Semester I
Core I - Biochemistry
Course Code: PZ2011

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

Learning Objectives

1. To impart knowledge on chemical structure, functions and metabolic process of biomolecules in living system.
2. To develop analytical and communicative skills to conduct experiments and interpret the results.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	define structure and types of chemical bonds in biomolecules such as hydrogen ions, water, protein, carbohydrate, lipid, nucleotides, enzymes and vitamins.	PSO - 1	R
CO - 2	explain the fate of biomolecules in different metabolic pathways.	PSO - 1	U
CO - 3	apply cognitive, technical and creative skills to pursue higher studies and employability in industrial, biomedical and research laboratories.	PSO - 4	Ap
CO - 4	analyse biomolecules in biological systems and relate deficiency disorders.	PSO - 3	An
CO- 5	design biochemical experiments and publish the results through effective written and oral communication after drawing accurate conclusions.	PSO - 2	E

Teaching plan with Modules

Total Hours: 90 (Incl. Assignments & Test)

nit	Modules	Topics	Hours	Learning Outcome / CO addressed	Pedagogy	Assessment
	Basic concepts of biochemistry (18 Hrs.)					
	1	Scope. Atoms – Molecules – Chemical bonds – Primary bonds and secondary bonds.	4	Outlines the scope of Biochemistry. Recalls atoms, molecules and chemical bonds.	Seminar, PPT, Video, Classroomscreen	Formative Assessment I

				(CO-1)		& Quiz I
	2	pH and Hydrogen ion concentration - Buffers - 'Henderson-HasselBalch' equation -	5	Demonstrates the importance of pH in biological system. Describes the derivation of pH as a measure of acidity in biological and chemical systems. **(CO-1,4)**	Seminar, PPT, Group Discussion	Seminar Online assignment
	3	Buffer systems in blood - Mechanism of buffer action - Acid base balance – Regulation of acid base balance – Acidosis and Alkalosis.	5	Illustrates the mechanism of buffer action Interpret the acid – base balance to diseases. **(CO-1,2,4)**	PPT, Video, Flow chart	Class test: Online Quiz (MCQ) using Google Forms
	4	Water – Colligative properties - Water turnover and balance. Electrolyte balance – Dehydration and Water intoxication.	4	Explains the properties of water. Describes electrolyte balance. **(CO-1,2,4)**	PPT, Video, Mind Map	
	Carbohydrate (18 Hrs.)					
	1	Classification, structure, properties of mono, oligo and polysaccharides and biological role of carbohydrates.	2	Explains structure of carbohydrate. **(CO-1,2,4)**	Lecture using screen capture technique Seminar	Formative Assessment I& QuizI
	2	Carbohydrate metabolism - glycogenesis, glycogenolysis, glycolysis.	4	Distinguish and describes catabolic and anabolic process. **(CO-1,2,3,4)**	Interactive PPT, Seminar Slido	Seminar
	3	Krebs cycle, Electron transport and Oxidative phosphorylation, Energetics of glucose metabolism.	3	Summaries the ATP producing process in the biological system. **(CO-1,2,3,4)**	Interactive PPT, Video, Chart	Home assignment Class test: Quizizz
	4	Pasteur effect–HMP shunt - gluconeogenesis – glyoxylate pathway– Cori cycle.	4	Differentiate different pathways of metabolism. **(CO-1,2,3,4)**	Lecture with PPT, Mind map	Kahoot
	5	Regulation and hormonal control of carbohydrate metabolism.	2	Correlate hormones to carbohydrate metabolism and diseases. **(CO-1,2,3,4)**	Lecture using jamboard tool, Discussion	
	6	Glycogen storage diseases – blood sugar level – Glycosuria - Glucose tolerance test – Diabetes.	3	apply knowledge to glycogen storage diseases. **(CO-3,4)**	Lecture with video links	

I	**Proteins** (18 Hrs.)					
	1	Classification, structure, Ramachandran plot, Properties and biological role.	3	Classify proteins. Describes the structure and discuss the role of proteins. **(CO-1,4)**	Seminar, PPT, Video	Formative Assessment II & Quiz II Group Discussion Seminar Slip test (MCQ) using Google Forms
	2	Amino acids - classification, structure and properties.	3	Describes the structure and properties of amino acids. **(CO-1,2)**	Seminar, PPT, Group Discussion	
	3	Metabolism of proteins - deamination, transamination – transmethylation and decarboxylation of amino acids.	4	Differentiate different methods ofmetabolism of amino acids.**(CO-2,3,4)**	PPT, Video, E-Content	
	4	Glycogenic and ketogenic amino acids. Formation and transport of ammonia - glucose-alanine cycle - Ornithine cycle.	4	Recalls and compare the metabolism of protein and carbohydrate. **(CO-2,3,4,5)**	PPT, Video, Google jamboard	
	5	Metabolism of Phenylalanine, Tyrosine. Tryptophan. Porphyrins	4	Explains amino acids metabolism **(CO-3)**	Seminar, PPT, Video	
	Lipids (18 Hrs.)					
	1	Classification, structure and Biological role – Chylomicrons.	3	Describe structure and Define Chylomicrons. **(CO-1,2,4)**	Lecture with PPT, Seminar	Formative Assessment II& QuizII Online assignment through Google classroom Seminar Class test: Mind map
	2	VLDL, LDL, HDL - Lipid metabolism. Theories of oxidation of fatty acids.	3	Define VLDL, LDL, HDL Describes oxidation theories. **(CO-1,2,3,4)**	Lecture, PPT, Classroomscreen	
	3	Oxidation of any one fatty acid and its bioenergetics (palmitic acid).	3	Explains beta oxidation. **(CO-1,2,3,4)**	Interactive PPT, Flow chart	
	4	Ketogenesis - Biosynthesis of palmitic acid.	3	Identify different steps in the process of biosynthesis. **(CO-1,2,3,4)**	Video link, PPT	
	5	Metabolism of cholesterol - lipid storage diseases – Role of liver in fat metabolism. Prostaglandins.	3	Describes and interpret role of liver. Explains role of Prostaglandins. **(CO-1,2,3,4)**	Lecture with PPT, Group discussion	
	6	Integration of carbohydrate, protein and lipid metabolism.	3	Summarise the integration of metabolism. **(CO-1,2,4)**	Self-paced class –E-content, Mind map	
	Nucleotide metabolism, Enzymes, Vitamins (18 Hrs.)					
	1	Biosynthesis and degradation of purines and pyrimidines**.**	4	Describes the biosynthetic process of Purines & Pyrimidines. Recall DNA structure.	Video links and PPT, Classroomscreen	Formative Assessment I& QuizI (2,3,4)

			(CO-1,2,4)		
2	Enzymes: Classification, nomenclature, enzyme kinetics.	3	Recall and Identify the enzymes. **(CO-1,2,4)**	Lecture using PPT, Seminar	Formative Assessment II & QuizII (1,5) Class test: Quiz through slido.com Online assignments: Mind map Seminar
3	Michaelis - Menten constant, enzyme inhibition, mechanism of enzyme action, factors affecting enzyme activity, isozymes, coenzymes.	4	Describes the role of enzymes and recall physiology of digestion. **(CO-1,2,3,4,5)**	Lecture using PPT, Seminar	
4	Classification of Vitamin (fat soluble and water soluble), occurrence and biochemical role.	3	Recall the nutrients and identify the sources and symptoms. **(CO-1,2,3,4,5)**	Thematic Discussion, Chart	
5	Mechanism of detoxification (oxidation, reduction, conjugation) - cytochrome P 450 system.	4	Explain and appreciate the detoxification process in the biological system. **(CO-1,2,3,4,5)**	Video lesson, Google jamboard, PPT	

Course Instructors **Head of the Department**
Dr.S. Mary Mettilda Bai

J. Vinoliya Josephine Mary
Dr.S. Mary Mettilda Bai

nar & Assignment topics

UNIT I

1. Scope of Biochemistry.
2. Atoms - molecules - chemical bonds - primary bonds and secondary bonds.
3. Hydrogen ion concentration and buffers.
4. Colligative properties of water.

UNIT II

5. Carbohydrates:Classification and structure.
6. Properties of mono, oligo and polysaccharides.
7. Biological role of carbohydrates.
8. Glycogenesis and glycogenolysis.
9. Glycolysis
10. Krebs cycle
11. Electron transport and Oxidative phosphorylation

UNIT III

12. Proteins:Classification and structure
13. Properties and biological role of proteins
14. Amino acids – classification and structure
15. Properties of amino acids.

UNIT IV

16. Lipids: Classification, structure and biological role.
17. Chylomicrons, VLDL, LDL, HDL

18. Lipid metabolism – general
19. Theories of oxidation of fatty acids.

UNIT V

20. Enzymes: classification, nomenclature.
21. Enzyme kinetics and mechanism of enzyme action.
22. Factors affecting enzyme activity.
23. Classification of fat soluble vitamins.
24. Classification of water soluble vitamins.
25. Vitamins: occurrence and biochemical role.

II. On line assignment – Conducting test through Google form and submission of marks from the allotted seminar topics.

Semester I

Core II - Ecobiology

Course Code: PZ2012

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

Learning Objectives

1. To impart knowledge on ecosystem, population, community, environmental pollutions and natural resources.
2. To develop the skill to sensitize environmental issues and work productively within and beyond the academy for sustainable environment.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	define various laws of ecology, components of ecosystem, characteristics and dynamics of population and community, natural resources and environmental pollutants.	PSO - 1	R
CO - 2	classify different types of ecosystem, habitat, environmental factors and interpret the population processes, ecological succession, biological clock, biogeochemical cycles, biogeography, natural disasters and causes of pollution.	PSO - 1	U
CO - 3	develop cognitive, technical and creative skills which enable	PSO - 3	Ap

	students for life-long learning and participate in environmental protection and conservation activities for sustainable environment and gain employability.		
CO - 4	analyse the nature of ecosystem, habitat, population, community, natural resources and environmental pollutions.	PSO - 2	An
CO - 5	assess the environmental issues like population explosion, urbanization, depletion of natural resources, pollution and waste managements.	PSO - 2	E
CO - 6	formulate hypotheses and test them by designing appropriate experiments, analyze, interpret the data and communicate the results through effective written and oral communication.	PSO - 4	C

Teaching Plan with Modules

Total Hours: 90(Incl. Seminar & Test)

Unit	Modules	Topics	Hours	Learning outcome / CO addressed	Pedagogy	Assessment
I	**Introduction to Ecology (18 Hrs)**					
	1	Scope of Ecobiology. Environmental concepts - laws and limiting factors.The environment - physical factors (climatic factors, topographic factors, edaphic factors),	3	Explain the advantages of being aware of ecobiology concepts, laws and factors. **(CO-1,2)**	Lecture, PPT, E-Content	Short test, MCQ, Seminar, Online assignment, Formative assessment I (1,2,3,4,5) Quiz I
	2	Biotic factors and their interactions (symbiosis, commensalism, parasitism and competition- prey-predator interactions - Scramble and contest competition).	3	Summarize ecosystem and its functions. **(CO-1,2)**	Lecture, PPT, You tube links, Blended teaching, E-Contents	
	3	Ecosystem: Concepts of ecosystem - structure and functions. Energy flow - single channel energy model, Y - shaped energy flow models.	3	Differentiate between the various models of energy flow. **(CO-1,2)**	Lecture, PPT, E-Contents, Mind map	

	4	Productivity - Primary production, secondary production, measurement of primary productivity. Homeostasis of the ecosystem	4	Summarize productivity and its types. **(CO-1,2)**	Lecture, PPT, Flow Chart, E-Contents	
	5	Habitat ecology: freshwater, marine, estuarine, mangrove and terrestrial.	5	Differentiate between the various ecological habitats. **(CO-1,2)**	Lecture, PPT, Youtube links, Flow charts.	
II	**Population and Community (18 Hrs)**					
	1	Population: Structure and regulation, growth form, population fluctuations, population processes.	4	Summarize the concept of population and various processes associated with it. **(CO-3,4)**	Lecture, PPT, E-Content	MCQ , Seminar, Online assignment, Formative assessment II (1,2,3,4,5) Quiz I Online assignment, Seminar
	2	life history strategies - diagrammatic and conventional life tables.Concept of Metapopulation.	3	Explain life table and life history strategies. **(CO-3,4)**	Lecture, PPT, Youtube links, Blended teaching, E-Contents	
	3	Community - basic terms, community structure, composition and stratification.	4	Describe community concept, structure etc. **(CO-1,3,4)**	Lecture, PPT, E-Contents, Mind map	
	4	Ecological niche, Ecotone and Edge effect, Ecotype.	3	Explain ecological niche and ecotype. **(CO-1,3)**	Lecture, PPT, Flow Chart, E-Contents	
	5	Ecological succession: types, general process, Concept of climax.	4	Summarize ecological succession. **(CO-1,3)**	Lecture, PPT, Youtube links, Flow charts.	
Unit III	**Biogeochemical cycles (18 Hrs)**					
	1	Water cycle, carbon cycle, nitrogen cycle	3	Summarize Gasceous cycle **(CO-1,2)**	Naitalism	

	2	Sulphur cycle and phosphorous cycle.	3	Summarize Sedimentary cycle **(CO-1,2)**	PPT , Web based	Short test, MCQ, Seminar, Online assignment, Formative assessment I (1,2,3,4,5,6, 7) Quiz I
	3	**Natural resource ecology**: Classification of resource, mineral resource	2	Classify Natural resources **(CO-5,6)**	PPT, You tube	
	4	Land resource, forest resource, water resource,	3	Describe different resources **(CO-5,6)**	PPT, Mind map	
	5	energy resource-conventional and non-conventional	2	Describe different energy resources **(CO-5,6)**	PPT, Group discussion	
	6	**Remote sensing**: Physical basis – information extraction – role in ecological research.	2	Summarize remote sensing **(CO-5,6)**	Group discussion, Web based	
	7	**Natural Disaster Management**: Floods, earthquakes, cyclones, landslides, Tsunami, Mitigation and Disaster Management.	3	Differentiate different types of disaster **(CO-5,6)**	You tube, Group discussion	
Unit IV	**Biogeography (18 Hrs)**					
	1	Patterns of distribution (continuous, discontinuous, endemic), descriptive zoogeography, zoogeographical regions of the world	3	Differentiate the patterns of distribution **(CO-5,6)**	PPT, Web based	Slido Short test, MCQ, Seminar, Online assignment, Formative assessment I (1,2,3) Quiz I Formative assessment II (3,4,5,6) Quiz II
	2	Dynamic biogeography (dispersal dynamics, dispersal pathways, migration, ecesis).	3	Summarize different biogeography**(CO-5,6)**	You tube, Group discussion	
	3	**Biodiversity**:Importance, Human impact on biodiversity,Endangered wildlife species - special projects in India - IUCN red list - hot spots.	3	Evaluate the importance of Biodiversity**(CO-5,6)**	Group discussion, Web based	
	4	Levels of diversity - species, genetic, ecosystem.GIS and satellite imaging in	3	Explain different levels of diversity**(CO-**	PPT, You tube	

		biodiversity assessment.		**5,6)**		
	5	Biodiversity indices**:** Shannon-Weiner index, Simpson index, Similarity and dissimilarity index, Association index.	3	Formulate hypothesisand test them by designing appropriate experiments**(CO-4,5)**	PPT, Group Discussion	
	6	Conservation of species: *In situ* and *Ex situ*- Wildlife sanctuaries, national parks and biosphere reserves - Indian Board of Wild Life (IBWL) - National Board for Wild Life (NBWL) - Wild Life Conservation Laws and Trade Laws (CITES) in India.	3	Summarize national parks and biosphere reserves**(CO-5,6)**	Group discussion, Web based	
Unit V	**Pollution ecology (18 Hrs)**					
	1	Green House gas emission and Global warming. Impact of chemicals on biodiversity - Pesticides and fertilizers in agriculture	4	Describe the impact of chemicals on biodiversity**(CO-3,6)**	PPT, You tube	Nearpod Short test, MCQ, Seminar, Online assignment, Formative assessment II (1,2,3,4,5) Quiz II
	2	Bio-indicator and biomarkers of environment.Carbon footprint, Carbon sink. Waste management: solid, liquid and gaseous wastes. e-wastes.	4	Evaluate the social and environmental issues**(CO-3,6)**	Group discussion, Web based	
	3	Toxicology: Biomagnification and bioaccumulation, toxicants, classification, toxicity (LC_{50} and LD_{50}), OECD Test Guidelines for the Chemicals (420, 423), mode of action of toxicants	4	Formulate hypotheses and test them by designing appropriate experiments, analyze, interpret data **(CO-4,5)**	Group discussion, Web based	
	4	. **Urbanization**: Possible	3	Describe the	Group	

	advantages of urbanization – problems, solutions – satellite villages- biovillages.		advantagesproblems and solutions of urbanization **(CO-5,6)**	discussion, PPT
5	Environmental ethics.Central and State Pollution Control Boards.Environmental auditing, Environmental impact assessment, Legislations for environmental Protection.	3	Evaluate contemporary social and environmental issues**(CO-5,6)**	Group discussion, PPT

Course Instructors **Head of the Department**

Dr. Jeni Chander Padua **Dr.S. Mary Mettilda Bai**

C. Josephine Priyatharshini

Seminar (Three from each unit)

1. Seminar : Scope of Ecobiology
   Assignment : Laws of environment
2. Seminar : Physical factors of environment
   Assignment : Biotic factors of environment
3. Seminar : Structure and functions of Ecosystem
   Assignment : Concepts of Ecosystem
4. Seminar : Energy flow – Single channel model
   Assignment : Y Shaped Energy Flow model
5. Seminar : Primary productivity
   Assignment : Secondary productivity
6. Seminar : Structure of population
   Assignment : Regulation, growth and population fluctuations in population
7. Seminar : Life history strategies - diagrammatic table
   Assignment : Life history strategies - conventional table
8. Seminar : Concept of metapopulation
   Assignment : Population processes
9. Seminar : Structure of community
   Assignment : Composition and stratification of community.
10. Seminar : Ecological niche, Ecotone and Edge effect
    Assignment : Ecological succession
11. Seminar : Water cycle
    Assignment : Floods and Tsunami
12. Seminar : Carbon cycle
    Assignment : Earthquakes and landslides
13. Seminar : Nitrogen cycle
    Assignment : Cyclones
14. Seminar : Sulphur cycle
    Assignment : Mitigation
15. Seminar : Phosphorous cycle
    Assignment : Mineral resources

16. Seminar : Biogeography – Patterns of distribution
    Assignment : Zoogeographical regions of the world
17. Seminar : Dynamic Biogeography
    Assignment : Importance of Biodiversity
18. Seminar : Endangered wildlife species - special projects in India
    Assignment : IUCN red list - hot spots.Levels
19. Seminar : Indian Board of Wild Life - IBWL
    Assignment : National Board for Wild Life - NBWL
20. Seminar : Wild Life Conservation Laws and Trade Laws (CITES) in India.
    Assignment : Conservation of species: *In situ* and *Ex situ*
21. Seminar : Green House gas emission and Global warming
    Assignment : Impact of chemicals on biodiversity
22. Seminar : Bio-indicator and biomarkers of environment
    Assignment : Carbon footprint, Carbon sink.
23. Seminar : Biomagnification and bioaccumulation, toxicants
    Assignment : Guidelines for the Chemicals (420, 423), mode of action of toxicants
24. Seminar : Environmental ethics.Central and State Pollution Control Boards.
    Assignment : Legislations for environmental Protection

Semester I

Core III - Structure and Function of Invertebrates

Course Code: PZ2013

No. of hours/ week	No. of credits	Total number of hours	Marks
5	3	75	100

Learning Objectives

1. To provide knowledge on the functional aspects of systems of invertebrates on a comparative basis.
2. To empower students with skills to comprehend the taxonomical and physiological functions of vital systems in invertebrates.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	recognise the organisation of coelom, mode of locomotion, nutrition, respiration, excretion and significance of larval forms of invertebrates.	PSO - 1	R
CO - 2	comprehend the systematic position and physiological functions of vital systems in invertebrates.	PSO - 4	U
CO - 3	apply the cognitive skills to pursue higher studies and employability relevant fields.	PSO - 3	Ap
CO - 4	explore the structure and functions of vertebrates.	PSO - 2	An

Teaching Plan with Modules

Total Hours: 75(Incl. Seminar & Test)

Unit	Modules	Topics	hrs	Learning Outcome	Pedagogy	Assessment
I	**Principle of Animal taxonomy** (12 hrs)					
	1	Species concept.	1	Demonstrate the knowledge of the concept of speciation.	PPT, Group discussion	Quiz through Google link, Test through Google classroom Assignment Formative Assessment - I
	2	International code of zoological nomenclature - Taxonomic procedures.	3	Discuss the principle of animal nomenclature. Identify species using taxonomical rules on animal classification.	PPT, Video, Identify and classify one invertebrate	
	3	New trends in taxonomy - Animal collection, handling and preservation.	4	Identify species using molecular taxonomy. Skill in collecting and preserving animals.	PPT, Video captured e-content.	

	4	Organization of coelom - Acoelomates - Pseudocoelomates - Coelomates.	3	Classify animals based on presence or absence of coelom.	Narrated PPT, Animation & Video	(1 - 5)
	5	Protostomia and Deuterostomia. .	1	Differentiate protostomes and deuterostomes.	PPT, Online images, Video	
II	**Locomotion and Nutrition**					
	1	Pseudopodia – Flagella and ciliary movement in protozoa	2	Explain the movements in protozoa.	PPT, captured e-content	Quiz through Google link, Assignment Google classroom Formative Assessment - I (1 - 3) Formative Assessment - I (3-4)
	2	Hydrostatic movement in Coelenterate, Annelida and Echinodermata.	3	Contrast the movements in lower invertebrates.	PPT, Animation video	
	3	Nutrition and digestion Free Digestive organs in invertebrates	2	Contrast animal groups with regard to nutrition and digestion.	PPT, Discussion	
	4	Patterns of feeding and digestion in lower metazoan Filter feeding in polychaeta, Mollusca and Echinodermata.	5	Recall and contrast the patterns of feeding in lower invertebrates	PPT, Video and animation	
III	**Respiration and Excretion**					
	1	Organs of respiration - gills, lungs and trachea, respiratory pigments	2	Describe the organs of respiration and respiratory pigments.	PPT, E content video	Quiz through Google link, Assignment Google classroom Formative Assessment-II (1 - 4)
	2	Mechanism of respiration.	3	Explicate the mechanism of respiration in invertebrates	PPT, video (YouTube)	
	3	Excretion – organs of excretion- coelom, coelomoducts, nephridia and Malpighian tubules	4	Describe and relate excretion of invertebrates using different excretory organs.	PPT, images and animation	
	4	Mechanisms of excretion and osmoregulation	3	Describe how invertebrates solve the physiological and environmental challenges.	PPT, images and animation	
IV	**Nervous system**					
	1	Primitive nervous system - Coelenterata and Echinodermata	3	Narrate the organization of nervous system in Coelenterata& Echinodermata.	PPT, Online images, e content	Quiz and Assignment Google classroom Formative Assessment -II (1)
	2	Advance nervous system - Annelida, Arthropoda (crustacean and insects), Mollusca (Cephalopoda).	5	Narrate the organization of nervous system in higher invertebrates,	PPT, animation	

	3	Endocrine organs in Invertebrates.	4	Explain the structure and role of endocrine organs in invertebrates	PPT and video	Formative Assessment - III (2&3)
V	**Invertebrate larvae and Minor Phyla**					
	1	Larval forms of free-living invertebrates, Larval forms of parasites	4	Explain why invertebrates exhibit different larval forms.		Quiz and Assignment via Google classroom Formative Assessment - III (1-4)
	3	Strategies and evolutionary significance of larval forms.	2	Explicate the strategies and evolutionary relationship of different larval forms.	PPT, animation, discussion	
	4	Minor Phyla (structural features and affinity) – significance – organization and general characters.	4	Identify the major characters and organization of minor phyla.	PPT, animation, discussion	

Course Instructor
Dr. A. Shyla Suganthi

Head of the Department
Dr. S. Mary Mettilda Bai

Semester I
Core IV - Comparative Anatomy of Chordates
Course Code: PZ2014

No. of hours/ week	No. of credits	Total number of hours	Marks
5	3	75	100

Learning Objectives

1. To provide the knowledge of origin, structure and function of different organ system of vertebrates.
2. To develop the skills to analyse the anatomy of vertebrates and its significance.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	identify the morphology and anatomy of major groups of vertebrates.	PSO - 1	R
CO - 2	interrelate the development of integuments, circulatory system, respiratory system, skeletal system, sense organs and nervous system.	PSO - 1	U
CO - 3	apply the cognitive skills to pursue higher studies and gain employability in academic and research institutions.	PSO - 3	Ap
CO - 4	analyse the anatomy of different groups of vertebrates.	PSO - 4	An

Teaching Plan with Modules

Total Hours 75 (Incl. Seminar & Test)

Units	Modules	Topics	Hours	Learning outcome/ CO addressed	Pedagogy	Assessment
I	**Protochordates (15 Hrs.)**					
	1	Origin of chordates, chordate characters	4	Identify the chordate characters**(CO-1)**	PPT	MCQ, Flow chart, Mind map, Short Answer Test, seminar Formative assessment I (1-4) Quiz I Online assignment
	2	classification of protochordata- general characteristics	4	Classify prochordates**(CO-1)**	Interactive PPT	
	3	development and affinities of Hemichordata	3	Analyse the affinities of Hemichordates **(CO-4)**	Open Board class	
	4	Urochordata, Chephalochordata.	4	Interrelate the characters of Urochordates and Cephalochordates **(CO-2)**	Youtube videos, comparative tables, PPT	
II	**Vertebrate Integument (15 Hrs.)**					
	1	Origin and classification of vertebrates	3	Classify vertebrates **(CO-1)**	Interactive PPT	MCQ, Comparative table, Mind map, Diagram test, Short Answer Test, seminar Formative assessment I (1)
	2	Vertebrate integument and its derivatives - development	4	Interrelate the development of integuments **(CO-2)**	Comparative pictures, You tube videos	
	3	general structure and functions of skin and its derivatives - glands	4	Anlayse the anatomy of skin and its derivatives **(CO-4)**	Open board class	
	4	scales, horns, claws, nail, hoofs, feathers and hairs	4	Compare the formation of scales,	PPT, Animation	

				horns, claws, nail, feathers and hairs **(CO-2)**	videos, Open board class	Quiz I Formative assessment II (2,3,4) Quiz II Online assignment
III	**Circulation and Respiration (15 Hrs.)**					
	1	General plan of circulation in various groups - blood - evolution of heart	4	Identify the circulatory pathway and components of blood **(CO-1)**	Interactive PPT, open board	MCQ, Flow chart, Mind map, Short Answer Test, seminar Formative assessment II (1,2,3,4) Quiz II, Online assignment
	2	evolution of aortic arches and portal systems	4	Analyze the evolution of aortic arches and portal systems **(CO-4)**	You tube video links, PPT	
	3	Respiratory system – characters ofrespiratory tissue - internal and external respiration	4	Describe the internal and external respiration **(CO-2)**	Open board, Animation videos	
	4	comparative account of respiratory organs.	3	Distinguish the various respiratory organs **(CO-4)**	PPT	
IV	**Skeletal and Urinogenital system (15 Hrs.)**					
	1	Skeletal system - form, function, body size and skeletal elements of the body	5	Explain the structure and function of skeletal system **(CO-2)**	Online diagrams and open board	MCQ, Comparative table, Mind map, Diagram test, Short Answer Test, seminar Formative assessment I (1-4) Quiz I Online assignment
	2	comparative account of jaw suspensorium,	3	Compare jaw suspensorium of vertebrates **(CO-2)**	Interactive PPT	
	3	vertebral column - limbs and girdles.	3	Identify the bones of limbs and girdles **(CO-1)**	You tube videos	
	4	Evolution of urinogenital system in vertebrate series	4	Recognize the evolution of urinogenital system in vertebrates **(CO-2)**	PPT, open board	
V	**Sensory and Nervous system (15 Hrs.)**					
	1	Sense organs - simple receptors – organs of olfaction, taste and hearing	4	Explain the different sense organs **(CO-1)**	PPT	MCQ, Flow chart, Mind map,

	2	lateral line system – electroreception.	2	Describe lateral line system **(CO-1)**	Interactive powerpoint	Short Answer Test, seminar Formative assessment I (1) Quiz I Formative assessment II (2,3,4) Quiz II Online assignment
	3	Nervous system – comparative anatomy of the brain in relation to its functions	4	Compare the functions of brain in vertebrates **(CO-2)**	Online videos, PPT	
	4	comparative anatomy of spinal cord – nerves – cranial, peripheral andautonomous nervous system.	5	Interrelate the cranial, peripheral and autonomous nervous system **(CO-2)**	Comparative diagrams, Open board	

Course Instructor **Head of the Department**

Dr. X.Venci Candida **Dr. S. Mary Mettilda Bai**

Assignments

1. Chordate characters.
2. General characteristics of prochordates.
3. Affinities of Hemichordata.
4. Affinities of Urochordata.
5. Affinities of Cephalochordata.
6. Origin of vertebrates.
7. Structure and function of Skin.
8. Derivatives of skin - scales, horns, claws.
9. Nail, hoofs, feathers and hairs.
10. Blood.
11. Characters of respiratory tissue.
12. Internal and external respiration.
13. Comparative account of respiratory organs.
14. Skeletal elements of the body.
15. Comparative account of jaw suspensorium.
16. Forelimbs and girdles.
17. Hindlimbs and girdles.
18. Urinogenital system in vertebrates.
19. Simple receptors.
20. Organs of olfaction, taste and hearing.
21. Lateral line system.
22. Electroreception.
23. Peripheral nervous system.
24. Autonomous nervous system.

Semester I

Elective I (a) - Animal Husbandry

Course Code: PZ2015

No. of hours/ week	No. of credits	Total number of hours	Marks
4	3	60	100

Learning Objectives

1. To gain knowledge on livestock management and construction of farms.
2. To develop skills on livestock farming and extend it to the society.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	acquire knowledge on Livestock resources, construction and management of Livestock farms.	PSO - 1	U
CO - 2	identify the breeds and stages of livestock.	PSO - 1	R
CO - 3	analyse the ethical laws formulated by the Animal Welfare Board.	PSO - 4	An
CO - 4	develop entrepreneurial skills and gain employability in animal farms and research laboratories.	PSO - 3	Ap

Teaching plan with Modules

Total Hours: 60 (Incl. Assignments & Test)

Unit	Modules	Topics	Hours	Learning Outcome	Pedagogy	Assessment
I	Livestock farming (Ruminants I): (12 hrs)					

	1	Prospects of livestock industry in India. Introduction and scope of cattle farming.	2	Explains the scope of livestock industry in India. (CO-1)	PPT, You tube links, Lecture	MCQ Online assignment, Seminar Formative Assessment I (1,2,3,4,5,6), Quiz.
	2	Housing systems-selection of site, layout and design.	2	Illustrate the Housing systems. (CO-1)	PPT, Video lesson, Lecture.	
	3	Selection of cattle - important exotic and indigenous breeds and their characteristics.	2	Identification of important exotic and indigenous breeds and their characteristics. (CO-2)	Flipped learning, Video, PPT	
	4	Fodder production and preservation of green fodder.	2	Explains the fodder production and preservation of green fodder. (CO-1)	PPT, Video, Lecture.	
	5	Management and feeding practices of calves, heifers, pregnant, lactating and dry animals, bulls and working animals.	2	Describes different stages of calves, heifers, pregnant, lactating and dry animals, bulls and working animals. (CO-2)	Discussion, PPT, Lecture.	
	6	Cattle diseases. Parasites – ecto and endo parasites.	2	Identifies different cattle diseases. (CO-1)	PPT, Flipped learning.	
II	Livestock farming (Ruminants II) (12 hrs)					
	1	Breeds of sheep and goat. Important economic traits for meat, milk and fibre.	2	Illustrate the breeds of sheep and goat. Important economic traits for meat, milk and fibre.(CO-2)	Video, Lecture, PPT.	Online assignment Seminar, Formative Assessment I, (1,2,3,4.5,6), Quiz.
	2	Management and feeding practices during different stages of growth and production (milk, meat and wool).	2	Explains management and feeding practices during different stages of growth and production. (CO-2)	Discussion, Lecture, PPT.	
	3	Breeding schedule and management of ram and buck.	2	Differentiates the ram and buck. (CO-2)	PPT, Lecture, flipped learning.	
	4	Weaning and fattening of lambs and kids.	2	Describes weaning and fattening of lambs and kids. (CO-2)	Video, PPT, Lecture.	
	5	Methods of	2	Explain methods of	Video, PPT,	

		milking and precautions.		milking and precautions. (CO-2)	Lecture.	
	6	Factors affecting quality and quantity of milk production and milk products.	2	Identification of factors affecting quality and quantity of milk production and milk products. (CO-2)	PPT, flipped learning.	
III	Livestock (Non ruminants) (12 hrs)					
	1	Scope of swine farming. Important exotic and indigenous breeds and their characteristics.	2	Describes swine farming and different breeds and their characteristics. (CO-2)	PPT, You tube links, Lecture.	Online assignment Seminar, Formative Assessment I, (1,2,3,4,5), Quiz. Formative Assessment II, (4,5)
	2	Housing and feeding of swine.	1	Illustrates the housing and feeding of swine. (CO-2)	PPT, Video, Lecture.	
	3	Management of different categories of swine: pregnant sows, pig-lets, growing stock, lactating sows.	4	Identify the management of different categories of swine. (CO-2)	Flipped learning, Video, PPT	
	4	Horses, donkeys and mules: feeding, Foaling and care of newborn.	3	Describes feeding, Foaling and care horses, donkeys and mules. (CO-2)	PPT, Video, Lecture.	
	5	Care of race horses and preparing horses for show.	2	Explains care of race horses and preparing horses for show. (CO-2)	Discussion, PPT, Lecture	
IV	Laboratory and Pet animal management (12 hrs)					
	1	Handling, weighing, sexing and weaning of laboratory animals (rat and rabbit).	3	Describes the handling, weighing, sexing of laboratory animals. (CO-4)	PPT, Video, Lecture.	Online assignment Seminar, Formative Assessment II, (1,2,3,4,5), Quiz.
	2	Marking for identification, Feeding schedule.	2	Marking for identification, Feeding schedule. (CO-4)	Flipped learning, Video, PPT	
	3	Prophylactic measures and Hygienic care.	2	Explains the prophylactic measures and Hygienic care. (CO-4)	PPT, Video, Lecture.	
	4	Handling of dogs and pet birds - Feeding practices and care of young ones.	3	Describes the handling and feeding practices of pet animals. (CO-4)	PPT, Video, Lecture.	
	5	Grooming and	2	Explains the methods of	Blended	

		bathing of dogs. Marketing.		Grooming, bathing and marketing of dogs. (CO-4)	learning, Video, PPT, Lecture	
V	Animal welfare (12 hrs)					
	1	Animal welfare and ethics - role and current status of Animal Welfare Board of India and other welfare organizations.	4	Describes the role of Animal Welfare Board of India and other welfare organizations. (CO-3)	PPT, Video, Lecture.	Online assignment Seminar, Formative Assessment II, (1,2,3,4), Quiz.
	2	Common offences against animals - Prevention of Cruelty to Animals (PCA) Act, 1960.	4	Explains the common offences against animals. (CO-3)	Flipped learning, Video, PPT	
	3	Functions of Animal ethics committee (CPCSEA).	2	Explains the functions of Animal ethics committee (CPCSEA). (CO-3)	PPT, Video, Lecture.	
	4	Livestock Importation Act - Evidence, liability and insurance.	2	Describes the livestock Importation Act. (CO-3)	Blended learning, PPT, Lecture	

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Course Instructor
Dr. Prakash Shoba

Head of the Department
Dr. S. Mary Mettilda Bai

Semester : III **Core VII**
Name of the Course : Physiology
Course code : PZ1731

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

Learning Objectives

1. To impart knowledge on the structure and functions of various organs organ systems and also to know about the associated disorders.
2. 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,ppt	
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,ppt	
	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	Identifiy 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 Mettilda 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 imunomodulatory 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 erythromatous and rheumatoid arthritis)	3	Recognize different types ofautoimmune 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 immunodiffusionand 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, Demonst-ration	
	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 flowcytometry.	Seminar, Lecture	
	10	Transplantation: classification of grafts, mechanism of graft rejection, graft versus host reaction, immuno suppressive 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

1. To learn how the endocrine system functions under normal circumstances, as well as the pathologies that arise when homeostasis fails.
2. 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 Formative Assessment I (1,2,3,4,5)
	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	
	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 chalones.	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 patho-physiology of hypothalamus, pituitary	4	Explain the structure and functions of hypothalamusand pituitary. Identify pathological conditions		
	3	Structure, functions and patho-physiology 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 Assessmen (1,2) Formative Assessmen
	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
	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 (1,2) Formative assessment (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 Mettilda Bai