L	M
CO 4	H	M	M	M	L	M
CO 5	H	H	M	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

### Unit-I

1.1 Types of spoilage in perishables and Nonperishable - Food classification based on spoilage and shelf life (K1, K2, K3)

1.2 Spoilage of by products and factors affecting quality - Storage changes that take place in the food spoiled (K1, K2, K3, K4)

- 1.3 Preservation of spoilage, storage conditions (K1, K2, K3, K4)
- 1.4 Types of spoilage in canned food-Definition of canning, steps in the process of canning from Field (K1, K2, K3, K4)
- 1.5 Types of spoilage in canned food and prevention (K1, K2, K3)
- 1.6 Causes of spoilage, remedial measures to be taken General spoilage of foods (K1, K2, K3)

## **Unit-II**

- 2.1 Fruits and vegetable drying/dehydration- General methods of fruits & vegetable drying/dehydration, sun drying, mechanical drying (K1, K2, K3, K4, K5)
- 2.2 Types of dryers (K1, K2)
- 2.3 Characteristics of dried fruits and vegetables (K1, K2)
- 2.4 General process of fruit and vegetable drying (K1, K2)
- 2.5 Specialized drying operations in fruits and vegetables (K1, K2)
- 2.6 Pickles: Principle of pickle production-different types of pickles from fruits and vegetables. (K1, K2)

## **Unit-III**

- 3.1 Method of techniques of proper packaging of finished products &proper storing in cold storages &refrigerator-selection of suitable packaging material (K1, K2, K3, K4, K5)
- 3.2 Packaging and storage for bakery items- Transportation & marketing (K1, K2, K3)
- 3.3 Method of techniques of proper packaging of finished products &proper storing in cold storages &refrigerator-selection of suitable packaging material (K1, K2, K3, K4)
- 3.4 Packaging and storage for company items (K1, K2)
- 3.5 Transportation & marketing - Food safety like HACCP, ISO 22000, FSSAI (K1, K2)
- 3.6 Importance of Personal hygiene (K1, K2)

## **Unit-IV**

- 4.1 Identification of spoilage in fresh fruits and vegetables, application of remedial measures to prevent them (K1, K2, K4, K6)
- 4.2 Identification of spoilage in preserved fruit and Vegetables and remedial measures (K1, K2, K3, K4)
- 4.3 Identification of spoilage in food – bacteria, Yeast and Mold – remedial measures. (K1, K2, K3, K4)

- 4.4 Identification of spoilage in milk and Milk products. (K1, K2, K3, K4)
- 4.5 Identification of spoilage in food by insects – Identification of insects. (K1, K2, K3, K4)
- 4.6 Identification of food adulteration and Adulterated food. (K1, K2, K3, K4)

#### **Unit-V**

- 5.1 Fleshy and sea food processing- Meat, Fish (K1, K2, K3, K4)
- 5.2 Fleshy and sea food processing- Poultry (K1, K2, K3, K4)
- 5.3 Fleshy and sea food processing-Egg (K1, K2, K3, K4)
- 5.4 Pre-Processing, processing and preservation- Smoking, Canning, drying (K1, K2, K3, K4)
- 5.5 Cooling, Dielectric Ohmic and infra-red heating (K1, K2)
- 5.6 Nutritional losses during processing and storage (K1, K2)

**[Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create]**

#### **Recommended Reading:**

1. Siva Sankar, Food Processing and Preservation, Prentice hall of India Pvt Ltd, New Delhi. 3<sup>rd</sup> Printing, 2005
2. Panda H. The Complete Book on Fruits, Vegetables and Food Processing. NIIR Project Consultancy Service, 2013.
3. B. Srilakshmi. Food Science, New Age Publishers, 2002
4. Meyer and Lillian Hoagland. Food Chemistry, New Age publication, 2004
5. Bawa. A.S, Raju P.S, Chauhan O.P. Food Science. New India Publishing agency, 2013
6. Frazier WC and Westhoff DC. Food Microbiology, TMH Publication, New Delhi, 2004
7. Subbulakshmi and shoha A Udipi. Food Processing and Preservation. New Age International Publishers. New Age Publishers. 2006

#### **Open Educational Resources (OER):**

1. <https://youtu.be/cNvIdbH0IaI>
2. <https://youtu.be/k-KHRJkVaGI>
3. <https://youtu.be/zh7CACofsio>
4. <https://youtu.be/pa32TWO5ucY>
5. <https://youtu.be/4-MBJwNgOak>



## INDEPENDENT ELECTIVE II A: HORTICULTURE

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
I / II	PIBCC20	Horticulture	Theory	Independent elective - III	-	2	40+60=100

### Objective:

To emphasis on the significance and concepts of horticulture and the techniques involved.

### Course Outcomes (CO)

On completion of the course, the students will be able to;

1. Recall the significance of horticulture
2. Outline the impact of soil nature on horticulture
3. Apply the concept of hybrid to enhance yield
4. Gain knowledge on cropping techniques and harvesting methods
5. Identify the role of gardening in common places

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	H	H	M	M	L	H
CO 2	H	M	H	H	H	M
CO 3	H	H	M	M	L	M
CO 4	H	M	M	M	L	M
CO 5	H	H	M	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	H	M	M	L	H
CO 2	H	M	H	H	H	M
CO 3	H	H	M	M	L	M
CO 4	H	M	M	M	L	M
CO 5	H	H	M	M	L	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

### Unit-I

- 1.1 Horticulture – Definition, scope and importance, Division and classification of horticultural crops (K1, K2, K3, K4)
- 1.2 Propagation – definition, methods, seed propagation, vegetative propagation, micro propagation (K1, K2, K3, K5)
- 1.3 Planting systems – Protected cultivation (K1, K2)
- 1.4 Irrigation systems - Weed management – nutrient application methods in horticultural crops – crop regulation (K1, K2, K3, K5)

- 1.5 Maturity indices – harvesting methods, pre cooling – packaging (K1, K2, K3)  
1.6 Storage of horticultural crops. (K1, K2, K3)

## **Unit-II**

- 2.1 Soil – definition – components – pedology – Edaphology. (K1, K2, K3)  
2.2 Physical properties of soil – Color, Texture, structure, Bulk density, Particle density, Pore space; soil water, soil air, soil temperature and their significance in crop production. (K1, K2, K3, K4)  
2.3 Soil chemical properties – Soil reaction, EC and CEC. Soil Organic Matter and its importance on soil properties – Essential nutrients for crop plants - Major, secondary and micro nutrients -Soils of Tamil Nadu. (K1, K2, K3, K4, K5)  
2.4 Types – Straight, Complex, Compound, Mixed, Fortified and chelated fertilizers and their reactions in soil. (K1, K2, K3, K4, K5)  
2.5 Techniques to enhance fertilizer use efficiently. (K1, K2, K3, K4, K5)  
2.6 Soil fertility – INM and IPNS – Problem soils – acid, saline and alkaline soils- their formation, reclamation and management. (K1, K2, K3)

## **Unit-III**

- 3.1 Morphology and general anatomy of medicinally important plant parts: Roots, Stem and its modifications, Barks, Leaves, Flowers, Fruits, Seeds. (K1, K2)  
3.2 Study of some medicinally important families (diagnostic features with examples of species of medicinal use): Papaveraceae, Rutaceae (K1, K2)  
3.3 Study of some medicinally important families (diagnostic features with examples of species of medicinal use): Rubiaceae, Asteraceae, Solanaceae, Scrophulariaceae (K1, K2)  
3.4 Study of some medicinally important families (diagnostic features with examples of species of medicinal use): Lamiaceae, Liliaceae, Fabaceae, Apiaceae (K1, K2)  
3.5 Cultivation methods, Herbal pesticides, Harvesting and Storage. (K1, K2)  
3.6 Marketing and general aspects of export of medicinally important plants (K1, K2)

## **Unit-IV**

- 4.1 Dry land horticulture – Importance, scope and distribution- Crops suitable for dry land systems – Important varieties, climate and soil requirements, commercial propagation methods (K1, K2)  
4.2 Spacing and planting patterns - Cropping systems and intercropping – mulching - Soil and moisture conservation methods (K1, K2)  
4.3 Anti transparent – Management of nutrients, water, weeds and problem soils (K1, K2)  
4.4 Regulation of cropping – training and pruning methods - top working and rejuvenation (K1, K2)  
4.5 Use of plant growth regulators (K1, K2)  
4.6 Post harvest handling – Economics of production. (K1, K2)

## **Unit-V**

- 5.1 Scope and importance of ornamental gardening and landscaping –principles – formal and informal garden (K1, K2, K3)

- 5.2 Styles of garden - Features of garden - Garden components and adornments – plant Components - non plant components - garden walls, fencing, steps, garden drives and paths– sunken garden, roof garden, rockeries. (K1, K2, K3)
- 5.3 Operations in planting and maintenance of public garden, institutional garden, Industrial garden, residential complex garden (K1, K2, K3)
- 5.4 Operations in landscape maintenance for high ways, bus terminus, airports, city roads and IT parks. (K1, K2)
- 5.5 Lawn – types of lawn grasses – criteria for selection- methods of lawn establishment – operation and maintenance – problems and remedial management (K1, K2, K3)
- 5.6 Flower arrangements and dry flowers – suitable plant (K1, K2)

**[Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create]**

### **Recommended Reading:**

1. Kaushal Kumar Mishra and Rajesh Kumar. Fundamentals of Horticulture. Biotech Books, 2014
2. Prasad. Principles of Horticulture. AGROBIOS publisher, 2<sup>nd</sup> Edition, 2012
3. Ivan A Ross. Medicinal Plants of the World. Humana Publication, 5<sup>th</sup> Edition, 2005
4. Jitendra Singh. Fundamental to Horticulture. Kalyani Publisher, 2014.
5. Charles Adams, Mike Early, Jane Brook and Katherine Bamford. Principles of Horticulture. Routledge Publication, 2014
6. Kumar N. Introduction to Horticulture, Oxford and IBH Publication, New Delhi, 2011
7. Robert E White. Principles and Practice of Soil Science: The soil as a Natural Resource. Blackwell publishing, 4<sup>th</sup> Edition, 2005

### **Open Educational Resources (OER):**

1. <https://youtu.be/RTR2RgMbJ-g>
2. <https://youtu.be/MUCk9FqjCBc>
3. <https://youtu.be/AAy5Z4zjgMU>
4. <https://youtu.be/iqOQTVGoLuI>
5. <https://youtu.be/K8a1RkIeick>

## INDEPENDENT ELECTIVE III A: NANOBIO TECHNOLOGY

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II/ III	PIBCE20	Nanobiotechnology	Theory	Independent elective - V	-	2	40+60=100

### Objective:

The course aims to provide an interdisciplinary knowledge on Nano materials and their applications in biosciences.

### Course Outcome (CO)

On completion of the course, the students will be able to;

1. Apply the essential role of Nanoscience
2. Outline the prospective of Nano biology and Nano sensors
3. Discuss the Nanoparticle drug base delivery systems
4. Create knowledge to develop Nanomaterials
5. Identify the role of plants in Nanoparticle synthesis

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	M	M	L	H	M	M
CO 2	M	H	M	L	H	H
CO 3	L	L	M	H	H	L
CO 4	H	M	H	M	M	H
CO 5	H	L	M	H	M	L
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	H	M	L	H	M	L
CO 2	L	H	H	M	L	M
CO 3	M	L	M	H	L	M
CO 4	H	M	L	M	H	L
CO 5	H	L	H	H	M	M
<b>H- High (3), M-Medium (2), L-Low (1)</b>						

### Unit I:

- 1.1 Introduction to Biocompatibility (K2, K3, K4)
- 1.2 Antibacterial Activity-Principles and Applications (K2, K3, K4)
- 1.3 Biomaterial Nano Circuitry-Protein based Nano circuitry (K3, K4)
- 1.4 Neurons for network formation of DNA (K2, K4)
- 1.5 Nanostructures for mechanics and DNA based computation (K3, K4)
- 1.6 DNA based Nano mechanical devices- Applications (K2, K3)

### Unit II:

- 2.1 Interaction between Biomolecules and Nanoparticle surface (K3, K4)
- 2.2 Different types of inorganic material used for the synthesis of Hybrid Nano-bio assemblies (K2, K3, K4)
- 2.3 Analytical applications of Nano in Biology and Nano probes (K3, K4)
- 2.4 A new methodology in medical diagnostics and biotechnology (K4)
- 2.5 Current status of Nano biotechnology (K3, K4)
- 2.6 Future prospective of Nano biology and Nano sensors (K2, K3, K4)

### **Unit III:**

- 3.1 Development of Nano medicines and Nano systems (K3, K4)
- 3.2 Protocols for Nano drug administration (K3, K5)
- 3.3 Materials used in diagnostics and therapeutic applications of nanotechnology (K3, K4)
- 3.4 Molecular Nano mechanics (K3, K4)
- 3.5 Molecular devices in Nanotribology (K2, K3, K4)
- 3.6 Applications of Nanotribology (K3, K4)

### **Unit IV:**

- 4.1 Molecular and cellular biology applications (K2, K3, K4)
- 4.2 2-D electrophoresis (K2, K3)
- 4.3 Mass spectrophotometer of proteins (K3, K4)
- 4.4 Protein Microarrays -Fabrication-Fluorescence detection (K2, K3)
- 4.5 Binding assays and Immunosensors (K3, K4)
- 4.6 Integrated Nano biotechnology systems (K2, K3, K4)

### **Unit V:**

- 5.1 Use of Bacteria, Fungi in Nanoparticle synthesis (K3, K4)
- 5.2 Actinomycetes for Nanoparticle synthesis (K3, K4)
- 5.3 Magneto tactic Bacteria for Natural synthesis of Magnetic Nanoparticles (K2, K3, K4)
- 5.4 Viruses as components for the formation of Nanostructured Materials (K4)
- 5.5 Process and applications of Nanostructured materials (K3, K4)
- 5.6 Role of plants in Nanoparticle synthesis (K2, K3, K4)

### **]Recommended Reading:**

1. G. Cao-Nanostructure and Nanomaterial's Synthesis, Properties and Applications-Imperial College Press- 2<sup>nd</sup> Edition,2011
2. G. J. Leggett, R. A .L. Jones-Bio nanotechnology in Nano scale and technology- John Willey & Sons- 3<sup>rd</sup> Edition,2015
3. D.S. Goodsell- Bionanotechnology-John Willey and Sons- 3<sup>rd</sup> Edition,2005
4. 2. H.S. Nalw- Encyclopedia of Nanoscience and Nanotechnology- American scientific publishers- 4<sup>th</sup> Edition, 2004.
5. Robert. A. Freitas-Nano medicine, Vol-II Biocompatibility-CRC Pres-3<sup>rd</sup> Edition, 2003
6. Massimiliano Diventra, Introduction to Nanoscale Science and Technology- 2007
7. Sergey Edward Lyshhevski-Nanoscience and Nanotechnology 4<sup>th</sup> Edition,2005

### **Open Educational Resources (OER):**

1. <https://www.youtube.com/watch?v=irGJ6dmcZfl>
2. <https://www.youtube.com/watch?v=uUDWK4MGcr0>
3. <https://www.youtube.com/watch?v=aFU5Qx-cLu8>
4. <https://www.youtube.com/watch?v=3wFh0z7so8w>
5. <https://www.youtube.com/watch?v=EvqAmrIkV1s>

**AUXILIUM COLLEGE (AUTONOMOUS)**  
**PG & RESEARCH DEPARTMENT OF CHEMISTRY**  
**M.Sc. CHEMISTRY**

**Curriculum Development – Environmental Sustainability Needs**

**PCCHB20 - STRUCTURAL INORGANIC CHEMISTRY**

<b>Year: I</b>	<b>Course Code</b>	<b>Title of the Course</b>	<b>Course Type</b>	<b>Course Category</b>	<b>H/W</b>	<b>Credits</b>	<b>Marks</b>
<b>SEM: I</b>	PCCHB20	Structural Inorganic Chemistry	Theory	Core	5	4	100

**Learning 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.

**Course Outcomes:**

The Learners will be able to

1. Summarize the theories of acids and bases.
2. Discuss conductors, semiconductors and insulators based on band theory.
3. Assess the structure and bonding in different types of ionic solids, metals and alloys.
4. Discuss the structure and bonding in polyacids, silicates and inorganic polymers.
5. Distinguish the structure and bonding in boranes, carboranes, metallo carboranes, boron nitrides and metal clusters.

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

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

**H-High (3), M-Moderate (2), L-Low (1)**

**Unit I****(15 Hours)**

- 1.1 Acids and bases, proton transfer equilibria in water - solvent leveling effects. (K1, K2, K3, K4, K5 & K6)
- 1.2 Aqua acids - periodic trends in aqua acids - simple oxo acids - anhydrous oxides - polyoxo compound formation. (K1, K2, K3, K4, K5 & K6)
- 1.3 Lewis acid - base concepts, hard and soft acids and bases, group characteristics of Lewis acids. (K1, K2, K3, K4, K5 & K6)
- 1.4 Lux - Flood theory of acids and bases, Usanovich acids and bases, super acids and super bases. (K1, K2, K3, K4, K5 & K6)
- 1.5 Non aqueous solvents, classification, protic and aprotic solvents, molten salts as solvents and ionic liquids. (K1, K2, K3, K4, K5 & K6)
- 1.6 Heterogeneous acids and bases - symbiosis and proton sponges. (K1, K2, K3, K4, K5 & K6)

**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. (K1, K2, K3, K4 & K5)
- 2.2 Imperfections in crystals - stoichiometric defects - Schottky, controlled valency, F-center and Frenkel defect - non-stoichiometric defects - metal excess defect, metal deficient defect - impurity defect. (K1, K2, K3, K4 & K5)
- 2.3 Band theory of solids, intrinsic and extrinsic semiconductors, piezoelectric and pyroelectric crystals. (K1, K2, K3, K4 & K5)
- 2.4 Superconductivity – Meissner effect, critical temperature and critical magnetic field - BCS theory. (K1, K2, K3, K4 & K5)
- 2.5 Type I and Type II superconductors. (K1, K2, K3, K4 & K5)
- 2.6 Ternary oxides - structures of 123 oxides (YBa-Cu- O) - applications of high temperature superconducting materials. (K1, K2, K3, K4 & K5)

**Unit III****(15 Hours)**

- 3.1 Structures of simple solids - unit cell and crystal structures. (K1, K2, K3, K4, K5 & K6)
- 3.2 Close packing of spheres - holes in closed packed structures. (K1, K2, K3, K4, K5 & K6)
- 3.3 Structure of metals and alloys - non-closed packed structures. (K1, K2, K3, K4, K5 & K6)
- 3.4 Atomic radii of metals - polytypism - polymorphism of metals. (K1, K2, K3, K4, K5 & K6)
- 3.5 Alloys - substitutional solid solutions, interstitial solid solutions of non-metals - intermetallic compounds. (K1, K2, K3, K4, K5 & K6)
- 3.6 Characteristic structures of ionic solids - binary phases (AX and AX<sub>2</sub>) - ternary phases (ABO<sub>3</sub> and AB<sub>2</sub>O<sub>4</sub>). (K1, K2, K3, K4, K5 & K6)

## Unit IV

(15 Hours)

- 1.1 Structure and bonding - polyacids - isopolyacids and heteropolyacids of molybdenum and tungsten. (K1, K2, K3, K4 & K5)
- 1.2 Dawson and Keggins structure of poly acids, heteropolyanions and heteropoly blues. (K1, K2, K3, K4 & K5)
- 1.3 Inorganic polymers - silicates, structures, properties, correlation and applications. (K1, K2, K3, K4 & K5)
- 1.4 Molecular sieves, feldspar, zeolites and ultramarines and their applications. (K1, K2, K3, K4 & K5)
- 1.5 Polysulphur-nitrogen compounds - structure and bonding in tetrasulphur tetranitride, polythiazyl and  $S_xS_y$  compounds. (K1, K2, K3, K4 & K5)
- 1.6 Poly organo phosphazenes. (K1, K2, K3, K4 & K5)

## Unit V

(15 Hours)

- 5.1 Structure and bonding - boron hydrides - introduction, classification of boranes - diborane, tetra borane, pentaborane, hexaborane and decaborane. (K1, K2, K3, K4, K5 & K6)
- 5.2 Polyhedral boranes - Wade's rule - closo, nido and arachno structures, hydroboration. (K1, K2, K3, K4, K5 & K6)
- 5.3 Carboranes - closo, nido and arachno structures of carboranes. (K1, K2, K3, K4, K5 & K6)
- 5.4 Metallocarboranes - closo, nido and arachno structures of carboranes. (K1, K2, K3, K4, K5 & K6)
- 5.5 Structure and bonding of boronitrides. (K1, K2, K3, K4, K5 & K6)
- 5.6 Metal clusters - chemistry of low molecularity metal clusters (up to trinuclear metal clusters). (K1, K2, K3, K4, K5 & K6)

### Reference Books:

1. J. E. Huheey, Inorganic Chemistry, Principles, Structure and Reactivity, Harper Collins, New York, 4<sup>th</sup> Edition, 2013.
2. F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry: A Comprehensive Text, John Wiley and Sons, 6<sup>th</sup> Edition, 2007.
3. K. F. Purcell and J. C. Kotz, Inorganic Chemistry, WB Saunders Co., USA, 2010.
4. M. C. Day and J. Selbin, Theoretical Inorganic Chemistry, Van Nostrand Co., New York, 1974.
5. G. S. Manku, Inorganic Chemistry, Tata McGraw Hill Publications, 1989.
6. D. F. Shriver, P. W. Atkins and C. H. Langford, Inorganic Chemistry, OUP, 2006.
7. N. H. Ray, Inorganic Polymers, Academic Press, 1978.
8. F. Basolo and R. G. Pearson, Mechanism of Inorganic Reaction, Wiley NY, 1967.

### Open Educational Resources (OER):

1. <https://nptel.ac.in/content/storage2/courses/104103071/pdf/mod2.pdf>
2. <https://nptel.ac.in/content/storage2/courses/104103069/module4/lec3/1.html>
3. <https://nptel.ac.in/courses/115/105/115105099/>
4. <http://epgp.inflibnet.ac.in/Home/ViewSubject?catid=5> (P-11, M-19)



## SEMESTER I

### PCCHC20 - KINETICS AND PHOTOCHEMISTRY

<b>Year:</b> I <b>SEM:</b> I	<b>Course Code</b> PCCHC20	<b>Title of the Course</b> Kinetics and Photochemistry	<b>Course Type</b> Theory	<b>Course Category</b> Core	<b>H/W</b> 5	<b>Credits</b> 4	<b>Marks</b> 100
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#### Learning Objectives:

- To get exposed to the kinetics of reactions in solutions, acid- base catalysis and surface reactions.
- To gain knowledge on photochemical and photo physical processes.
- To have an in-depth knowledge on the kinetics of complex and fast reactions.

#### Course Outcomes:

The Learners will be able to

1. Describe Activated Complex Theory in terms of translational and vibrational partition functions and apply it to derive the kinetics of reactions in solutions, Hammett and Taft equations and kinetic isotope effects in studying the mechanism of chemical reactions.
2. Discuss the concepts and kinetics of homogeneous and heterogeneous catalysis and explain adsorption isotherms of Langmuir and BET.
3. Derive the kinetics of complex reactions and apply the techniques of fast reactions.
4. Analyse the principles involved in photo excitation of molecules.
5. Derive the kinetics of photochemical reactions, and explain the applications of radiation chemistry, kinetics of photochemical reactions, solar energy conversion and radiolysis of water.

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

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

**H-High (3), M-Moderate (2), L-Low (1)**

**Unit I****(15 Hours)**

- 1.1 Activated complex theory - derivation - partition functions and activated complex - Eyring equation in terms of translational and vibrational partition functions. (KI, K2, K3, K4, K5 & K6)
- 1.2 Determination of free energy, enthalpy and entropy of activation and their significance. (KI, K2, K3, K4, K5 & K6)
- 1.3 Potential energy surfaces. (KI, K2, K3, K4, K5 & K6)
- 1.4 Applications of activated complex theory to reactions in solution - effect of pressure, and dielectric constant. (KI, K2, K3, K4, K5 & K6)
- 1.5 Effect of ionic strength on reactions in solutions, cage effect. (KI, K2, K3, K4, K5 & K6)
- 1.6 Kinetic isotope effect, linear free energy relationships - Hammett and Taft equations. (KI, K2, K3, K4, K5 & K6)

**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 catalyzed reactions (protolytic and prototropic mechanism) – Bronsted catalysis law. ((KI, K2, K3, K4 & K5)
- 2.2 Heterogeneous catalysis - surface reactions, types - physisorption and chemisorption, difference between physisorption and chemisorption, Lennard-Jones plots. (KI, K2, K3, K4 & K5)
- 2.3 Adsorption isotherms - Langmuir and BET isotherms - postulates and derivations. (KI, K2, K3, K4 & K5)
- 2.4 Kinetics of surface reactions - unimolecular and bimolecular reactions, catalysis by semiconductor oxides (n-type and p-type). (KI, K2, K3, K4 & K5)
- 2.5 Mechanism of heterogeneous catalytic reactions, Langmuir and Rideal-Eley mechanism - adsorption co-efficient and its significance. (KI, K2, K3, K4 & K5)
- 2.6 Enzyme catalysis - types of enzyme catalysis, rate of enzyme catalyzed reactions by Michaelis-Menton mechanism - study of effect of substrate concentration, pH and temperature on enzyme catalyzed reactions - inhibition in enzyme catalyzed reactions. (KI, K2, K3, K4 & K5)

**Unit III****(15 Hours)**

- 3.1 Complex reactions - definition with examples, kinetics of reversible, consecutive and parallel reactions. (KI, K2, K3, K4, K5 & K6)
- 3.2 Chain reactions - types of chain reactions (stationary and non-stationary). (KI, K2, K3, K4, K5 & K6)
- 3.3 General treatment of chain reactions - chain length - explosion limits. (KI, K2, K3, K4, K5 & K6)
- 3.4 Rice Herzfeld mechanism - order of reactions of unity, one-half and three-halves for photolysis of acetaldehyde. (KI, K2, K3, K4, K5 & K6)
- 3.5 Fast reactions - relaxation methods - pressure and temperature jump methods (KI, K2, K3, K4, K5 & K6)
- 3.6 Stopped flow and flash photolysis methods. (KI, K2, K3, K4, K5 & K6)

**Unit IV****(15 Hours)**

- 4.1 Photochemistry - introduction, absorption and emission of radiation - intensity distribution in the electronic, vibrational species - Franck Condon Principle. (KI, K2, K3, K4 & K5)

- 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. (K1, K2, K3, K4 & K5)
- 4.3 Electronically excited states - excited state dipole moment and acidity constant. (KI, K2, K3, K4 & K5)
- 4.4 Decay of electronically excited states, dissociation and predissociation of diatomic molecules - energy transfer process. (KI, K2, K3, K4 & K5)
- 4.5 Photophysical processes - kinetics of unimolecular and bimolecular photophysical processes - kinetic treatment of excimer and exciplex formation. (KI, K2, K3, K4 & K5)
- 4.6 Quenching - static and dynamic quenching - Stern-Volmer equation. (KI, K2, K3, K4 & K5)

## Unit V

(15 Hours)

- 5.1 Photochemical reactions - photo assisted mechanism, hydrogen and halogen reactions. (KI, K2, K3, K4, K5 & K6)
- 5.2 Kinetics of photochemical reaction, photoredox, photosubstitution, photoisomerization and photosensitized reactions. (KI, K2, K3, K4, K5 & K6)
- 5.3 Photovoltaic and photogalvanic cells, photo assisted electrolysis of water, application of solar energy conversion. (KI, K2, K3, K4, K5 & K6)
- 5.4 Radiation chemistry - interaction of high-energy radiation with matter - primary and secondary processes. (KI, K2, K3, K4, K5 & K6)
- 5.5 G value - radiolysis of water - hydrated electron, ion pair yield. (KI, K2, K3, K4, K5 & K6)
- 5.6 Photocatalysis - applications of  $\text{TiO}_2$  photocatalyst for oxidation of organic pollutants - photochemical reaction of vision. (KI, K2, K3, K4, K5 & K6)

## Reference Books:

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., 3<sup>rd</sup> Edition, 2005.
3. B. R. Puri, L. R. Sharma and M. S. Pathania, Principles of Physical Chemistry, Vishal Publishing Co., January 2019.
4. N. J. Turro, Modern Molecular Photo Chemistry, Benjamin, Cumming, Menlo Park, California, 1978.
5. K. K. Rohatgi Mukherjee, Fundamentals of Photo Chemistry, Wiley Eastern Ltd., 2<sup>nd</sup> Edition, 1992.
6. Gurdeep Raj, Photochemistry, Goel Publishing House, 4<sup>th</sup> Edition, 2002.
7. A. Singh, R. Singh, Photochemistry, Campus Books International, 1<sup>st</sup> Edition, 2005.
8. P. W. Atkins, Physical Chemistry, Oxford University Press, 11<sup>th</sup> Edition, 2018.
9. G. W. Castellan, Physical Chemistry, Narosa Publishing House, Seventh Reprint, 2004.
10. Donald A. Mc Quarrie and John D. Simon, Physical Chemistry: A Molecular Approach - 1997, Viva Books Pvt., Ltd., New Delhi, Reprint 2004.
11. J. Rajaram J.C. Kuriacose, Kinetics and Mechanisms of Chemical Transformations: Applications of Femto Chemistry, Mc Millan Publishers India Ltd., Reprint, 2009.

## Open Educational Resources (OER):

1. <http://photobiology.info/Ilichev.html> (Photochemistry basics)
2. [https://chem.libretexts.org/Courses/University\\_of\\_California\\_Davis/UCD\\_Chem\\_107/B%3A\\_Physical\\_Chemistry\\_for\\_Life\\_Scientists/Chapters/2%3A\\_Chemical\\_Kinetics/2.10%3A\\_Fast\\_Reactions\\_in\\_Solution](https://chem.libretexts.org/Courses/University_of_California_Davis/UCD_Chem_107/B%3A_Physical_Chemistry_for_Life_Scientists/Chapters/2%3A_Chemical_Kinetics/2.10%3A_Fast_Reactions_in_Solution).
3. [https://swayam.gov.in/nd1\\_noc20\\_cy22/preview](https://swayam.gov.in/nd1_noc20_cy22/preview) (Introduction to Chemical Thermodynamics and Kinetics)

4. Brian Wardle, Principles and applications of photochemistry, Wiley publications, 2009, ISBN – 978-0-470-01494.

[https://cds.cern.ch/record/1254287/files/9780470014936\\_TOC.pdf](https://cds.cern.ch/record/1254287/files/9780470014936_TOC.pdf)

### SEMESTER III

#### PECHE20 - ELECTIVE III A: ANALYTICAL CHEMISTRY

<b>Year:</b> II <b>SEM:</b> III	<b>Course Code</b> PECHE20	<b>Title of the Course</b> Analytical Chemistry	<b>Course Type</b> Theory	<b>Course Category</b> Core Elective	<b>H/W</b> 5	<b>Credits</b> 5	<b>Marks</b> 100
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#### Learning Objectives:

- To study in detail the different types of chromatographic techniques and their applications.
- To give an in-depth knowledge on environmental chemistry and its impacts.
- To understand the applications of computers in chemistry.

#### Course Outcomes:

The Learners will be able to

1. Compare different thermal methods of analysis and explain their applications in material science.
2. Elaborate the principle, instrumentations of the Gas, HPLC and SCF chromatographic techniques and their applications.
3. Examine the identification of metal ions using AAS and photo acoustic spectroscopy.
4. Solve simple problems in chemistry using 'C' program.
5. Analyze the importance of Green Chemistry and its impact on the sustainable environment and the quality of water.

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

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

**H-High (3), M-Moderate (2), L-Low (1)**

**Unit I****(15 Hours)**

- 1.1 Thermal Analysis - Thermo Gravimetric Analysis (TGA) - principle, instrumentation, thermogravimetric curves of  $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ ,  $\text{MgCr}_2\text{O}_4$ ,  $\text{Hg}_2\text{CrO}_4$ ,  $\text{Ag}_2\text{CrO}_4$ ,  $\text{AgNO}_3$  and  $\text{Cu}(\text{NO}_3)_2$ . (K1, K2, K3, K4, K5 & K6)
- 1.2 Factors affecting TGA, applications of TGA. (K1, K2, K3, K4, K5 & K6)
- 1.3 DTG - principles, comparison of DTG & TGA. (K1, K2, K3, K4, K5 & K6)
- 1.4 Differential Thermal Analysis (DTA) - principle, instrumentation, simultaneous TGA and DTA curves and applications. (K1, K2, K3, K4, K5 & K6)
- 1.5 Differential Scanning Calorimetry (DSC) - principle, instrumentation and applications. (K1, K2, K3, K4, K5 & K6)
- 1.6 Thermometric titrations - principle, instrumentation and applications. (K1, K2, K3, K4, K5 & K6)

**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. (K1, K2, K3, K4 & K5)
- 2.2 Applications of GC. ((K1, K2, K3, K4 & K5)
- 2.3 High Pressure Liquid Chromatography (HPLC) - principle, characteristics of HPLC. (K1, K2, K3, K4 & K5)
- 2.4 Instrumentation, applications, comparison of HPLC with GLC. (K1, K2, K3, K4 & K5)
- 2.5 Super Critical Fluid Chromatography (SCFC) - principle, properties, instrumentation. (K1, K2, K3, K4 & K5)
- 2.6 Comparison with other types of chromatography, super critical fluid extraction and applications. (K1, K2, K3, K4 & K5)

**Unit III****(15 Hours)**

- 3.1 Atomic absorption spectrometry - principle, difference between AAS and AES, measurement of absorption. (K1, K2, K3, K4, K5 & K6)
- 3.2 Instrumentation with block diagram - radiation source, atomization unit, oxidizing agents, flame and non-flame atomizer, burners, monochromators, detectors, and amplifier and readout devices. (K1, K2, K3, K4, K5 & K6)
- 3.3 Interferences in AAS - spectral, chemical, ionization, dissociation of metal compounds, effect of solvent. (K1, K2, K3, K4, K5 & K6)
- 3.4 Differences between atomic absorption and emission methods, advantages and disadvantages of atomic emission spectroscopy, advantages of AAS over flame emission spectroscopy, disadvantages of AAS. (K1, K2, K3, K4, K5 & K6)
- 3.5 Applications of AAS, some typical analysis like determination of metals like Na, K, Ca and Mg in blood serum, lead in petrol, metals in food stuff. (K1, K2, K3, K4, K5 & K6)
- 3.6 Photo acoustic spectroscopy: Principle, instrumentation with block diagram and applications. (K1, K2, K3, K4, K5 & K6)

## Unit IV

(15 Hours)

- 4.1 Computers in Chemistry - introduction to computers - types of computers, hardware, software, types of software and programming languages - implementation and uses. (K1, K2, K3, K4 & K5)
- 4.2 C-Programming - definition, types of variables with examples, constant - definition, types with examples, C-operators - classification with examples. (K1, K2, K3, K4 & K5)
- 4.3 Input and output functions, control statement, loop, go to statement - functions, arrays and pointers. (K1, K2, K3, K4 & K5)
- 4.4 Calculation of pH, solubility product, calculation of bond energy using Born-Landé equation. (K1, K2, K3, K4 & K5)
- 4.5 Internet: Introduction to internet service providers in India, terms used in internet, www, http, html, TCP/IP bandwidth, dialup service. (K1, K2, K3, K4 & K5)
- 4.6 ISDN and search engines. (K1, K2, K3, K4 & K5)

## Unit V

(15 Hours)

- 5.1 Environmental chemistry: Water quality standards - BOD, COD, TDS, TSS & TS. (K1, K2, K3, K4, K5 & K6)
- 5.2 Analysis of waste water and its treatment. (K1, K2, K3, K4, K5 & K6)
- 5.3 Salinity of water and its treatment - Reverse Osmosis. (K1, K2, K3, K4, K5 & K6)
- 5.4 Toxic chemicals in environment - toxicity of mercury, lead, chromium, arsenic. (K1, K2, K3, K4, K5 & K6)
- 5.5 Green chemistry - principle, conditions followed in green synthesis. (K1, K2, K3, K4, K5 & K6)
- 5.6 Carbon-carbon bond formation in aldol condensations like silyl enol ethers in aqueous media, solid phase, supercritical water and asymmetric aldol condensation. (K1, K2, K3, K4, K5 & K6)

### Reference Books:

1. H. Kaur, Instrumental Methods of Chemical Analysis, Pragati Prakashan, Meerut, 3<sup>rd</sup> Edition, 2010.
2. B. K. Sharma, Instrumental Methods of Chemical Analysis, Krishna Prakashan Media (P) Ltd., 2014.
3. Y. Anjaneyulu, K. Chandrasekhar, Valli Manickam, A Textbook of Analytical Chemistry, Pharma Book Syndicate, Hyderabad, 2019.
4. V. K. Ahluwalia, Strategies for green organic synthesis, Ane Books Pvt. Ltd., New Delhi, 2012.
5. Willard Merritt, Dean Settle, Instrumental Methods of Analysis, CBS Publishers and Distributors, New Delhi, 7<sup>th</sup> Edition, 2018.
6. Skoog, Holler, Nieman, Principles of Instrumental Analysis, Thomson Books, United Kingdom, 5<sup>th</sup> Edition, 2005.
7. Skoog, West, Holler, Rouch, Fundamentals of Analytical Chemistry, Brooks/ Cole Cengage Learning, 9<sup>th</sup> Edition, 2013.
8. Jag Mohan, Organic Analytical Chemistry Theory and Practice, Narosa Publishing House, New Delhi, 2014.
9. A. K. De, Environmental Chemistry, New Age International Publishers, New Delhi, 7<sup>th</sup> Edition, 2010.
10. G. S. Sodhi, Fundamental Concept of Environmental Chemistry, Narosa Publishing House, 3<sup>rd</sup> Edition, New Delhi, 2013.
11. S. S. Dara, A Textbook of Environmental Chemistry and Pollution Control, S. Chand and Company Ltd., New Delhi, 2004.
12. S. M. Khopkar, Basic Concept of Analytical Chemistry, New Age International (P) Ltd. Publishers, New Delhi, 3<sup>rd</sup> Edition, 2008.

13. G. I. David Krupadanan, D. Vijaya Prasad, K. Varaprasad Rao, K. L. N. Reddy, C. Sudhakar, Analytical Chemistry, University Press, Hyderabad, Andhra Pradesh, 2001.
14. K. V. Raman, Computers in Chemistry, Tata McGraw-Hill, New Delhi, 2013.
15. Krishnan Kannan, Environmental Chemistry, Chand and Co. Ltd., 1995.
16. M. S. Yadav, Instrumental Methods of Chemical Analysis, Campus Books International, 2006.
17. A.K. Srivatasava, P.C. Jain, Instrumental Approach to Chemical Analysis, S. Chand & Company, 2010

**OER:**

1. <https://www.americanpharmaceuticalreview.com/Featured-Articles/36776-Thermal-Analysis-A-Review-of-Techniques-and-Applications-in-the-Pharmaceutical-Sciences/>
2. <https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod5.pdf>
3. <https://www.iitk.ac.in/che/pdf/resources/AAS-GTA-reading-material.pdf>
4. <https://www.epa.gov/greenchemistry/basics-green-chemistry>

**SEMESTER III****PECHF20 - ELECTIVE III B: GREEN CHEMISTRY**

<b>Year:</b> II <b>SEM:</b> III	<b>Course Code</b> PECHF20	<b>Title of the Course</b> Green Chemistry	<b>Course Type</b> Theory	<b>Course Category</b> Core Elective	<b>H/W</b> 5	<b>Credits</b> 5	<b>Marks</b> 100
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**Learning Objectives:**

- To understand the goals and principles of green chemistry.
- To explain the green reactions.
- To understand the good laboratory practices and designing of green synthesis.
- To learn selected green preparations.
- To analyze the future trends in green chemistry.

**Course Outcomes:**

The Learners will be able to

1. Explain the goals and progress of green chemistry.
2. Summarize the principle of green chemistry and green reactions.
3. Discuss the good laboratory practices and designing of green synthesis, and to explain the mechanism and applications of certain named reactions and rearrangements.
4. Explain selected green preparations.
5. Analyze the future trends in green chemistry.

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

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

**H-High (3), M-Moderate (2), L-Low (1)**



**Unit I****(15 Hours)**

- 1.1 Green chemistry - definition, need for green chemistry. (K1, K2, K3, K4, K5 & K6)
- 1.2 Goals of green chemistry, the roots of innovation and its limitations. (K1, K2, K3, K4, K5 & K6)
- 1.3 Progress of green chemistry and planning a green synthesis in a chemical laboratory. (K1, K2, K3, K4, K5 & K6)
- 1.4 Percentage atom utilization, atom economy. (K1, K2, K3, K4, K5 & K6)
- 1.5 Evaluating the type and selection of starting materials. (K1, K2, K3, K4, K5 & K6)
- 1.6 Biocatalysts - production of bulk and fine chemicals by microbial fermentation. (K1, K2, K3, K4, K5 & K6)

**Unit II****(15 Hours)**

- 2.1 Principles of green chemistry - twelve principles of green chemistry. (K1, K2, K3, K4 & K5)
- 2.2 Green reactions – addition and elimination reactions. (K1, K2, K3, K4 & K5)
- 2.3 Green reactions - substitution reactions. (K1, K2, K3, K4 & K5)
- 2.4 Concept of selectivity - chemoselectivity and regioselectivity. (K1, K2, K3, K4 & K5)
- 2.5 Enantioselectivity and diastereoselectivity. (K1, K2, K3, K4 & K5)
- 2.6 Green solvents - definition and uses. (K1, K2, K3, K4 & K5)

**Unit III****(15 Hours)**

- 3.1 Good laboratory practices - sampling preparation for analysis. (K1, K2, K3, K4, K5 & K6)
- 3.2 Equipment & glass wares - selection, suitability, cleaning and drying. (K1, K2, K3, K4, K5 & K6)
- 3.3 Designing a green synthesis - choice of starting materials (reagents, catalysts, solvents) (K1, K2, K3, K4, K5 & K6)
- 3.4 Mechanism and applications of Barbier and Barton reactions. (K1, K2, K3, K4, K5 & K6)
- 3.5 Mechanism and applications of Cannizzaro reaction. (K1, K2, K3, K4, K5 & K6)
- 3.6 Mechanism and applications of Claisen rearrangement and Baker-Venkataraman rearrangements. (K1, K2, K3, K4, K5 & K6)

**Unit IV****(15 Hours)**

- 4.1 Green preparations - aqueous phase reactions (hydrolysis, iodoform). (K1, K2, K3, K4 & K5)
- 4.2 Solid state reactions (phenyl benzoate). (K1, K2, K3, K4 & K5)
- 4.3 Photochemical reactions (benzopinacol, conversion of trans-stilbene into cis-stilbene). (K1, K2, K3, K4 & K5)
- 4.4 PTC catalyzed reactions (phenyl isocyanide, flavone). (K1, K2, K3, K4 & K5)
- 4.5 Microwave assisted reactions - Hofmann elimination and esterification. (K1, K2, K3, K4 & K5)
- 4.6 Microwave assisted reactions – saponification, preparation of Schiff's bases. (K1, K2, K3, K4 & K5)

**Unit V****(15 Hours)**

- 5.1 Future trends in green chemistry - green nanosynthesis (biosynthesis of nanoparticles using plant extracts). (K1, K2, K3, K4, K5 & K6)
- 5.2 Green analytical methods - enzymatic transformation (ethanol, benzoin). (K1, K2, K3, K4, K5 & K6)
- 5.3 Green polymer chemistry - polymer from renewable resources. (K1, K2, K3, K4, K5 & K6)
- 5.4 Redox reagents and green catalysts. (K1, K2, K3, K4, K5 & K6)
- 5.5 Proliferation of solvent-less reactions and biomimetic. (K1, K2, K3, K4, K5 & K6)
- 5.6 Combinational green chemistry, green chemistry in sustainable developments. (K1, K2, K3, K4, K5 & K6)

**Reference Books:**

1. V. Kumar, Introduction to Green Chemistry, Vishal Publishing Co., 1<sup>st</sup> Edition, 2007.
2. V. K. Ahluwalia, Green Chemistry, Ane Books India, 1<sup>st</sup> Edition, 2006.
3. V. K. Ahluwalia, Agarwal K., Organic Synthesis: Special Techniques, Narosa Publishing House, 1<sup>st</sup> Edition, 2005.
4. Rashmi Sanghi, M. M. Srivastava, Green Chemistry, Alpha Science, Fourth Reprint, 2009.
5. Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch, Fundamentals of Analytical Chemistry, Cengage Learning, 9<sup>th</sup> Edition, 2013.

**OER:**

1. [https://shodhganga.inflibnet.ac.in/bitstream/10603/55041/7/07\\_chapter%201.pdf](https://shodhganga.inflibnet.ac.in/bitstream/10603/55041/7/07_chapter%201.pdf) (Introduction to green chemistry)
2. <https://www.youtube.com/watch?v=J9SpYVx8H68> (Dr. Paul Anastas - Father of green chemistry)
3. <https://www.youtube.com/watch?v=NycWPUcN4YI> (Dr. Paul Anastas)
4. <https://www.youtube.com/watch?v=v6V22gwqxeY> (Dr. Paul Anastas)

**PECHH20 - ELECTIVE IVB: ORGANIC FARMING AND SOLID WASTE  
MANAGEMENT**

<b>Year:</b> II	<b>Course Code</b> PECHH20	<b>Title of the Course</b> Organic Farming and Solid Waste Management	<b>Course Type</b> Theory	<b>Course Category</b> Core Elective	<b>H/W</b> 5	<b>Credits</b> 4	<b>Marks</b> 100
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**Learning Objectives:**

- To understand the importance of solid waste management.
- To learn about hazardous waste management.
- To get a thorough knowledge on the concept of organic farming, components and practices.

**Course Outcomes:**

The Learners will be able to

1. Elaborate the concept of organic farming.
2. Explain the vision and importance of organic farming movements, apply vermicomposting process and prepare bio-fertilizers.
3. Evaluate the technology to approach the benefits of organic farming.
4. Explain the various aspects of solid waste management.

5. Demonstrate the methods to reduce hazards.

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

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

**H-High (3), M-Moderate (2), L-Low (1)**

**Unit I**

**(15 Hours)**

- 1.1 Organic farming - concepts, relevance of organic farming to Indian agriculture. (K1, K2, K3, K4, K5 & K6)
- 1.2 Effects of green revolution, adverse effects of continuous use of chemicals. (K1, K2, K3, K4, K5 & K6)
- 1.3 Categories of organic farming, organic vs natural farming. (K1, K2, K3, K4, K5 & K6)
- 1.4 Essential characteristics of organic farming. (K1, K2, K3, K4, K5 & K6)
- 1.5 Key principles in organic farming system - components of organic farming systems. (K1, K2, K3, K4, K5 & K6)
- 1.6 Management of organic farming - research needs. (K1, K2, K3, K4, K5 & K6)

**Unit II**

**(15 Hours)**

- 2.1 Principles and practices of organic farming. (K1, K2, K3, K4 & K5)
- 2.2 The vision and importance of organic farming movements. (K1, K2, K3, K4 & K5)
- 2.3 Guidelines for organic production system - organic farming practices - bulky organic manures. (K1, K2, K3, K4 & K5)
- 2.4 Role of micro-organisms (bio-fertilizers) in organic farming. (K1, K2, K3, K4 & K5)
- 2.5 Vermitechnology. (K1, K2, K3, K4 & K5)
- 2.6 Research advances in organic farming. (K1, K2, K3, K4 & K5)

**Unit III**

**(15 Hours)**

- 3.1 Benefits of organic farming. (K1, K2, K3, K4, K5 & K6)
- 3.2 Nutritional values of organic foods. (K1, K2, K3, K4, K5 & K6)
- 3.3 Health benefits of organic foods. (K1, K2, K3, K4, K5 & K6)
- 3.4 SREP approach for promoting organic farming. (K1, K2, K3, K4, K5 & K6)

- 3.5 Use of organic practices in enhancing crop productivity. (K1, K2, K3, K4, K5 & K6)  
 3.6 Participatory technology development in organic farming. (K1, K2, K3, K4, K5 & K6)

**Unit IV (15 Hours)**

- 4.1 Solid Waste Management - introduction. (K1, K2, K3, K4 & K5)  
 4.2 Classification of solid wastes. (K1, K2, K3, K4 & K5)  
 4.3 Mismanagement and side effects. (K1, K2, K3, K4 & K5)  
 4.4 Physical and chemical characteristics. (K1, K2, K3, K4 & K5)  
 4.5 Waste collection, storage and transport. (K1, K2, K3, K4 & K5)  
 4.6 Waste disposal - types - composting, incineration, bio gasification. (K1, K2, K3, K4 & K5)

**Unit V (15 Hours)**

- 5.1 Plastics, bio medical and hazardous waste management. (K1, K2, K3, K4, K5 & K6)  
 5.2 Various types of plastics - plastic recycling and the environment. (K1, K2, K3, K4, K5 & K6)  
 5.3 Guidelines for the plastic waste hazards control. (K1, K2, K3, K4, K5 & K6)  
 5.4 Sources of biomedical waste - pathological waste, pharmaceutical wastes, genotoxic wastes, chemical wastes, radioactive wastes. (K1, K2, K3, K4, K5 & K6)  
 5.5 Measures to reduce hazards. (K1, K2, K3, K4, K5 & K6)  
 5.6 Household hazardous waste management - precautions, disposal, waste minimization. (K1, K2, K3, K4, K5 & K6)

**References Books:**

1. L. V. Hirevenkanagoudar, Extension Strategies for Promotion of Organic Farming, Agrotech Publishing Academy, 2007.
2. B. B. Hosetti, Prospects and Perspectives of Solid Waste Management, New Age International Publishers, 2006.
3. A. Kamala, D. L. Kanth Rao, Environmental Engineering, Water Supply, Sanitary Engineering and Pollution, Tata McGraw-Hill Publishing Ltd., New Delhi, 13<sup>th</sup> Reprint, 2002.
4. S. S. Dara, A Textbook of Environmental Chemistry and Pollution Control, S. Chand & Company Ltd., 7<sup>th</sup> Edition, 2004.
5. B. K. Sharma, Environmental Chemistry, Goel Publishing House, Meerut, 2005.

**OER:**

1. [http://agritech.tnau.ac.in/org\\_farm/orgfarm\\_introduction.html](http://agritech.tnau.ac.in/org_farm/orgfarm_introduction.html)
2. <https://www.nationalgeographic.com/environment/future-of-food/organic-farming-crops-consumers/>
3. <https://www.britannica.com/topic/organic-farming>
4. <https://www.conserve-energy-future.com/sources-effects-methods-of-solid-waste-management.php>
5. [https://ec.europa.eu/echo/files/evaluation/watsan2005/annex\\_files/WEDC/es/ES07CD.pdf](https://ec.europa.eu/echo/files/evaluation/watsan2005/annex_files/WEDC/es/ES07CD.pdf)
6. [https://www.geo.lu.lv/fileadmin/user\\_upload/lu\\_portal/projekti/gzzf/videunilgtspējiga\\_attistiba/VidZ1000/16.LECTURE-Solid\\_waste\\_management.pdf](https://www.geo.lu.lv/fileadmin/user_upload/lu_portal/projekti/gzzf/videunilgtspējiga_attistiba/VidZ1000/16.LECTURE-Solid_waste_management.pdf)
7. <http://www.indiaenvironmentportal.org.in/files/file/municipal%20solid%20waste%20management.pdf>

**PICHJ20 - IEP - LEATHER CHEMISTRY**

Year:	Course Code	Title of the Course	Course Type	Course Category	H/W Own Pace	Credits	Marks
II SEM: IV	PICHJ20	Leather Chemistry	Theory	Independent Elective		2	100

## Learning Objectives:

The Learners will be able

- To acquire technical competence on leather manufacturing with eco -friendly and sustainable approach.
- To develop indigenous and adaptable technologies related to leather for small scale production and to develop entrepreneurial skills, towards betterment of society.
- To develop state-of-art facilities for testing and consultancy for leather industries.

## Course Outcomes:

The Learners will be able to

1. Outline the tanning processes in leather industry.
2. Discuss the cleaner technology in leather industry.
3. Illustrate the chrome tanning process.
4. Outline the mechanism of tanning and role of surface charge and importance of electrostatic, H-bond, dipole-dipole and hydrophobic interactions.
5. Apply waste water management and zero discharge approaches in leather industry.

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

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

**H-High (3), M-Moderate (2), L-Low (1)**

## Unit I

- 1.1 Raw materials, stages in the leather processing. (K1 & K2)
- 1.2 Pre-tanning operations - soaking, liming, deliming, bating, pickling, degreasing. (K1 & K2)
- 1.3 Tanning process - chrome tanning, vegetable tanning. (K1 & K2)
- 1.4 Post-tanning operations - rechroming of wet blue leathers, neutralization. (K1 & K2)
- 1.5 Retanning, dyeing and fatliquoring. (K1 & K2)

1.6 Drying and finishing. (K1 & K2)

## **Unit II**

2.1 Environmental challenges in leather industries. (K1 & K2)

2.2 Cleaner technology options - curing, air drying, frame drying, freezing, chemical methods, biocides for curing and control drying. (K1 & K2)

2.3 Desalting, soaking after desalting. (K1 & K2)

2.4 Liming and unhairing. (K1 & K2)

2.5 Advantages of sulphide free unhairing system by using dehairing process, advantages of less sulphide unhairing system, and advantages of sulphide lime unhairing system. (K1 & K2)

2.6 Delimiting and bating. (K1 & K2)

## **Unit III**

3.1 Chrome tanning - method of chrome tannage, masking principle of masking, effect of masking on chrome tannage. (K1 & K2)

3.2 Influence of reducing agent on nature of chrome complexes. (K1 & K2)

3.3 Mechanism of chrome tanning, variable parameters of chrome tanning. (K1 & K2)

3.4 Wet finishing operations - rechroming, neutralization, retanning, dyeing, fatliquoring and finishing. (K1 & K2)

3.5 Chrome management options - chrome recovery and reuse - partial replacement of chrome tanning agent by other tanning agents. (K1 & K2)

3.6 High exhaust tanning systems - closed loop tanning systems. (K1 & K2)

## **Unit IV**

4.1 Mechanism of tanning - transport of tanning materials into pelt. (K1 & K2)

4.2 Role of surface charge and importance of electrostatic, H-bond, dipole-dipole and hydrophobic interactions. (K1 & K2)

4.3 Theory of finishing with special emphasis to optical properties of pigments and binders. (K1 & K2)

4.4 Diffusion equilibria and mechanism of vegetable, mineral and combination tannages. (K1 & K2)

4.5 Role of crosslinking in leather finishing. (K1 & K2)

4.6 Fibre coating in matrix stability. (K1 & K2)

## **Unit V**

5.1 Quality control in leather processing. (K1 & K2)

5.2 Tannery effluents, effluent disposal, types of effluent disposal. (K1 & K2)

5.3 Recovery and reuse of water in tanning industry, utilization of treated effluents. (K1 & K2)

5.4 Productivity and quality consistency. (K1 & K2)

5.5 Waste water management and zero discharge approaches. (K1 & K2)

5.6 Energy audit and environmental footprints. (K1 & K2)

## **Reference Books:**

1. P. S. Briggs, Gloving, clothing and special leathers, Tropical 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 Robert M. Lollar, The Chemistry and Technology of Leather, Vol. 1, Preparation for tannages, EL. Robert Krieger Publishing Company, New York, 1978.
4. Bienkiewicz, Physical Chemistry of Leather Making, Krieger Publishing Co., Florida, 1982.
5. D. Covington, Tanning Chemistry: The Science of Leather, Royal Society of Chemistry, 2009.

**OER:**

1. <http://wwwchem.uwimona.edu.jm/courses/CHEM2402/Textiles/Leather.html>
2. [https://www.researchgate.net/publication/337720281\\_Leather\\_Processing\\_Its\\_Effects\\_on\\_Environment\\_and\\_Alternatives\\_of\\_Chrome\\_Tanning](https://www.researchgate.net/publication/337720281_Leather_Processing_Its_Effects_on_Environment_and_Alternatives_of_Chrome_Tanning)
3. <https://www.iloencyclopaedia.org/component/k2/item/872-tanning-and-leather-finishing>
4. [https://shodhganga.inflibnet.ac.in/bitstream/10603/7476/10/10\\_chapter%201.pdf](https://shodhganga.inflibnet.ac.in/bitstream/10603/7476/10/10_chapter%201.pdf)
5. [https://www.researchgate.net/publication/337720281\\_Leather\\_Processing\\_Its\\_Effects\\_on\\_Environment\\_and\\_Alternatives\\_of\\_Chrome\\_Tanning](https://www.researchgate.net/publication/337720281_Leather_Processing_Its_Effects_on_Environment_and_Alternatives_of_Chrome_Tanning)
6. [https://shodhganga.inflibnet.ac.in/bitstream/10603/75047/14/14\\_chapter%206.pdf](https://shodhganga.inflibnet.ac.in/bitstream/10603/75047/14/14_chapter%206.pdf)
7. <http://en.kimyasal.boun.edu.tr/webpages/courses/leathertechnology/deri16.htm>
8. [https://www.researchgate.net/publication/223418622\\_Reducing\\_the\\_environmental\\_impact\\_of\\_the\\_unhairing-limiting\\_process\\_in\\_the\\_leather\\_tanning\\_industry](https://www.researchgate.net/publication/223418622_Reducing_the_environmental_impact_of_the_unhairing-limiting_process_in_the_leather_tanning_industry)

**PG DEPARTMENT OF COMPUTER SCIENCE**

**OUTCOME BASED SYLLABUS**

**SEMESTER I**

**PICSB20 – GREEN COMPUTING**

<b>Year: I</b> <b>Sem: I</b>	<b>Course Code:</b> PICSB20	<b>Title of the Course:</b> Green Computing	<b>Course Type:</b> Theory	<b>Course Category:</b> Independent Elective	<b>H/W</b> -	<b>Credits</b> 2	<b>Marks</b> 100
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**Course Objectives**

1. Understand the dimensions and goals of Green IT.
2. Discuss the green enterprise architecture with environmental intelligence.
3. Analyze the Grid framework with the collaboration of cloud computing.
4. Understand the concept of Green compliance.
5. Apply Green IT strategies and applications of home appliances.

**Course Outcomes (COs)**

1. Understand the Concept of Green IT.
2. Discuss Green IT in relation to technology.
3. Evaluate IT use in relation to environmental perspectives.
4. Discuss the methods and tools to measure energy consumption.
5. Conclude with a Green IT to sustainable development and develop energy saving.

CO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L



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

(Low - L, Medium – M, High - H)

## Course Syllabus

### Unit I

- 1.1 Green IT: An Overview: Introduction - Environmental Concerns and Sustainable Development - Environmental Impacts of IT (K1)
- 1.2 Green IT: OCED Green IT Framework – Green IT 1.0 and 2.(K1)
- 1.3 Holistic Approach to Greening IT:Greening Computer’s Entire life Cycle – The Three Rs of Green IT (K1)
- 1.4 Greening IT: Green PCs, Notebooks and Servers – Green Data Centres – Green Cloud Computing – Green Data Storage – Green Software – Green Networking and Communication (K1, K2)
- 1.5 Applying IT for Enhancing Environmental Sustainability-Green IT Standards and Eco Labelling of IT - Enterprise Green IT Strategy(K1, K2)
- 1.6 Green Devices and Hardware: Introduction-Life Cycle of a Device or Hardware- Reuse, Recycle and Dispose (K1)

### Unit II

- 2.1 Sustainable Software Development: Introduction - Current Practices - Sustainable Software-Software Sustainability Attributes (K1)
- 2.2 Software Sustainability Metrics: Modifiability and Reusability – Portability – Supportability – Performance – Dependability – Usability – Accessibility – Predictability – Efficiency – Project’s Carbon Footprint (K1, K2)
- 2.3 Sustainable Software Methodology: Collecting Metrics – Code metrics Tools – Simplified Usability Study – Platform Analysis – Existing Project Statistics - Defining Actions (K2, K3)

- 2.4 Green Data Centres: Data Centres and Associated Energy Challenges(K1)
- 2.5 Data Centre IT Infrastructure: Servers – Networking – Storage – IT Platform Innovation - Data Centre Facility Infrastructure-Implications for Energy Efficiency: Power System – Cooling – Facilities Infrastructure Management (K1, K3)
- 2.6 IT Infrastructure Management: Server Power – Consolidation – Virtualization (K2)

### **Unit III**

- 3.1 Green Cloud Computing and Environmental Sustainability: Introduction -What is Cloud Computing? - Cloud Computing and Energy Usage Model (K1)
- 3.2 Features of Clouds Enabling Green Computing (K2)
- 3.3 Towards Energy Efficiency of Cloud Computing (K3)
- 3.4 Green Cloud Architecture (K2, K3)
- 3.5 Enterprise Green IT Strategy: Introduction-Approaching Green IT Strategies- Business Drivers of Green IT Strategy (K1, K3)
- 3.6 Business Dimensions for Green IT Transformation - Organizational Considerations in a Green IT Strategy (K3, K4,K6)

### **Unit IV**

- 4.1 Sustainable Information Systems and Green Metrics: Introduction- Multilevel Sustainable Information (K2)
- 4.2 Sustainability Hierarchy Models: Sustainability Frameworks – Sustainability Principles – Tools for Sustainability (K4, K5, K6)
- 4.3 Product Level Information: Life-Cycle Assessment – The four stages of LCA – CRT Monitors versus LCD Monitors: Life Cycle Assessment (K3, K4)
- 4.4 Individual Level Information ( K3)
- 4.5 Functional Level Information: Data Centre Energy Efficiency – Data centre Power Metrics – Emerging Data Centre Metrics (K4, K6)
- 4.6 Organizational Level Information: Reporting Greenhouse Gas Emissions (K4, K5)

### **Unit V**

- 5.1 Green Enterprises and the Role of IT: Introduction-Organizational and Enterprise Greening: The Green Enterprise: A value chain Perspective(K2, K3)
- 5.2 Information Systems in Greening Enterprises: Environmental Management Information systems – Software and Databases – ERP EMISs – ERP Challenges and Deficiencies with Respect to EMIS – Integrating Environmental and LCA Information with ERP – Electronic Environmental and Sustainability Reporting (K3, K4, K5, K6)
- 5.3 Greening the Enterprise-IT Usage and Hardware: Environmental Information Technology Standards – Green Management of Data Centre (K2, K3)
- 5.4 Inter-organizational Enterprise Activities and Green Issues: Electronic Commerce and Greening the Extended Enterprise – Demanufacturing and Reverse Logistics- Eco-Industrial Parks and Information Systems - Enablers and Making the Case for IT and the Green Enterprise (K4, K5,K6)
- 5.5 Managing Green IT: Introduction-Strategizing Green Initiatives: Strategic Thinking – Strategic Planning – Strategic Implementation – Enterprise Architecture Planning(K2, K4)
- 5.6 Implementation of Green IT: Return on Investment – Metrics – The Goal-Question-Metric

**(GQM) - Information Assurance: Risk Management -Communication and Social Media(K5, K6)**

**Text Books:**

1. San Murugesan, G.R. Gangadharan-Harnessing Green It Principles and Practices, A John Wiley & Sons, Ltd., Publication 2012.

**Reference Books:**

1. John Lamb, “The Greening of IT”, Pearson Education, 2009.
2. Jason Harris, “Green Computing and Green IT– Best Practices on Regulations & Industry”, Lulu.com, 2008.
3. Woody Leonhard, Katherrine Murray, “Green Home Computing for Dummies”, August 2009.
4. Swarup K. Das, “Cloud Computing”, Dominant Publishers, 2015.
2. PrasantaPattnaik, ManasKabat,” Fundamentals of Cloud Computing”, S.Chand (G/L) & Company Ltd; First edition (2014).

**Open Educational Resources (OER):**

1. [https://www.google.com/url?sa=t&source=web&rct=j&url=http://www.vandemataramcollege.com/app/webroot/files/NOTES\\_sem246/Green\\_IT-FYCS-Sem2.pdf&ved=2ahUKEwjYgJaM\\_IXrAhUBX30KHeNtAFcQFjAAegQIARAB&usg=AOvVaw0gQehqD562q0zVa7ulBEH3&cshid=1596721284883](https://www.google.com/url?sa=t&source=web&rct=j&url=http://www.vandemataramcollege.com/app/webroot/files/NOTES_sem246/Green_IT-FYCS-Sem2.pdf&ved=2ahUKEwjYgJaM_IXrAhUBX30KHeNtAFcQFjAAegQIARAB&usg=AOvVaw0gQehqD562q0zVa7ulBEH3&cshid=1596721284883)
2. [https://youtu.be/QYThOy\\_QiTU](https://youtu.be/QYThOy_QiTU)
3. <https://www.youtube.com/watch?v=CRdm3xEJ97E>
4. <https://youtu.be/Nc8sNUcE-yk>
5. <https://youtu.be/6dSZyDRg11M>
6. <https://youtu.be/X43KVeWVk>

**FOCUS:**

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

**ENVIRONMENTAL  
SUSTAINABILITY  
(NEEDS)****PG  
MEDIA****ELECTRONIC****SEMESTER IV****PCEMQ20 - DEVELOPMENT COMMUNICATION**

Year: II	Course Code:	Title of the Course:	Course Type:	Course Category:	H/W	Credits	Marks
Sem: IV	PCEMQ20	Development Communication	Theory	Core	5	4	100

**Course Objective:**

To enable students to understand the use of media in furthering development of society and the contributions of media professionals in democracy

**Course Outcomes(CO)**

The Learners will be able to

CO1: Review the various approaches for Development communication.

CO2: Analysing the Development communication in the global perspectives.

CO3: Acquiring the knowledge about the key concepts in development communication.

CO4: Assessing the policies of government on development perspectives.

CO5: Evaluating the role communication and empowerment strategies for development communication.

**(Low- L, Medium - M, High - H)****Course Syllabus****Unit I: Approaches to Development****(15 hours)**

1.1 Development communication. (K2, K3)

1.2 Critical perspective on communication and development. (K3, K4, K5, K6)

1.3 Modernization Models of development communication. (K3, K4, K5)

1.4 Kheda communications project. (K4, K5, K6)

- 1.5 Information and Communication technologies for rural development. (K4, K5)
- 1.6 Recent Projects. (K4, K5, K6)

**Unit II: The world of development communication (15 hours)**

- 2.1 The modernization paradigm. (K3, K4, K5)
- 2.2 Mainstream Development Discourse. (K3, K4, K5)
- 2.3 The Challenges. (K4, K5, K6)
- 2.4 Communication order. (K4, K5, K6)
- 2.5 Role of a communicator in the process of social change. (K3, K4, K5, K6)
- 2.6 Use of Media. (K4, K5, K6)

**Unit III: Key Concepts (15 hours)**

- 3.1 Key concepts in development. (K3, K4)
- 3.2 Complexities of development efforts. (K4, K5)
- 3.3 Development support communication. (K3, K4, K5)
- 3.4 Alternate path to development, Impact of Electronic media on Development. (K3, K4, K5)
- 3.5 Media Functions, structure of media companies. (K4, K5, K6)
- 3.6 Diffusion of innovation theory, 2 step flow. (K3, K4, K5, K6)

**Unit IV: Policies of Government (15 hours)**

- 4.1 e-Governance, e-Resource (ERP). (K3, K4, K5)
- 4.2 Electronic Records, Digital Signature. (K3, K4, K5)
- 4.3 Bridging Digital Divide, Demonetization. (K4, K5, K6)
- 4.4 Aathar, Digital wallet, LPG Subsidiary. (K4, K5, K6)
- 4.5 Cashless transactions, Electronic voting machine. (K4, K5, K6)
- 4.6 New Schemes of the Government. (K4, K5, K6)

**Unit V: Communication and Empowerment (15 hours)**

- 5.1 Communication strategies for development, communitarian theory. (K2, K3)
- 5.2 Communication effects approach. (K3, K4, K5, K6)
- 5.3 Mass media and modernization. (K4, K5, K6)
- 5.4 Social marketing (family, health, agriculture, HIV awareness). (K4, K5, K6)
- 5.5 ICT for social development. (K4, K5, K6)
- 5.6 ICT for Educational development. (K2, K3, K4, K5, K6)

**Books for Study and Reference:**

1. Dipankar Sinha – Development Communication , contexts for the Twenty – first Century – Orient BlackSwan, 2013.
2. Kevel J. Kumar – Mass Communication in India, 4<sup>th</sup> Edition – Jaico Publications, 2011.
3. Roger L. Sadha – Electronic Media Law – Sage Publication, 2005.
4. Srinivas R. Melkote, H. Leslie Steeves – Communication for Development in the Third World: Theory and Practice for Empowerment, 2<sup>nd</sup> Edition – Sage Publications, 2001.

## SEMESTER II

### PEEMC20 - ELECTIVE II A: INTER-CULTURAL COMMUNICATION

<b>Year: I</b> <b>Sem: II</b>	<b>Course Code:</b> PEEMC20	<b>Title of the Course:</b> Inter-Cultural Communication	<b>Course Type:</b> Theory	<b>Course Category:</b> Elective	<b>H/W</b> 5	<b>Credits</b> 4	<b>Marks</b> 100
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#### Course Objective:

To initiate students to the challenges in global communication in the age of cross-culture communication

#### Course Objective:

- To initiate students to the challenges in global communication in the age of cross-culture communication

#### Course Outcomes(CO)

The Learners will be able to

**CO1:** Discuss the Concept of Inter Culture Communication.

**CO2:** Acquiring Knowledge in the aspects of inter cultural Business Communication.

**CO3:** Analysing the Concepts of Intra Cultural Communication.

**CO4:** Acquiring the Knowledge about Global Communication

**CO5:** Evaluating the Relationship Between Intercultural Communications in News Media Production.

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

(Low- L, Medium - M, High - H)

#### Course Syllabus:

##### Unit I: Introduction to ICC

(15 hours)

- 1.1. Introduction to Communication.(K2, K3, K4)
- 1.2. Culture and Inter-cultural Communication.(K3, K4)
- 1.3. Dimensions of culture.(K2, K3, K4)

- 1.4. Enculturation.(K2, K3, K4)
- 1.5. Acculturation. (K2, K3, K4)
- 1.6. Cultural barriers, Relevance of Inter-cultural communication to Journalism and Mass communication. (K3, K4, K5, K6)

**Unit II: Inter-cultural Business Communication (15 hours)**

- 2.1. Work attitudes.(K1,K2, K3)
- 2.2. Individualism VS Collectivism.(K2, K3, K4)
- 2.3. Global etiquette in business introductions. (K2, K4, K5)
- 2.4. Electronic communication, and travel and dining. (K3, K4)
- 2.5. Business and social customs. (K2, K3, K4)
- 2.6. Cultural difference in communication. (K2, K4, K5)

**Unit III: Intra-cultural Communication (15 hours)**

- 3.1. Inter-cultural versus Intra-cultural communication.(K1,K2, K3,K5)
- 3.2. Nature and Characteristics. (K2, K3, K4)
- 3.3. Indian and South Indian contexts of Inter-cultural communication.(K2, K3, K4)
- 3.4. Role of mass media in bridging cultural divides.(K2, K4, K5)
- 3.5. Cultural Identities and loss of cultural identity. (K2, K3, K4)
- 3.6. Problem of ethnocentrism. (K2, K3, K4)

**Unit IV: Global Communication (15 hours)**

- 4.1. Global communication. (K1,K2, K3)
- 4.2. Growth of International Communication.(K2, K3, K4)
- 4.3. Cultural shock, Language and Inter-cultural communication. (K2, K3, K4)
- 4.4. High and low context languages.(K2, K3, K4)
- 4.5. Subjective interpretation.(K1,K2, K3)
- 4.6. Language and cultural interaction, Cross Cultural Communication. (K2, K4, K5)

**Unit V: ICC and News (15 hours)**

- 5.1. Implications of inter cultural barriers in News media production.(K1,K2, K3)
- 5.2. Public sphere, LPG.(K2, K3, K4)
- 5.3. Cultural hegemony. (K2, K3, K4)
- 5.4. Influence in media production.(K3, K4, K5, K6)
- 5.4. International news flow patterns.(K2, K4, K5)
- 5.6. Offline and online. (K1,K2, K3,K5)

**Books for Study and Reference:**

1. Stanley J .Baran – Introduction to Mass Communication – Media Literacy and Culture, Tata McGraw-Hill, 2010.
2. Yahya R. Kamalipour – Global Communication – Wadsworth Thomson Learning, 2007.
3. William B. Gudykunst – Theorizing about Intercultural Communication, Sage Publication, 2005.
4. Hamid Mowlana – Global Communication in Transition – Sage Publciations, 1996.





## SEMESTER II

### PCZOE20 - APPLIED ENTOMOLOGY

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
I	II	PCZOE20	Applied Entomology	Theory	Core	5	4	100

#### Objective:

- This core paper has been designed to understand the biology of Insects, Insect pest management, Integrated Pest Management and biological control.

#### Course Outcomes:

**On completion of the course the student will be able to...**

**CO1:** Identify the pest in different cash crops and the mode of infection.

**CO2:** Analyze the pest species of vegetables, fruits, stored grains and household pests.

**CO3:** Categorize the different insect pests and vectors of livestock.

**CO4:** Explain the classification of insecticides and the mode of action.

**CO5:** Apply appropriate method of insect pest management and integrated pest management.

CO/PO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	M	H	H	H	H
CO5	H	H	H	H	H	H

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	M	H	M	H
CO2	H	H	M	H	M	H
CO3	H	H	M	H	M	H
CO4	H	M	M	H	M	H
CO5	H	H	M	H	M	H

#### Unit 1:

(15

#### Hours)

1.1: Causes for insects assuming pest status. (K1, K2, K3, K4, K5)

1.2: Forecasting Pest outbreak. (K1, K2, K3, K4, K5)

1.3: Biology, nature, extent of damage and control measures of insect pests of Sugarcane - *Chilo infuscatellus*, *Tryporyza nivella*, *Chilosacchariphagus*. (K1, K2, K3, K4, K5)

1.4: Biology, nature, extent of damage and control measures of insect pests of Cotton – *Aphis gossypii*, *Dysdercus koenigii*, *Thrips tabaci*. (K1, K2, K3, K4, K5)

1.5: Biology, nature, extent of damage and control measures of insect pests of Groundnut – *Aphis craccivora*, *Aproraemamodicella*, *Helicoverpa armigera*. (K1, K2, K3, K4, K5)

1.6: Coconut - *Rhynchophorus ferrugineus*, *Oryctes rhinoceros*, *Nephantisseiropa*. (K1, K2, K3, K4, K5)

#### Unit 2:

(15

#### Hours)

- 2.1: Biology, nature, extent of damage and control measures of insect pests of Vegetable - *Epilachnadodecastigma*, *Pierisbrassicae*, *Leucinodesorbonalis*. (K1, K2, K3, K4, K5)
- 2.2: Biology, nature, extent of damage and control measures of insect pests of Fruits - *Sternochetusmangifera*, *Cosmopolites sordidus*, *Papiliodemoleus*. (K1, K2, K3, K4, K5)
- 2.3: Biology, nature, extent of damage and control measures of insect pests of Stored product - Paddy - *Leptocorisavaricornis*, *Tryporyzaincertulus*, *Sitophilusoryzae*. (K1, K2, K3, K4, K5)
- 2.4: Biology, nature, extent of damage and control measures of insect pests of stored product Wheat - *Triticumvulgare*, *Mythimnaseparata*, *Spodopteramauritia*. (K1, K2, K3, K4, K5)
- 2.5: Biology, nature, extent of damage and control measures of insect pests of Household pest- *Ctenolepismasaccharina*, *Anthrenapimpinella*, *Trichophagaabruptella*. (K1, K2, K3, K4, K5)
- 2.6: Insect resistant crops. (K1, K2, K3, K4, K5, K6)

**Unit 3: (15 Hours)**

- 3.1: Insect pest of domestic animals - Cattle- Cattle fly. (K1, K2, K3, K4, K5)
- 3.2: Insect pest of domestic animals Ox - Warble fly. (K1, K2, K3, K4, K5)
- 3.3: Insect pest of domestic animals Fowl - Chicken flea, Shaft louse. (K1, K2, K3, K4, K5)
- 3.4: Insect pest of domestic animals Sheep and Goat - Head Maggot, Sheep Ked, Biting Louse. (K1, K2, K3, K4, K5)
- 3.5: Insect vectors of Animals – Mites, Ticks. (K1, K2, K3, K4, K5)
- 3.6: Organic methods of domestic pest management. (K1, K2, K3, K4, K5)

**Unit 4: (15 Hours)**

- 4.1: Classification of Insecticides - Chemical nature – Inorganic - Arsenic and Fluorine compounds. (K1, K2, K3, K4, K5)
- 4.2: Organic compounds- Animal origin – Nereistoxin. (K1, K2, K3, K4, K5)
- 4.3: Plant origin - Nicotinoids, Pyrethroides, Rotenoids. Hydrocarbons. (K1, K2, K3, K4, K5)
- 4.4: Synthetic organic compounds - DDT, BHC, Parathion. (K1, K2, K3, K4, K5)
- 4.5: Mode of action - Physical Poison, Protoplasmic Poison, Respiratory Poison. (K1, K2, K3, K4, K5)
- 4.6: Nerve Poison. Mode of Entry - Stomach Poisons, Contact Poison, Fumigants. (K1, K2, K3, K4, K5)

**Unit 5: (15 Hours)**

- 5.1: Biological control of plant pest. (K1, K2, K3, K4, K5)
- 5.2: Viral insecticides, Bacterial insecticides, Fungal insecticides. (K1, K2, K3, K4, K5)
- 5.3: Integrated Pest Management. (K1, K2, K3, K4, K5, K6)
- 5.4: Use of insect pathogens in control of pest. (K1, K2, K3, K4, K5)
- 5.5: Non-conventional pest control- Insect Attractants, Repellents, Antifeedants, Genetic radiations. (K1, K2, K3, K4, K5)
- 5.6: Plant protection appliances- Duster, Sprayers and Fumigators. (K1, K2, K3, K4, K5)

**Books for study and Reference:**

**Textbooks:**

1. Vasantharaj V.B, Kumaraswami. T- 1998-Elements of Economic Entomology- Popular Book Depot.
2. NalinaSundari, Santhi R- 1962- Entomology- MJP Publishers.

**Reference Books:**

3. JawaidAhsan, Subhas Prasad Sinha 1981- A handbook on Economic Zoology- S. Chand and Company limited.
4. B.S Tomar 2004-Introduction to Economic Zoology-EMKAY Publications.
5. ChinmoyGoswami, B.D Panaik 2011- Handbook of Entomology- Wisdom press.
6. M. R Ghosh 1995-Concepts of Insect control- New Age International Publishers.
7. C.L Metcalf, W.P Flint 1962- Destructive and useful insects their habits and control 4ed- Tata McGraw Hill Publications.
8. United Stated Department of Agriculture Washington DC 1952- The Yearbook of Agriculture – Oxford and IBH Publishing Co.
9. David B.V, Muralirangan, M.C, MeeraMuralirangan 1992- Harmful and Beneficial Insects- Popular Book Depot.
10. Saxena A.B 1996 - Harmful Insects- Anmol Publications.

**E-Resources:**

<http://www.entosocindia.org>

<https://www.entsoc.org>

<https://entomology.cals.cornell.edu>

## SEMESTER II

### PCZOF20 - BIODIVERSITY AND WILDLIFE CONSERVATION

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
I	II	PCZOF20	Biodiversity and wild life conservation	Theory	Core	6	4	100

#### Objective:

- To understand the habitat and distribution of wild animals, causes for their endangerment and methods adopted for their conservation.

#### Course Outcomes:

On completion of the course the student will be able to...

**CO1:** Discuss the Biodiversity India and ecosystems.

**CO2:** Explain the values of Biodiversity.

**CO3:** Discuss the Wildlife of India and threats to the wildlife.

**CO4:** Explain Wildlife protection and conservation.

**CO5:** Explain conservation methods.

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
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	M	H
CO5	H	H	H	H	M	H

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	M	H	M	H
CO2	H	H	M	H	M	H
CO3	H	H	M	H	M	H
CO4	H	M	M	H	M	H
CO5	H	H	M	H	M	H

#### Unit 1:(18 Hours)

- 1.1: Biodiversity in India: Genetic, species and ecosystem diversity. (K1, K2, K3, K4, K5)
- 1.2: Biogeographic classification of India. National and local level. (K1, K2, K3, K4, K5)
- 1.3: India as a mega diversity nation. (K1, K2, K3, K4, K5, K6)
- 1.4: Ecology and Ecosystems - Structure and function of ecosystem. (K1, K2, K3, K4, K5)
- 1.5: Energy flow in the ecosystem. (K1, K2, K3, K4, K5, K6)
- 1.6: Types of Ecosystem: Forest, Aquatic (Lake and Ocean) and Urban. (K1, K2, K3, K4, K5)

#### Unit 2:(18 Hours)

- 2.1: Value of biodiversity: Consumptive use, Productive use, Social, Ethical and Aesthetic. (K1, K2, K3, K4, K5)
- 2.2: Hotspots of biodiversity. (K1, K2, K3, K4, K5, K6)

- 2.3: Endemic and Invasive species. (K1, K2, K3, K4, K5)
- 2.4: Threats to biodiversity: Habitat loss. (K1, K2, K3, K4, K5, K6)
- 2.5: Climate change; Poaching. (K1, K2, K3, K4, K5)
- 2.6: Man and wildlife conflicts. (K1, K2, K3, K4, K5)

### **Unit 3:(18 Hours)**

- 3.1: Wildlife of India. (K1, K2, K3, K4, K5)
- 3.2: Values of wildlife - Positive and Negative. (K1, K2, K3, K4, K5)
- 3.3: Morphological and Physiological adaptations of Endangered and threatened species. (K1, K2, K3, K4, K5)
- 3.4: Population dynamics: Exponential and Logistic. (K1, K2, K3, K4, K5)
- 3.5: Local and Regional Extinction. (K1, K2, K3, K4, K5)
- 3.6: Red Data Book. (K1, K2, K3, K4, K5)

### **Unit 4:(18 Hours)**

- 4.1: Wildlife protection Act. (K1, K2, K3, K4, K5)
- 4.2: In-situ and ex-situ conservation. (K1, K2, K3, K4, K5, K6)
- 4.3: IUCN Red List – CITES. (K1, K2, K3, K4, K5)
- 4.4: National Parks and Sanctuaries. (K1, K2, K3, K4, K5)
- 4.5: Biospheres reserves. (K1, K2, K3, K4, K5)
- 4.6: Project Tiger - Project Gir Lion and Crocodile breeding project. (K1, K2, K3, K4, K5)

### **Unit 5:**

**(18 Hours)**

- 5.1: Germplasm conservation and Cryogenic preservation. (K1, K2, K3, K4, K5)
- 5.2: Assisted reproduction. (K1, K2, K3, K4, K5)
- 5.3: Captive breeding - Non-invasive and Minimal invasive method. (K1, K2, K3, K4, K5)
- 5.4: Scat analysis and Radio telemetry. (K1, K2, K3, K4, K5, K6)
- 5.5: Habitat suitability. (K1, K2, K3, K4, K5)
- 5.6: Remote sensing and GIS. (K1, K2, K3, K4, K5, K6)

### **Books for Study and Reference:**

#### **Textbooks:**

1. H.R Singh, Neeraj Kumar - Ecology and Environmental science- Vishal Publishing Co., 2006
2. Rayappa A. Kasi - Earth- Designed for Biodiversity- LTD Media Publications, 2010

#### **Reference Books:**

3. K.C Agarwal - Biodiversity- Agarobios India, 2000
4. Desh Deepak Verma, SujataArora, R K Rai - Perspectives of Biodiversity-Ministry of Environment and Forest, 2006
5. Lee Hannah - Climate change Biology- Elsevier, 2011
6. P.C Das - Environmental Biology- AITBS Publishers India, 2011
7. V.K Agarwal, Usha Gupta - Ecology and Ethology- S. Chand and Company Ltd, 2002

#### **E-Resources:**

<http://www.enviroindia.net>

<http://aelsindia.com>

<http://environment-ecology.com>

### SEMESTER III

#### PCZOI20 - ENVIRONMENTAL BIOLOGY

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II	III	PCZOI20	Environmental Biology	Theory	Core	7	4	100

#### Objectives:

- Understand the Changes in environment and its impact.
- Understand the contaminants, their effects and disposal.
- Importance of recycling technologies in Environmental Conservation.
- Understand the issues related to pollution and laws enforced.

#### Course Outcomes:

#### On completion of the course the student will be able to...

**CO1:** Describe ecological succession and Environmental stresses and their management.

**CO2:** Explain the major classes of contaminants and their impact on environment.

**CO3:** Explain green energy and the types of recycling technologies for solid and liquid wastes and their role in environmental conservation.

**CO4:** Discuss environmental indicators and their role in environmental balances and bioremediation.

**CO5:** Explain the importance of global ecology towards sustainable civilization.

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	H	H	H	H	M	H
CLO2	H	H	H	H	M	H
CLO3	H	H	H	H	M	H
CLO4	H	H	H	H	M	H
CLO5	H	H	H	H	M	H

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	H	H	M	H	M	H
CLO2	H	H	M	H	M	H
CLO3	H	H	M	H	M	H
CLO4	H	H	M	H	M	H
CLO5	H	H	M	H	M	H

#### Unit 1:(21 Hours)

1.1: Ecological succession – Process and Patterns of Succession. (K1, K2, K3, K4, K5)

1.2: Human influence on Succession. (K1, K2, K3, K4, K5, K6)

1.3: Homeostasis. (K1, K2, K3, K4, K5, K6)

1.4: Radioactive compounds and their impact on the environment. (K1, K2, K3, K4, K5)

1.5: Environmental Stresses and their management - global climatic pattern. (K1, K2, K3, K4, K5, K6)

1.6: Atmospheric ozone, Ozone depletion, coping with climatic variations. (K1, K2, K3, K4, K5, K6)

#### Unit 2:(21 Hours)

2.1: Major classes of contaminants. (K1, K2, K3, K4, K5)

- 2.2: Uptake, biotransformation, detoxification, elimination and accumulation of toxicants. (K1, K2, K3, K4, K5)
- 2.3: Factors influencing bioaccumulation from food and tropic transfer. (K1, K2, K3, K4, K5)
- 2.4: Important heavy metals and their role in environment. (K1, K2, K3, K4, K5)
- 2.5: Agrochemical use and misuse, alternatives. Pesticides and other chemicals in agriculture, industry and hygiene and their disposal.(K1, K2, K3, K4, K5)
- 2.6: Impact of chemicals on biodiversity of microbes, animals and plants. Biodegradation of chemicals.(K1, K2, K3, K4, K5)

**Unit 3: (21 Hours)**

- 3.1: Green energy – Bio fuels. (K1, K2, K3, K4, K5)
- 3.2: Recycling and reuse technologies for solid wastes and their role in environmental conservation. (K1, K2, K3, K4, K5)
- 3.3: Recycling and reuse technologies for liquid wastes and their role in environmental conservation. (K1, K2, K3, K4, K5)
- 3.4: Remote sensing – basic concepts. (K1, K2, K3, K4, K5)
- 3.5: Applications of remote sensing techniques in environmental conservation. (K1, K2, K3, K4, K5, K6)

**Unit 4:(21 Hours)**

- 4.1: Environmental indicators and their role in environmental balance. (K1, K2, K3, K4, K5)
- 4.2: Bioremediation - Definition - Need and Scope of Bioremediation. (K1, K2, K3, K4, K5, K6)
- 4.3: Environmental application of Bioremediation. (K1, K2, K3, K4, K5)
- 4.4: Phytoremediation. (K1, K2, K3, K4, K5)
- 4.5: Biomagnifications. (K1, K2, K3, K4, K5)
- 4.6: Bioavailability. (K1, K2, K3, K4, K5)

**Unit 5:(21 Hours)**

- 5.1: Global ecology towards sustainable civilization: Ecological. (K1, K2, K3, K4, K5)
- 5.2: Societal gaps. (K1, K2, K3, K4, K5)
- 5.3: Global sustainability, Long term transitions. (K1, K2, K3, K4, K5)
- 5.4: Human designed and Management systems. (K1, K2, K3, K4, K5)
- 5.5: Environmental laws and Acts pertaining to environmental protection and management. (K1, K2, K3, K4, K5)
- 5.6: Environmental monitoring and environmental assessment. (K1, K2, K3, K4, K5)

**Books for Study and Reference:**

**Text books:**

1. Odum E.P., 1983, Basic Ecology, Saunders, New York.
2. ShardhaSinha, ManishaShukla and RanjanaShukla. 2013, A Text book of Environmental Studies, A.I.T.B.S. Publishers, India.

**Reference Books:**

3. Rao C.S., 1992, Environmental Pollution Control Engineering, Wiley Eastern Ltd.
4. Peter Gomes Dayal, 2010-11, Environmental Toxicology, Dominant Publishers.
5. Trivedi P.R., Gurdeep Raj, 1992, Environmental Biology, Akashdeep Publishing House.

6. Sharma B.K., 2001, An Introduction to Environmental Pollution, Goel Publishing House, Meerut.
7. Sharma P.D., 1995, Ecology and Environment, Rastogi Publications.
8. Chapman J.L. and Resiss M.J., 1992, Ecology Principles and applications, Cambridge University Press.
9. Biswarup Mukherjee, 1997, Environmental Biology, Tata McGraw-Hill Publishing Company Ltd. New Delhi.
10. Lee Hannah 2011, Climate Change Biology, Elsevier.
11. Conklin, A.R. Jr., 2004, Principles and Practices in Environmental Analysis, CRC Press.
12. Grant, W.E. and Swannack, T.M., 2013, Ecological Modeling, Blackwell.
13. Meenambal T., Uma R.N., and Murali K., 2005, Principles of Environmental Science and Engineering, S. Chand and Company Ltd.

**E-resources:**

<https://www.sebiology.org>

<http://www.enviroindia.net>

<http://aelsindia.com>

<http://environment-ecology.com>



### SEMESTER III

#### PCZOJ20 -LIMNOLOGY AND TOXICOLOGY

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II	III	PCZOJ20	Limnology and Toxicology	Theory	Core	6	4	100

#### Objectives:

- To understand the different fresh water habitat, their fauna and Physio-chemical properties.
- An introduction to basic toxicology to understand dosage, route of exposure and its effects on fauna

#### Course Outcomes:

**On completion of the course the student will be able to...**

**CO1:** Attains basic concept about fresh water habitats and its types.

**CO2:** Describe the Physio-Chemical Characteristics and its importance in freshwater ecosystems.

**CO3:** Summarize about the organisms and adaptation in the freshwater ecosystem.

**CO4:** Explain the basic knowledge about toxicology its principle, agents and estimation methods.

**CO5:** Describe the impact of toxicant in the aquatic ecosystem.

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	M	L
CO2	H	H	H	H	M	M
CO3	H	H	H	H	M	M
CO4	H	H	H	H	M	M
CO5	H	H	H	H	M	M

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	M	H	L	H
CO2	H	H	M	H	M	H
CO3	H	H	H	M	M	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H

#### Unit 1: LIMNOLOGY(18 Hours)

1.1: Limnology – Definition, historical development. (K1, K2, K3, K4, K5)

1.2: Scope of Limnology. (K1, K2, K3, K4, K5)

1.3: Types of freshwater habitats and their ecosystem. (K1, K2, K3, K4, K5, K6)

1.4: Lentic- Ponds. (K1, K2, K3, K4, K5)

1.5: Lakes. (K1, K2, K3, K4, K5)

1.6: Lotic- Streams, Rivers. (K1, K2, K3, K4, K5)

#### Unit 2:(18 Hours)

2.1: Physio – Chemical Characteristics- Light. (K1, K2, K3, K4, K5)

- 2.2: Temperature and Radiation.(K1, K2, K3, K4, K5)
- 2.3: Stratification and Heat Budget. (K1, K2, K3, K4, K5)
- 2.4: Dissolved Solids – Carbonate, Bicarbonates, Phosphate and Nitrate. (K1, K2, K3, K4, K5)
- 2.5: Turbidity. (K1, K2, K3, K4, K5)
- 2.6: Dissolved gases - Oxygen, Carbon dioxide, pH. (K1, K2, K3, K4, K5)

### **Unit 3:(18 Hours)**

- 3.1: General study of freshwater organisms. Plankton – Phytoplankton - Diatoms, Dinoflagellates, Blue- green algae. (K1, K2, K3, K4, K5, K6)
- 3.2: Zooplankton – Larval forms of Arthropods. (K1, K2, K3, K4, K5, K6)
- 3.3: Benthos- general adaptations. (K1, K2, K3, K4, K5)
- 3.4: Littoral zone- general adaptations. (K1, K2, K3, K4, K5)
- 3.5: Limnetic zone- general adaptations. (K1, K2, K3, K4, K5)
- 3.6: Profundal zone - general adaptations. (K1, K2, K3, K4, K5)

### **Unit 4:TOXICOLOGY**

**(18 Hours)**

- 4.1: Toxicology - Basic concepts. (K1, K2, K3, K4, K5)
- 4.2: Toxicokinetics –Principles- ADME (Absorption, Distribution, Metabolism and Excretion). (K1, K2, K3, K4, K5, K6)
- 4.3: Various types of toxicological agents. (K1, K2, K3, K4, K5)
- 4.4: Toxicity testing principles, hazards, risks and their control methods. (K1, K2, K3, K4, K5)
- 4.5: Heavy metal toxicity – Estimation of mercury by DithizoneColorimetric method, Estimation of fluoride by DiphenylCarbozide Colorimetric method. (K1, K2, K3, K4, K5)
- 4.6:Estimation of Chromium by DiphenylCarbozide Colorimetric method. (K1, K2, K3, K4, K5)

### **Unit 5:(18 Hours)**

- 5.1: Aquatic environment – Toxicants and toxicity. (K1, K2, K3, K4, K5)
- 5.2: Factors that affect the environmental concentrations of the toxicants. (K1, K2, K3, K4, K5, K6)
- 5.3: Factors that influence toxicity. (K1, K2, K3, K4, K5)
- 5.4: Effect on aquatic Fauna. (K1, K2, K3, K4, K5)
- 5.5: Toxicity test: Acute toxicity test - chronic toxicity test - LC 50 – LD 50. (K1, K2, K3, K4, K5)
- 5.6: Factors that modify toxicity. (K1, K2, K3, K4, K5)

### **Books for Study and Reference:**

#### **Textbooks:**

1. V.K.Agarwal, Usha Gupta 2002 - Ecology and Ethology- S. Chand and Company Ltd.
2. S.N Prasad 1991- An Introduction to Toxicology- S. Chand and Company Ltd.

#### **Reference Books:**

3. H.R Singh, Neeraj Kumar 2006 - Ecology and Environmental Science - Vishal Publishing Co.
4. G T Tonapi 1950 - Fresh Water animal of India an ecological approach - Oxford and IBH Publishing Co.
5. Alexander J Horne, Charles R. Goldman 1994- Limnology- McGraw- Hill International editions.

6. Modern concepts of ecology H.D. Kumar 1995 - Vikas Publishing House Pvt. Ltd., New Delhi.
7. Ecology of Freshwater, Alison Leadlay Brown 1971, Heinemann Educational Books Ltd., London.
8. Introduction to Ecology, Papul A. Colinvaux, 1978 John Wiley and Sons, Inc., New York.
9. Fish and Fisheries of India V.G. Jhingram, 1980 Hindustan Publishing Co., New Delhi.
10. Peter Gomes Dayal 2011- Environmental Toxicology- Dominant Publishers and Distributors.
11. Krishna Pillai N. 1986- Introduction to Planktonology 1 ed - Himalaya Publishing House.
12. Manivasakam. N. Physico chemical examination of water, sewage and industrial effluents. PragatiPrakashan, Meerut.

**E-Resources:**

<https://limnology.org>

<https://www.aslo.org>

<http://www.geocities.ws/limsocindia/limlinks.htm>

<https://www.toxicology.org>

<https://www.setac.org>

<http://www.indiansocietyoftoxicology.org>

## SEMESTER IV

### PIZOG20 - INDEPENDENT ELECTIVE IVA- BIOSYSTEMATICS

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II	IV	PIZOG20	Biosystematics	Theory	Independent Elective	-	2	100

#### 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.

#### Course Outcomes:

**On completion of the course the student will be able to...**

**CO1:** Explain the concept, importance and attributes of biosystematics.

**CO2:** Discuss the biological characteristics.

**CO3:** Compute the evolutionary relationship among the organisms.

**CO4:** Familiarize different taxonomic procedures, taxonomic keys and zoological nomenclature.

**CO5:** Apply phylogeny classification at species level and infra species level.

PSO/CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	M
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	M	H	H	H	H
CO5	H	M	H	H	H	H

CO/PLO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

#### Unit 1:

1.1: Introduction & basic concept of biosystematics & taxonomy. (K1, K2, K3, K4, K5)

1.2: Rise of Taxonomy - Problems, aims and tasks in taxonomy. (K1, K2, K3, K4, K5)

1.3: Taxonomy as a profession. (K1, K2, K3, K4, K5)

1.4: Importance & application of biosystematics in biology. (K1, K2, K3, K4, K5)

1.5: Chemotaxonomy – Cytotaxonomy. (K1, K2, K3, K4, K5)

1.6: Attributes of Taxonomy. (K1, K2, K3, K4, K5)

#### Unit 2:

2.1: Types of biological classification (Essentialism, Nominalism, Empirism, Cladism and evolutionary classification). (K1, K2, K3, K4, K5)

2.2: Newer Trends in Taxonomy: Morphological approach, Immature stages and embryological approach. (K1, K2, K3, K4, K5)

2.3: Ecological Approach, Behavioural Approach. (K1, K2, K3, K4, K5)

2.4: Cytological and Biochemical Approaches. (K1, K2, K3, K4, K5)

- 2.5: Numerical taxonomy. (K1, K2, K3, K4, K5)  
2.6: Differential Systematics. (K1, K2, K3, K4, K5)

**Unit 3:**

- 3.1: Zoological Classification Kinds of classification, phyletic lineages. (K1, K2, K3, K4, K5)
- 3.2: Components of classification - Hierarchy of categories. (K1, K2, K3, K4, K5)
- 3.3: Species concepts, Typological species concept, Nominalistic species concept. (K1, K2, K3, K4, K5)
- 3.4: Biological species concept, Evolutionary species concept, Recognition species concept. (K1, K2, K3, K4, K5)
- 3.5: Kinds of species : Polytypic & monotypic species, subspecies, infraspecific groups. (K1, K2, K3, K4, K5)
- 3.6: Super species, other kind of species. (K1, K2, K3, K4, K5)

**Unit 4:**

- 4.1: Taxonomic procedures, Taxonomic collection. (K1, K2, K3, K4, K5)
- 4.2: Curing of animals & Process of Identification. (K1, K2, K3, K4, K5)
- 4.3: Preservation of specimens. (K1, K2, K3, K4, K5)
- 4.4: Taxonomic Keys - Types, merits & demerits. (K1, K2, K3, K4, K5)
- 4.5: International code of Zoological Nomenclature (ICZN). (K1, K2, K3, K4, K5)
- 4.6: Interpretation of rules of nomenclature. (K1, K2, K3, K4, K5)

**Unit 5:**

- 5.1: Taxonomic Records. (K1, K2, K3, K4, K5)
- 5.2: Publications Taxonomic keys. (K1, K2, K3, K4, K5)
- 5.3: Taxonomic characters description. (K1, K2, K3, K4, K5)
- 5.4: Taxonomic paper. (K1, K2, K3, K4, K5)
- 5.5: Zoological Records. (K1, K2, K3, K4, K5)
- 5.6: Directories, Abstracts, Review. (K1, K2, K3, K4, K5)

**Books for Study and Reference:**

**Textbooks:**

1. Kapoor V.C. 2010. Theory and practice of animal taxonomy, Oxford and IBH, New Delhi.
2. Ashok Verma, 2015. Principles of Animal Taxonomy, Narosa Publishing house, New Delhi.

**Reference Books:**

3. George Gaylord Simpson, 1990. Principles of animal taxonomy, Columbia University Press, New York.
4. Quicke, D. L. J, 2008. Principles and Techniques of contemporary Taxonomy, Blackie Academic Professional, 310pp.
5. Quentin. T. Wheeler, 2008m The New Taxonomy, The Systematics Association Special Volume Series, 76. (ed.) CPR Press.
6. Theodore Horace Savory, 1970. Animal Taxonomy, University of Michigan.
7. Dr.R.C.Tripathi, Biosystematics & Taxonomy, University Book House, Jaipur.
8. G.G. Simpson, Principle of Animal Taxonomy: Oxford & IBH Publishing Co.

**E-Resources:**

<http://epgp.inflibnet.ac.in>  
<https://onlinelibrary.wiley.com>  
<http://www.brainkart.com>

## PG MICROBIOLOGY

### PCMBB20: FOOD, AGRICULTURE AND ENVIRONMENTAL

### MICROBIOLOGY

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: I	PCMBB20	Food, Agriculture and Environmental Microbiology	Theory	Core	6	5	100

**Course Objective:** To make the students familiarize on Food, Agriculture and Environmental aspects of Microbiology.

#### Course Outcomes (CO):

At the end of the course, the learners will be able to;

**CO1:** Analyse the principles in food preservation.

**CO2:** Communicate diseases associated with food.

**CO3:** Discuss the role of microorganisms in soil and microbial interaction.

**CO4:** Utilize the knowledge on biogeochemical cycles to produce biofertilizers.

**CO5:** Assess information about microbiological quality of air and water.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	L	H	M
CO2	H	L	L	M	L	H
CO3	H	H	M	H	L	H
CO4	H	L	L	M	M	H
CO5	H	H	M	H	L	H

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	M	L	H	M
CO2	H	M	M	L	L	H
CO3	H	H	M	H	L	H
CO4	H	L	L	L	M	H
CO5	H	H	M	H	L	H

**H – HIGH (3)**

**M – MODERATE (2)**

**L – LOW (1)**

## **COURSE SYLLABUS**

### **UNIT-I: Food Microbiology. (15 hours)**

- 1.1 Importance of studying Food microbiology- Primary sources of microorganisms in foods. (K1,K2)
- 1.2 Factors influencing microbial growth in foods - extrinsic and intrinsic.(K1,K2)
- 1.3 Principles of food preservation - preservation methods - irradiation - drying, heat processing, chilling and freezing, high pressure, modification of atmosphere and chemical preservatives. (K1,K2,K3,K4)
- 1.4 Nutritional value of fermented foods. (K2,K3,K4,K5,K6)
- 1.5 SCP and their uses. (K1,K2,K3)
- 1.6 Contamination, preservation and spoilage of fruits, vegetables, meat and poultry products. (K1,K2,K3)

### **UNIT-II: Dairy Microbiology. (15 hours)**

- 1.1 Microbiology of fermented milk - Starter lactic cultures (K1,K2)
- 1.2 Fermented milk products (cheese, yoghurt, acidophilus milk, kefir, kumis). (K1,K2,K3)
- 1.3 Food sanitation in food manufacture and in the retail trade. (K1,K2,K3)
- 1.4 (HACCP) - Food control agencies and its regulations. (K1,K2,K3)
- 1.5 Food borne disease.(K1,K2)
- 1.6 Milk borne diseases. (K1,K2)

### **UNIT-III: Soil Microbiology. (15 hours)**

- 1.1 Distribution of soil microorganisms in soil. (K1,K2)
- 1.2 Factors influencing the soil microflora. (K1,K2)
- 1.3 Role of microorganisms in soil fertility. (K1,K2)
- 1.4 Interactions among microorganisms, mutualisms, commensalism, competition, amensalism, parasitism, predation. (K1,K2)
- 1.5 Interactions between microbes and plants - rhizosphere, phyllosphere. (K1,K2)
- 1.6 Mycorrhizae, root nodule bacteria. (K1,K2,K3,K4)

### **UNIT-IV: Biogeochemical cycle and Biofertilizers. (15 hours)**

- 4.1 Biogeochemical - carbon cycle - role of microbes in carbon cycle.(K1,K2)
- 4.2 Nitrogen cycle - mechanism of biological nitrogen fixation - ammonification - nitrification - denitrification and microorganisms involved in such processes. (K1,K2)
- 4.3 Phosphorous cycle. (K1,K2)
- 4.4 Sulphur cycle. (K1,K2)
- 4.5 Biofertilizer for sustainable agriculture *Rhizobium*, *Azospirillum*, *Azotobacter*.(K1,K2,K3,K4)
- 4.6 *Azolla*, BGA -mass production methods - applications methods and crop response of biofertilizers.( K1,K2,K3,K4)

### **UNIT-V: Aero Microbiology and Aquatic Microbiology. (15 hours)**

- 5.1 Droplet, Droplet nuclei and Aerosol. (K1,K2)
- 5.2 Assessment of air quality. (K2,K3,K4)
- 5.3 Airborne diseases, their symptoms and preventive measures, water borne disease.(K1,K2)

5.4 Types of water – Assessment of microbiological quality of water.(K2,K3,K4)

5.5 Treatment of municipal water (K4,K5)

5.6 Types of wastes, characterization of solid and liquid waste. Sewage treatment-composting. (K3,K4,K5)

**TEXT BOOKS:**

1. Frazier W.C. and West Hoff D.C (2008). Food Microbiology. 4<sup>th</sup> edition. Mc Graw Hill, New York.
2. Joseph C. Daniel (1999). Environmental aspects of Microbiology. 1<sup>st</sup> edition, Bright Sun publications, Chennai.
3. Subba Rao NS (2004). Soil Microbiology. 4<sup>th</sup> edition, Oxford and BH Publishing Co.Pvt. Ltd., New Delhi.

**REFERENCE BOOKS:**

1. Adam M.R. and Moss M.O (2004). Food Microbiology. 2<sup>nd</sup> edition, New international pvt. Ltd., publishers.UK.
2. Banwart G. J (2004). Basic Food Microbiology. 2<sup>nd</sup> edition, CBS Publishers and Distributors, New Delhi.
3. James M. Jay (2003). Modern Food Microbiology. 4<sup>th</sup> edition, CBS Publishers, New Delhi.
4. Vijaya Ramesh K (2004). Environmental Microbiology. 1<sup>st</sup> edition, MJP publishers. Chennai.
5. Singh D.P and Dwivedi S.K (2005). Environmental Microbiology and Biotechnology. 1<sup>st</sup> edition, New Age International (P) Ltd., New Delhi.
6. Mishra RR (2004). Soil Microbiology. 1<sup>st</sup> edition, CBS Publishers and distributors, New Delhi.
7. Rangaswami G and Mahadevan A (2002). Disease of Crop Plants in India. 4<sup>th</sup> edition, PHI Learning (P) Ltd., New Delhi.
8. Atlas R.M. and Bartha R (1992). Microbial Ecology, Fundamental and Application, 3<sup>rd</sup> edition, Bengamin and Cummings. United States.

**OER:**

1. <http://www.loc.gov/>
2. <http://library.clark.edu/>
3. <http://www.dli.ernet.in/>
4. <http://www.loc.gov/education/>