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 : 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

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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
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