

M.Sc. Zoology

Programme Outcomes of M.Sc.

- Acquire interdisciplinary knowledge and the skill of designing and conducting experiments independently in collaboration and interpreting scientific data.
- Communicate effectively, analyze critically and learn to adapt to the socio technological changes.
- Face competitive examinations that offer challenging and rewarding careers in science and education.
- Identify, formulate and critically analyze various scientific problems and design/develop solutions by applying the knowledge to different domains.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSOs	Upon completion students of M.Sc. Zoology will be able to :
PSO - 1	Explain the various aspects of life sciences including Biochemistry, Cell and Molecular Biology, Genetics, Physiology, Developmental Biology, Ecobiology, Immunology, Microbiology, Endocrinology, Evolution, Biotechnology and Nanobiology.
PSO - 2	Carry out experimental techniques and methods of statistical analysis appropriate for their course.
PSO - 3	Develop personal and key transferable skills such as group work, presentation and report writing.
PSO - 4	Develop competence in the design and execution of research.
PSO - 5	Independently assemble facts, summarize and draw conclusions from scientific text.
PSO - 6	Pursue M Phil/Ph. D, compete in national eligibility test (NET) and select an independent professional career.

Semester : I
Name of the Course : Biochemistry
Course code : PZ1711

Major Core I

No. of hours/ week	No. of credits	Total number of hours	Marks
6	4	90	100

Learning Objectives

1. To create awareness among the students about the structure and functions of biomolecules.
2. To provide knowledge in tackling more advanced and specialized biochemical Techniques.

Course Outcome

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Assess the relationship between chemistry, physics and biology.	PSO -1	E
CO - 2	Recognize the structure and functions of biomolecules.	PSO -1	R
CO - 3	Discuss basic principles of metabolism and associated metabolic	PSO -3	U

	diseases.		
CO - 4	Demonstrate experiments and techniques related to biochemistry.	PSO -2; PSO -4	Ap; An
CO - 5	Gain employability in industrial, biomedical and research laboratories.	PSO -6	Ap

Teaching Plan
Total Hours: 60 (Incl. Seminar & Test)

Unit	Module	Topics	Hours	Learning outcome	Pedagogy	Assessment
I	Atoms, Molecules, Buffer and water (15 hrs)					
	1	Atoms – Molecules – Chemical bonds – Primary bonds and secondary bonds.	3	Recalls atoms , molecules and chemical bonds	Seminar and lecture	MCQ, (1, 4) Short test (2, 3)
	2	pH and Hydrogen ion concentration, Buffer systems in blood - Mechanism of buffer action	3	Demonstrates the importance of pH in biological system	Seminar, Lecture	
	3	Buffers - 'Henderson-Hasselbalch' equation.	2	Describes the derivation of pH as a measure of acidity in biological and chemical systems	Lecture, PPT	Formative Assessment I (1, 2, 3)
	4	Acid base balance – Regulation of acid base balance – Acidosis and Alkalosis.	3	Interpret the acid – base balance to diseases	Seminar and lecture	Formative Assessment II (4, 5, 6)
	5	Water – Colligative properties - Water turnover and balance.	2	Explains the properties of water.	Lecture	
	6	Electrolyte balance – Dehydration and Water intoxication	2	Describes electrolyte balance	Lecture, Discussion	
II	Carbohydrate (15 hrs)					
	1	Classification, structure, properties of mono, oligo and polysaccharides and biological role of carbohydrates	1	Explains structure of carbohydrate	Seminar	Short test (1) Mind map (2,3, 4,5)
	2	Carbohydrate metabolism - glycogenesis, glycogenolysis, glycolysis	3	Distinguish and Describes catabolic and anabolic process	Lecture/ PPT	
	3	Krebs cycle, Electron transport and Oxidative phosphorylation, Energetics of glucose metabolism	3	Summarise the ATP producing process in the biological system	Lecture/ PPT, Video	MCQ (6) Test Formative Assessment I (1,2,3) Formative Assessment II (4,5,6)
	4	Pasteur effect–HMP shunt - gluconeogenesis – glyoxylate pathway– Cori cycle –	4	Differentiate different pathways of metabolism	Lecture/PPT	
5	Regulation and hormonal control of	2	Correlate hormones	Lecture,		

		carbohydrate metabolism		to carbohydrate metabolism and diseases	Discussion	
	6	Glycogen storage diseases – blood sugar level – Glycosuria - Glucose tolerance test – Diabetes.	2	Apply knowledge to glycogen storage diseases	Seminar, Lecture, PPT	
III	Proteins (15 hrs)					
	1	Classification, structure, Ramachandran plot, Properties and biological role.	3	Describes the structure and discuss the role of proteins	Lecture/ PPT, Discussion	MCQ (1, 2) Slip test (1, 2,3)
	2	Amino acids - classification, structure and properties	2	Describes the structure and properties	Seminar, Lecture	Mind Map (4,5,6,7)
	3	Metabolism of proteins - deamination, transamination– transmethylation and decarboxylation of amino acids.	2	Differentiate different methods of metabolism of aminoacids	Lecture/ PPT	Formative Assessment I (1,2,3)
	4	Metabolism of proteins - decarboxylation of amino acids Glycogenic and ketogenic amino acids –	2	Recalls and compare the metabolism of protein and carbohydrate	Lecture, PPT	Formative Assessment II (4,5)
	5	Formation and transport of ammonia - glucose-alanine cycle - Ornithine cycle –	2	Interpret metabolism of protein and carbohydrate	Lecture/ PPT	Formative Assessment III (6,7)
	6	Metabolism of Phenylalanine, Tyrosine	2	Differentiate and Explains amino acids metabolism	Lecture/ PPT	
	7	Metabolism of Tryptophan. Porphyrins	2	Differentiate and Explains	Lecture/ PPT	
IV	Lipids (15 hrs)					
	1	Classification, structure and Biological role - Chylomicrons,	3	Describe structure and Define Chylomicrons	Lecture/ Demonstration/ PPT	MCQ (1,2,6) Short test (3,4, 5)
	2	VLDL, LDL, HDL - Lipid metabolism. Theories of oxidation of fatty acids.	2	Define VLDL, LDL, HDL Describes oxidation theories.	Mind Map, Lecture	Formative Assessment II (1- 5)
	3	Oxidation of any one fatty acid and its bioenergetics (palmitic acid)	3	Explains beta oxidation	Mind map, Lecture, PPT	Formative Assessment III (6,7)
	4	Ketogenesis - Biosynthesis of palmitic acid	3	Identify different steps in the process of biosynthesis	Lecture/ PPT	
	5	Metabolism of cholesterol - lipid storage diseases – Role of liver in fat metabolism. Prostaglandins.		Describes and interpret role of liver. Explains role of Prostaglandins.	Lecture , PPT	
	6	Integration of carbohydrate, protein and lipid metabolism.		Summarise the integration of	Probing questions	

				metabolism			
V	Nucleotide metabolism, Enzymes, Vitamins & Detoxification (15 hrs)						Short test, Quiz, Formative Assessment III (1,2,3)
	1	Biosynthesis and degradation of purines and pyrimidines.	4	Describes the biosynthetic process of Purines & Pyrimidines. Recall DNA structure.	Lecture, PPT		
	2	Classification, nomenclature, enzyme kinetics	2	Recall and Identify the enzymes	Lecture, Discussion		
	3	Michaelis - Menten constant, enzyme inhibition, mechanism of enzyme action, factors affecting enzyme activity, isozymes, coenzymes.	3	Describes the role of enzymes and recall physiology of digestion	Lecture		
	4	Classification (fat soluble and water soluble), occurrence and biochemical role.	3	Recall the nutrients and identify the sources and symptoms.	Seminar, Thematic Discussion		
	5	Mechanism of detoxification (oxidation, reduction, conjugation) - cytochrome P 450 system.	3	Explain and appreciate the detoxification process in the biological system.	Lecture, PPT		

Course instructor
Dr. F. Brisca Renuga

Head of the Department
Dr. S. Mary Mettilda Bai

Semester : I

Core II

Name of the Course : Cell and Molecular Biology

Course code : PZ1712

No. of Hours/ week	No. of Credits	Total Number of Hours	Marks
6	4	90	100

Learning Objectives

- To provide a firm intellectual and basic knowledge on the structure and functions of biomembranes, cell organelles and molecules of eukaryotic cells.
- Get employment in educational institutions and research laboratories.

Course Outcome

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Recognize and describe the structural and functional organization of cell organelles.	PSO - 1	U
CO - 2	Illustrate DNA replication and trace the flow of genetic information from DNA to protein, protein sorting and trafficking	PSO - 4	Ap
CO - 3	Summarise the cell cycle and proteins involved in the regulation and molecular defects leading to cancer.	PSO - 5	U
CO - 4	Identify signaling components and pathways.	PSO - 1	U

CO - 5	Apply the principles and techniques of molecular biology for further education and employment.	PSO - 6	Ap
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Teaching Plan
Total Hours: 90 (Incl. Seminar & Test)

UNIT	Module	Description	Hours	Learning outcome	Pedagogy	Assessment
I II	Nutrition (15 hrs.)					
	1	Prokaryotic cells – structure	1	Recognize prokaryotic cells	Seminar	Short test, MCQ, Formative assessment I (1, 2, 3) Formative assessment II 4, 5, 6, 7
	2	Plasma membrane: Structure and function - active transport and pumps- transport of transporter proteins – membrane potential.	4	Explain the processes of transport across membranes and the role of the proteins involved in it.	Lecture/ ppt	
	3	Cell – cell and cell – matrix interaction: Cell adhesion molecules: Selectin – Integrin – Cadherins.	3	Elucidate different cell adhesion molecules	Lecture/ ppt	
	4	Calcium dependent and Calcium independent homophilic cell–cell adhesion.	3	Differentiate Calcium dependent and Calcium independent cell adhesion	Lecture/ppt	
	5	Tight junction Gap junction – connexin.	3	Recall and relate the role of tight and gap junction	Lecture/ppt	
	6	Extracellular matrix – Collagen and non – collagen components.	1	Evaluate the function of extracellular matrix	Lecture/ppt	
	Cell signaling (15 hrs)					
	1	Extracellular signaling – signaling molecules and their receptors - Functions of cell surface receptors.	3	Identify signaling molecules	Seminar	MCQ Mind map Formative assessment I

	2	Pathways of intracellular signal transduction: G protein coupled receptors	2	Narrate the signalling pathways of GPCR	Lecture/ ppt/video	(1, 2, 3, 4) Formative assessment II (5, 6, 7)
	3	Pathways of intracellular signal transduction: Cyclic AMP pathways	2	Trace the signaling pathways of cAMP	Lecture/ppt /video	
	4	Pathways of intracellular signal transduction: Receptor Tyrosine Kinases (RTKs)	3	Elucidate the signal transduction of RTKs	Lecture/ video clipping	
	5	Pathways of intracellular signal transduction: Ras, Raf and MAP kinase pathway	2	Relate the Ras, Raf and MAP kinase pathway	Lecture/ video clipping	
	6	Pathways of intracellular signal transduction: second messengers	2	Identify first and second messengers and explain their differences	Lecture/ppt /	
	7	Signaling from plasma membrane to the nucleus.	1	Elucidate signaling from plasma membrane to the nucleus	Lecture/ video clipping	
III	Cell organelles and Nucleic acids (15 hrs)					
	1	Structure and functions of Nucleus, mitochondria and Endoplasmic reticulum	6	Illustrate the structure of nucleus, mitochondria and ER	Seminar Lecture	Mind map, Short test, Formative assessment I – 1
	2	Structure, functions of Golgi complex and lysosomes	3	Identify the structure of the Golgi complex and lysosomes	Lecture	Formative assessment II - 2,3,4
	3	Cytoskeleton – structure and functions.	3	Identify the components of cytoskeleton and how they affect cell shape, function, and movement	Seminar/ ppt	

	4	Ribosomes and translation of genetic information	2	Discriminate the flow of information from DNA to a protein.	Lecture/ppt /video clipping	
	5	Types, structure and functions of RNA.	1	Recall the role of RNAs	Seminar	
IV	Protein synthesis and transport (15 hrs)					
	1	DNA template	2	Describe the structure of Gene	Seminar	Formative assessment I (1,2,3,5) Memory matrix (parts of nervous system), Short test Formative assessment II (4)
	2	Transcription – Translation – Post translation detection. Protein – Protein trafficking - sorting	5	Differentiate Transcription and Translation	Lecture/ppt / video Seminar	
	3	Secretory and endocytic pathway – transport from endoplasmic reticulum to Golgi.	4	Describe vesicle trafficking in cells	Lecture/vid eo	
	4	Anterograde and retrograde transport – transport to lysosome – exocytosis – endocytosis.	2	Identify trafficking from inside to outside membrane	Lectue/ppt/ video	
5	Membrane protein and secretory proteins.	2	Differentiate membrane and secretory proteins	Lecture		
V	Normal and abnormal cell growth and functions (15 hrs)					
	1	Cell cycle – Mitosis – Meiosis	3	Describe the cell division and the cell cycle.	Lecture and chart	Listing out important terms, Slip test, Formative assessment I- (1,2) Formative assessment II (3,4,5)
	2	Cyclin and Cyclin dependent kinases	3	Discuss the role of Cyclin and cyclin kinases in cell cycle	Lecture and Video	
	3	Regulation of cyclin dependent kinases (cdk) – Cyclin activity.	4	Describe the cell cycle progression and regulation	Lecture and Video	
	4	Biology of ageing – role of anti-oxidants and free radicals. Apoptosis – definition – mechanism and significance.	2	Discuss the factors of ageing	PPT/ Mind storming/Ji gsaw	
5	Neoplastic transformation: cancer	3	Discuss uncontrolled cell	Lecture/ chart/video		

		– proto-oncogenes – tumour suppressor genes.		division and programmed cell death		
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Course instructor

Dr. A. Shyla Suganthi

Head of the Department

Dr. S. Mary Mettilda Bai

Semester

: I

Core III

Name of the Course : Culture and Capture Fisheries

Course code : PZ1713

No. of hours/ week	No. of credits	Total number of hours	Marks
6	4	90	100

Learning Objectives

1. To gain knowledge on the construction and maintenance of ponds for culture of different types of cultivable aquatic organisms and also to gain information on fishery management, fish processing, preservation techniques and parasites of fishes.
2. To raise aqua farming and extend it to the society.

Course Outcome

CO	Upon completion of this course the students will be able to	PSO addressed	CL
CO - 1	Acquire knowledge on different types of aquatic organisms and construction of ponds.	PSO - 1	U
CO - 2	Formulate the nutritional requirement of fishes and develop the breeding techniques.	PSO - 2	C
CO - 3	Explain the culture of finfish and shellfish and identify the diseases and control measures.	PSO - 2	U; Ap
CO - 4	Gain knowledge on fishery genetics and transgenic fishes.	PSO - 1	U
CO - 5	Identify fish resource, capture techniques and fish marketing.	PSO - 3	U
CO - 6	Develop entrepreneurship skill by employing fish processing techniques.	PSO - 5	Ap

Teaching Plan

Total Hours: 90 (Including Seminar & Test)

Unit	Module	Topics	Hours	Learning outcome	Pedagogy	Assessment
I	Introduction to Aquaculture (15 hrs)					
	1	Purpose and importance of aquaculture Basic qualification of candidate species Cultivable freshwater and marine fishes	3	Evaluate the scope of aquaculture, Identify the cultivable species	Lecture, PPT	MCQ Short test Formative Assessment I (1,2,4)
	2	Global and Indian scenario of aquaculture Construction and maintenance of fish farm: selection of site	4	Design culture farms	Lecture, seminar	

		lay-out and Types of ponds				Formative Assessment II (3)
3	Aquatic plants and their control, control of fish predators Liming, fertilization of ponds	4	Identify aquatic weeds and fish predators	Lecture, Video class		
4	Kinds of aquaculture, Integrated fish farming, Sewage fed fish culture Pen and cage culture	4	Compare different Kinds of aquaculture	Lecture, PPT		
II	Nutrition and Breeding (15 hrs)					
1	Nutritional requirements Culture of fish feed organisms: phytoplankton (diatom), zooplankton (rotifers, cladocerans), Artemia, Tubifex	4	Prepare fish feed and culture live feeds	Lecture, seminar	Short test Objective test Formative Assessment I (1,2) Formative Assessment II (3,4)	
2	Artificial feed and feed formulation	3	Explain artificial feed and feed formulation	Lecture/ PPT		
3	Seed collection: Sex identification – collection, rearing and selection of brooders	4	Rearing and maintaining the brooders	Lecture		
4	Induced breeding by hypophysation Ovaprim - Transportation of fish seed.	4	Apply induced breeding in cultivable fishes	Lecture, video		
III	Finfish and Shellfish culture, Fish pathology (15hrs.)					
1	Culture of Indian major carps, Tilapia and murrel	4	culture major carp	Lecture	Short test MCQ Objective test Formative Assessment I (1,2) Formative Assessment II (3,4)	
2	Ornamental fish culture and its prospectus Shell fish culture: Culture of freshwater and marine prawns.	4	Design aquarium and culture of ornamental fish, freshwater and marine prawns.			
3	Culture of lobsters, crabs, edible oysters and pearl oysters	4	Recall the culture techniques of lobsters, crabs, edible oysters and pearl oysters	Lecture, PPT		
4	Fish pathology: Ectoparasites, Endoparasites Bacterial, Viral and fungal diseases nutritional deficiency diseases	3	Identify diseased fishes	Lecture, seminar		

IV	Fishery Genetics (15 hrs.)					Open book test MCQ Formative Assessment I (1,2,3,4) Formative Assessment III (5)
	1	Chromosomes in fishes Chromosome set manipulation	4	Describe fish chromosomes and their manipulation	Lecture, PPT	
	2	Gynogenesis and androgenesis Induced polyploidy	4	Explain the mechanism of Gynogenesis ,androgenesis and Induced polyploidy	Lecture	
	3	Chromosomal abnormalities Sex determination in fishes	2	Identify the sex and chromosomal abnormalities in fishes	Lecture	
	4	Sex –patterns Intrinsic and Extrinsic factors in sex control and sex reversal.	3	Recall Sex – patterns and factors affecting sex control and sex reversal	Lecture, PPT	
	5	Transgenic fishes	2	Recognize the mechanism of Transgenic fish production	Lecture	
V	Capture Fisheries and fish by-products (15 hrs.)					Short test, Quiz (1,2,3) Formative Assessment III (4,)
	1	Inland fisheries (riverine, lakesterine and cold water fisheries) Estuarine fisheries	5	Compare different Inland fisheries	Lecture, video	
	2	Marine fisheries Crafts and Fishing gears	4	Discuss Marine fisheries , fishing gears and crafts	Lecture, video	
	3	Common fishes of Kanyakumari Fish spoilage and methods of fish preservation	3	Identify the fishes of Kanyakumari, Apply fish preservation methods	Lecture, PPT	

4	Fish Marketing and co-operative societies in aquaculture. Economic importance of fishes: Food value and fish by-products	3	Production and marketing of fish by-products	Lecture	
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Course instructor

Mrs. P.T. Arokya Glory

Head of the Department

Dr. S. Mary Mettilda Bai

Semester

: I

Elective I (a)

Name of the Course : Biosystematics and Biodiversity

Course code : PZ1714

No. of hours/ week	No. of credits	Total number of hours	Marks
6	5	90	100

Learning Objectives

1. To enable the students to know about the diversified forms in nature and also to identify the relationships among different species.
2. Get employability in Zoological Survey of India, Museum and Biodiversity conservation organizations.

Course Outcome

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Evaluate the importance, application, and practice of systematic biology.	PSO - 1	U; Ap
CO - 2	Outline the classification of animal kingdom.	PSO - 1	R
CO - 3	Collect, identify, preserve zoological specimens and assign systematic position based on International Code of Zoological Nomenclature.	PSO - 2; PSO - 3	Ap
CO - 4	Discuss the importance of biodiversity and its conservation.	PSO - 1	An; Ap
CO - 5	Assess the biodiversity and use library resources in biological research.	PSO - 2; PSO - 5	E; Ap

Teaching Plan

Total Hours: 90 (Including Seminar & Test)

Unit	Module	Description	Hours	Learning outcome	Pedagogy	Assessment
I	1	Basic concepts of Biosystematics' Importance and applications of biosystematics	4	Explain the basic concepts of Biosystematics and applications	Lecture, PPT	Evaluation through MCQ Short test Mind Map Formative Assessment I
	2	Stages of taxonomy – alpha, beta and gamma	3	Compare the various stages of taxonomy	Lecture	

		taxonomy.				(1,2)
	3	Newer trends in taxonomy Morphological, embryological, ecological, behavioral	4	Evaluate the importance of systematic biology.	Seminar, Lecture, PPT	Formative Assessment II (3,4)
	4	Cytological, biochemical approaches, Numerical taxonomy and Molecular taxonomy	4	Appraise the importance of cytological and biochemical approaches in taxonomy	Lecture /Vocabulary drill	
II	1	Zoological classification: Introduction, Theories of classification, Components of classification, Linnaean hierarchy	4	Outline the theories of classification and Linnaean hierarchy	Lecture, Probing, PPT	Short test Mind map Objective test Formative Assessment I (1,2) Formative Assessment II (3)
	2	Outline classification of animal kingdom, Systematic position of Invertebrates (one example for each phylum) , Systematic position of Chordates (one example for each class)	6	Identify the systematic position of Invertebrates and Chordates	Lecture, Seminar	
	3	Concept of species: kinds of species concept, Polytypic species, sub species and other infra specific groups, Super species	5	Explain the concept of species	Lecture, PPT, Probing	

III	1	Taxonomic collection: Introduction Collecting ways, Preservation of collected materials Identification of collected specimens	5	Discuss on taxonomic collection, preservation and identification of specimens	Lecture, Seminar	Short test MCQ Objective test Formative Assessment I (1,2) Formative Assessment II (3,4)
	2	Curating Preparation of specimens methods of identification of specimens	5	State the protocol for curating and identification of specimens	Lecture, Demonstration	
	3	Zoological Nomenclature: International code of Zoological Nomenclature (ICZN), Rules of nomenclature	3	State the International code of Zoological Nomenclature (ICZN), and discuss the rules of nomenclature	Seminar, Lecture, PPT	
	4	Typification, type and its kinds	2	Describe typification and identify the types	Lecture, PPT, OHP	
IV	1	Biodiversity and its conservation: Introduction Importance of biodiversity Human impact on biological diversity: habitat fragmentation	3	Explain biodiversity conservation and the human impact	Lecture, PPT	Open book test MCQ Formative Assessment I (1,2,3,) Formative Assessment II, (4,5)
	2	Wild life and human conflict Loss of animal diversity	2	Discuss the impact of wild life and human conflict	Lecture	
	3	Endangered wildlife species, Special projects ,IUCN red list Hot spots.	4	List the endangered species and Hot spots.	Lecture, PPT	

	4	Conservation of biodiversity: <i>In situ</i> and <i>Ex situ</i> conservation Management of germplasm. Conservation practices in India: Wildlife sanctuaries, national parks and biosphere reserves.	3	Differentiate biodiversity Conservation methods	Seminar, Lecture, PPT	
	5	Indian Board of Wildlife (IBWL), Wildlife protection laws, Trade laws (CITES)	3	Explain the regulations of Indian Board of Wildlife (IBWL) and trade laws (CITES)	Seminar, Lecture, PPT	
V	1	Biodiversity – Levels of diversity – species, genetic, ecosystem	2	Discuss the levels of biodiversity	Demonstration, Lecture	Short test, Quiz, Formative Assessment II (1,2), Formative Assessment III (3.4)
	2	Evaluation of Biodiversity indices: Introduction Shannon-Weiner index, Brillouin diversity index	4	Enumerate Biodiversity indices Compare and Utilise Shannon-Weiner index, Brillouin diversity index	Lecture, Demonstration, PPT	
	3	Dominance index (Simpson and Margalef index), Evenness index, richness index	4	Utilise Dominance index Evenness index, richness index for real time analysis	Lecture, PPT	
	4	Similarity and dissimilarity index, Association index, Diversity and ecosystem process theory	5	Conduct biodiversity survey using indices	Lecture, Video	

Course instructor
Dr. Jeni Chandar Padua

Head of the Department
Dr. S. Mary Mettilda Bai

Semester : III
 Name of the Course : Physiology
 Course code : PZ1731

Core VII

No. of hours, week	No. of credits	Total number of hours	Marks
6	4	90	100

Learning Objectives

- To impart knowledge on the structure and functions of various organs organ systems and also to know about the associated disorders.
- To get job in diagnostic centers research and academic institutions.

Course Outcome

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Describe the anatomy of different physiological systems at the tissue and cellular levels.	PSO -1	U
CO- 2	Evaluate the physiological functioning of different organs.	PSO -2	E
CO- 3	Analyze the physiological changes in relation to environmental conditions.	PSO - 2	Ap; An
CO -4	Identify different tissues related to anatomy and physiology from an evidence-based perspective.	PSO -1	U
CO- 5	Carry out physiological studies in the laboratory Interpret data and graphs and write a report.	PSO -3; PSO -5	Ap; An

Teaching Plan

Total Hours: 90 (Including Seminar & Test)

UNIT	Module	Description	Hours	Learning outcome	Pedagogy	Assessment
I	Nutrition (15 hrs.)					
	1	Types of nutrition and feeding mechanisms in animals	1	Compare the different types of feeding and nutrition in animals	Seminar	Short test MCQ Formative assessment I
	2	Digestion - Functional anatomy of the digestive system (human) Movements of gastrointestinal tract Secretory functions of the alimentary tract and glands Digestion and absorption	5	Describe the anatomy and physiology of digestive system	Lecture, Video	
3	Metabolism of protein Metabolism of	6	Explain the metabolism of	Lecture, ppt		

		carbohydrate Metabolism of lipid		protein fat and carbohydrate			
	9	Balanced diet – Malnutrition - Energy balance – BMR.	1	Interpret the value of a healthy diet	Seminar		
	10	Gastrointestinal disorders: Gall stones liver cirrhosis gastritis peptic ulcer and appendicitis.	2	Correlate different gastrointestinal disorders with the physiology of digestive system	Lecture,pp t		
II	Respiration and Homeostasis						
	1	Respiratory organs and respiratory pigment in animals.	1	Compare respiratory organs and pigment in different animals	Seminar	Slip test Formative assessment II	
	2	Physiological anatomy of the respiratory system (human) Transport of respiratory gases Regulation of respiration	4	Comprehend the structure and function of respiratory system	Seminar Lecture		
	3	Respiratory problems - bronchial asthma pneumonia and pulmonary tuberculosis.	2	Identify the symptoms of respiratory problems	Lecture,pp t		
	4	Homeostasis Osmoregulation - types and mechanism Thermoregulation : Classification thermoregulatory mechanism in animals Aestivation and hibernation	4	Outline the basics of homeostasis and adaptations	Seminar Lecture		
	5	Deep sea physiology High altitude and space physiology Effects of exposure to cold and heat.	2	Explain the physiological changes at different altitude	Lecture, video		
	6	Bioluminescence – physiology and functions	2	Appreciate the biochemical changes during bioluminescence	Lecture		
III	Circulation						
	1	Components and functions of blood Blood clotting	3	Compare blood cells and its functions	Seminar, Lecture	Mind map Short test Formative assessment -	
	2	Haemopoiesis	1	Explain the	Lecture		

		Myogenic and neurogenic heart.		formation and differentiation of blood cells. Differentiate heart		III
	3	Functional anatomy of human heart.	2	Explain the structure of heart	Seminar, ppt	
	4	Cardiac cycle pace maker heart rate Bradycardia and tachycardia	2	Discuss the cardiac cycle and cardiac problems	Lecture	
	6	Electrocardiogram (ECG)	2	Analyze the rhythmic pattern of heart beat	Seminar	
	7	Heart diseases (Atherosclerosis coronary thrombosis and angina pectoris).	2	Identify the causes of heart diseases	Lecture, video	
	8	Lymphatic system - organization composition of lymph and functions	3	Describe the lymphatic system	Lecture	
IV	Neuro-muscular system					
	1	Structure of brain and neuron	2	Explain the structure of central nervous system	Seminar	Formative assessment I- (1, 2, 3, 5) Memory matrix (parts of nervous system) Short test Formative assessment II (4)
	2	Neurotransmitters Synapse Nerve impulse conduction Reflex activity Inborn and conditioned reflex actions	4	Differentiate transmission of nerve impulse	Lecture,ppt, video Seminar	
	3	Electroencephalogram. Neural disorders - Meningitis and epilepsy	2	Comprehend and analyse the role of EEG in identifying neural disorders	Lecture, video	
	4	Types of muscle structure and properties of skeletal muscle Mechanism of muscle contraction Neuromuscular junction	5	Identify the types of muscle and the mechanism of contraction	Lecture , ppt	
	5	Sense organs - Structure and functions of skin eye ear	2	Differentiate the receptor organs its structure and function	Lecture, model	
V	Excretion and Reproduction					

	1	Excretory organs in different groups of animals	2	Illustrate the excretory organs and types of excretion in animals	Seminar	Listing out important terms Slip test Formative assessment I- (1, 2) Formative assessment II (3, 4, 5)
	2	Patterns of excretion				
	3	Structure and function of kidney (human) Nephron Formation of urine Micturition Renal disorders – nephritis renal calculi Dialysis	6	Explain the structure and function of human kidney and associated disorders	Seminar Lecture Demonstration of urine samples to identify renal calculi, Video on dialysis	
	4	Structure of testis and ovary (human)	2	Differentiate male and female gonad	Lecture, chart	
	5	Oestrus and menstrual cycle Pregnancy parturition and lactation Hormonal regulation of reproduction.	5	Explain the physiology of reproduction and apply the knowledge in day today life	Lecture, ppt	

Course instructor

Dr. J. Vinoliya Josephine Mary

Head of the Department

Dr. S. Mary Metilda Bai

Semester

: III

Core VIII

Name of the Course : Immunology

Course code

: PZ1732

No. of hours/ week	No. of credits	Total number of hours	Marks
6	4	90	100

Learning Objectives

1. To facilitate the students to understand and appreciate the defense functions of the immune system.
2. To develop the skill to determine the immunomodulatory strategies used to enhance or suppress the immune response.

Course Outcome

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Explain the importance of innate immune response in providing adaptive immunity.	PSO- 1	U

CO - 2	Know the evolution of immune molecules in different groups of animals.	PSO- 1	U
CO - 3	Differentiate the types of hypersensitive allergic reactions by seeing the symptoms and duration and suggest the remedies.	PSO -2	R; An
CO - 4	Discuss the role of immune molecules in different diseases and organ transplantation.	PSO- 2	Ap
CO - 5	Demonstrate detailed knowledge and understanding of immunology and the way it is applied in diagnostic and therapeutic techniques and research.	PSO -3; PSO- 5	U; Ap

Teaching Plan

Total Hours: 90 (Incl. Seminar & Test)

Unit	Module	Description	Hours	Learning outcome	Pedagogy	Assessment
I	Immune system in invertebrates and vertebrates					
	1	Immunity- Innate and acquired Immunity- Types – natural and artificial, active and passive immunity, II, III and IV line of defense.	3	Differentiate innate and acquired Immunity.	Lecture, Seminar.	MCQ Short test Memory matrix Formative Assessment I (1,2,3,4,5) Formative Assessment I (6)
	2	Lymphoid organs, Cells involved in immune response.	2	Describe lymphoid organs and cells involved in immune response.	Lecture, PPT, Demonstration	
	3	Antigens, Immunoglobulins – characteristics Haptens and types.	3	Discuss the structure and functions of antigens and immunoglobulins.	Seminar, Lecture, Video.	
	4	Immune Response: Humoral immune response, Cell mediated immune response, primary immune response and secondary immune response.	4	Categorize immune response.	Lecture, Video.	
	5	Importance of B cells in humoral immune response (antibody formation), Factors influencing antibody formation and Immunological memory (Anamnesis).	2	Illustrate the role of B cells in humoral immune response and immunological memory.	Lecture	
	6	Immunization: immunization schedule and vaccines.	1	Apply immunization schedule and vaccines.	Lecture	
II	Major and minor histocompatibility complex					
	1	MHC class I molecules, MHC class II molecules, Cellular distribution and regulation of MHC expression.	5	Differentiate the MHC class I and MHC class II molecules.	Lecture	MCQ Short test Mind Map Formative

	2	MHC in immune responsiveness, MHC and susceptibility to infectious diseases, Minor histocompatibility (H) antigens,	4	Explain the role of MHC in immune responsiveness and susceptibility to infectious diseases.	Lecture	Assessment I (1,2,3,) Formative Assessment II (4)
	3	Immune effector mechanisms: Cytokines and their functions	2	Appreciate cytokines and their functions.	Lecture, PPT	
	4	Complement system – classical pathways, alternate pathways and biological functions	4	Differentiate the classical and alternate pathways of complement system.	Lecture, PPT	
III	B and T cell					
	1	B cells – Maturation, B cells – activation, B cells –differentiation, B cell receptor (BCR) and B cell co-receptor complex. Signal transduction from B cell antigen receptor and Major pathways of BCR signaling.	6	Describe B cells and B cell co-receptor complex.	Lecture, PPT	MCQ Short test Mind Map Formative Assessment II (1,2,3,)
	2	T cells – maturation, T cells - activation and differentiation, T cell receptor (TCR). T cell co-receptor complex, Formation of T and B cell conjugates. Co-stimulation in T cell response and signal transduction, Clonal anergy.	7	Illustrate T cells and signal transduction.	Lecture, Video	
	3	Antigen processing and presentation – role of antigen presenting cells, cytosolic pathway and endocytic pathway	2	Recognize antigen processing and presentation.	Lecture, Video.	
IV	Immune system in health and diseases					
	1	Tumour immunology- properties of tumour cells and causes of tumours, tumour antigens, immune response to tumour and immune surveillance. Tumour immunology- immunodiagnosis of tumour antigens and immuno therapy of tumour.	4	Acquire knowledge on the- properties of tumours and immuno therapy.	Lecture, PPT	Short test Mind map Objective test Formative Assessment II (1,2,3,4,5) Formative Assessment III (6)
	2	Hypersensitivity: factors causing hypersensitivity, Type I, II, III, and IV reactions	2	Discuss the factors and types of hypersensitivity.	Seminar, Lecture	
	3	Immunodeficiency – primary and secondary	2	Describe the immunodeficiency diseases.	Lecture, PPT	
	4	Autoimmune diseases- characteristics,	2	Acquire knowledge on	Lecture,	

		causes, classification		autoimmune diseases.	PPT	
	5	Autoimmune diseases - localized (Diabetes mellitus and Addison's disease) Autoimmune diseases – systemic (lupus erythematous and rheumatoid arthritis)	3	Recognize different types of autoimmune diseases.	Seminar, Lecture	
	6	Immune response to infectious diseases and treatment - Protozoan disease (Malaria), Bacterial disease (Tuberculosis) and Viral disease (AIDS).	2	Discuss the immune response to infectious diseases and treatment.	Lecture, PPT	

V	Antigen-antibody interaction					
	1	Antigen-antibody interaction: strength, affinity, avidity and cross reactivity.	1	Describe the antigen-antibody interaction.	Seminar, Demonstration	Short test Mind map Objective test Formative Assessment III
	2	Complement fixation test- precipitation reaction in fluids and precipitin curve.	1	Discuss the complement fixation test.	Lecture, PPT	
	3	Radial immunodiffusion and Double immunodiffusion.	2	Demonstrate immunodiffusion.	Demonstration, Lecture	
	4	Immunoelectrophoresis – counter electrophoresis and rocket electrophoresis. Agglutination reaction– hemagglutination and bacterial agglutination. Agglutination reaction- coated particle agglutination and agglutination inhibition	3	Demonstrate immunoelectrophoresis, hemagglutination and bacterial agglutination	Seminar, Lecture and Video, Demonstration	
	7	Radio immuno assay, ELISA and Western blotting Immunofluorescence	4	Demonstrate radio immuno assay, ELISA and western blotting. immunofluorescence	Seminar, Lecture	
	9	Flow cytometry	1	Explain flow cytometry.	Seminar, Lecture	
	10	Transplantation: classification of grafts, mechanism of graft rejection, graft versus host reaction, immunosuppressive therapy during transplantation.	3	Describes transplantation.	Lecture	

Course instructor
Dr. A. Punitha

Head of the Department
Dr. S. Mary Mettilda Bai

Semester : III Elective III (a)
 Name of the Course : General Endocrinology
 Course code : PZ1733

No. of hours/week	No. of credits	Total number of hours	Marks
6	5	90	100

Learning Objectives

- To learn how the endocrine system functions under normal circumstances, as well as the pathologies that arise when homeostasis fails.
- To get job in clinical laboratory and endocrine research institutes.

Course Outcome

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	Discuss the principles of endocrine system, hormonal communication and neuroendocrine mechanism in animals.	PSO -1	U
CO - 2	Explain the secretion and transportation of hormones to maintain homeostasis.	PSO -1	U
CO - 3	Apply the knowledge of endocrinology to understand hormone-related disorders.	PSO -1	Ap
CO - 4	Explain women related physiological processes such as menstruation, gestation and lactation	PSO -3	Ap
CO - 5	Correlate endocrine regulation of reproduction and metamorphosis in various invertebrates and vertebrates.	PSO -3	Ap; An

Teaching Plan

Total Hours: 90 (Incl. Seminar & Test)

Unit	Module	Topics	Hours	Learning outcome	Pedagogy	Assessment
I	Historical Perspective (15 hrs)					
	1	Historical perspective and scope of endocrinology.	2	Explain the history and Scope of Endocrinology	Seminar, and group discussion	MCQ Short test Open book test
	2	Endocrine methodologies - assay of hormones, surgical methods, radioisotope studies, pharmacological methods, and replacement therapy	5	Differentiate the various methods of hormonal assays	Lecture , Seminar, and group discussion	Formative Assessment I (1,2,3,4,5)
	3	Animal models for research	2	Identify different animals used in research	Seminar	

	4	Chemical messengers –neurocrine, paracrine, autocrine, endocrine	4	Illustrate the action of hormones as messengers	Seminar, Lecture / Video class	
	5	Pheromones and chalone.	2	Relate the hormone and behaviour	Seminar, Lecture	
II	Neurosecretion and Neuroendocrine mechanisms (15 hrs)					
	1	Neuroendocrine integration.	3	Relate the integration between the nervous system and the endocrine system	Lecture, Group discussion	Quiz, Slip test Mind map Formative Assessment II (1,2,3) Formative Assessment III (4,5)
	2	Evolution of regulatory mechanisms	2	Explore the evolution of regulatory mechanism	Lecture, PPT	
	3	Endocrine control of neural function.	1	Appreciate the control of nervous system by endocrine organs	Video	
	4	Neuroendocrine mechanisms and functions in insects non-arthropods invertebrates	5	Identify the role of Neuroendocrine mechanisms in insects and non-arthropod invertebrates	Seminar, lecture	
	5	Analogous neurosecretory systems of invertebrates and vertebrates.	4	Recognize the analogy of endocrine glands and their function in vertebrates and invertebrates	Seminar, Lecture PPT	
III	Endocrine glands and hormones (15 hrs)					
	1	Organization of the endocrine system - classification of hormones	1	Describe the different types of hormones.		Formative Assessment I (1) Formative Assessment II (2,3) Formative Assessment III (4,5)
	2	Structure, functions and pathophysiology of hypothalamus, pituitary	4	Explain the structure and functions of hypothalamus and pituitary. Identify pathological conditions		
	3	Structure, functions and pathophysiology of thyroid and parathyroid	3	Explain the structure and functions of thyroid and parathyroid. Identify pathological conditions.		
	4	Structure, functions and pathophysiology of adrenal and pancreas	4	Explain the adrenal gland and pancreas.	Seminar, Lecture	

				Interpret pathological conditions.		
	5	Structure, functions and pathophysiology of gonads .Gastro-intestinal hormones.	3	Describe gonads and Gastro-intestinal hormones	Seminar, Lecture	
IV	Hormone synthesis and mechanism of hormone action (15 hrs)					
	1	Biosynthesis, storage and release of amine (catecholamines and thyroxine) protein (growth hormone and insulin) and steroid hormones (sex hormones).	5	Explain the synthesis of amine , protein and steroid hormones	Lecture, Mind map	Formative Assessment I (1,2) Formative Assessment I
	2	Mechanism of hormone action - receptors (membrane and cytosolic) - second messengers, signal transduction, termination of hormone activity.	4	Discuss hormone and cell communication	Lecture, PPT	Formative Assessment III
	3	Pathophysiological correlates of hormone action	3	Analyse the importance of receptor number for proper functioning of hormone	Lecture , Group discussion	
	4	Endocrine disorders due to receptor number and function. Hormonal therapy.	3	Outline the importance of receptor number. Evaluate the therapeutic role of hormones	Lecture , Group discussion	
V	Endocrine Integration (15 hrs)					
	1	Diffused effect of hormones	2	Interpret the varied role of one hormone on different organs		MCQ Short test Mind map Formative assessment II (1,2) Formative assessment III (3,4,5)
	2	Hormonal regulation of growth, development and metabolism	3	Appreciate the physiological regulation of hormones	Seminar, lecture	
	3	Reproductive cycle and pregnancy, Parturition and lactation	4	Describe the role of hormones in reproduction	Seminar, lecture	
	4	Migration (birds and fishes),	2	Analyse the reason and changes in animals during migration	Seminar, lecture	
5	Behavior and hibernation, Neoplastic growth, Colour change in vertebrates	4	Describe the physiological and behavioural role of hormones in animals	Seminar, lecture		

Course instructor
Dr. F. Brisca Renuga

Head of the Department
Dr. S. Mary Metilda Bai