



ST. ALOYSIUS COLLEGE(AUTONOMOUS), JABALPUR

Reaccredited 'A++' Grade by NAAC(CGPA:3.58/4.00)

College with Potential for Excellence by UGC

DST-FIST Supported & STAR College Scheme by DBT

SchemeB-1 (For course of science Practical Discipline having Major Practicum Component)

Part A – Introduction

PROGRAMME: PG Diploma		Class: M.Sc.	2 Year/ III Semester	Session – 2026-27
Subject – Zoology				
1	Course Code	CC-31 (Paper -1)		
2	Course Title	Biology of gametes and its development.		
3	Course Type	Core course		
4	Pre – requisite (if any)	To study this course a student must have had one year PG diploma certificate or four year (Hon's/Hon's with research degree course.)		
5	Course Learning Outcomes (CLO)	- To understand the structure, function, and molecular biology of gametes across different organisms. - To know the processes of gametogenesis (spermatogenesis and oogenesis) and the regulatory mechanisms involved. - To know the hormonal, genetic, and environmental factors influencing gamete development and fertility. - To know about stages of fertilization and early embryonic development. - To understand and application of modern techniques and experimental approaches to study gamete biology and reproductive technologies. - Understand the ethical, medical, and societal implications of assisted reproductive technologies. - Career opportunities in reproductive biology embryology, IVF technology, developmental genetics and fertility research in clinical and research settings.		
6	Credit Value	06		
7	Total Marks	Max. Marks: 60+40 =100		Min. Passing Marks: 40

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Part B – Content of the Course		
Total No. of Lectures –Tutorials - Practical (in hour per week): 5 hour per week L-T-P		
Unit	Topics	No. of Lectures
I	Gamete biology - Gametogenesis and its structure. - Biochemistry of Semen: Semen composition and formation, assessment of sperm function. - Ovarian follicular growth and differentiation: morphology and endocrinology. - Molecular biology of oogenesis and vitellogenesis, ovulation and multiple ovulation and embryo transfer technology: invivo oocyte, maturation, superovulation elementary idea of IVF.	15
II	Fertilization And Early Embryonic Development - Recognition of Egg and Sperm: Capacitation, Acrosomal Reaction. Egg envelops and classification of eggs. - Mechanism of Fertilization in reference, to Sea Urchin and Mammals (Biochemistry of fertilization, Prefertilization, Postfertilization events). - Pattern of Cleavage, Morulation, Blastulation, Gastrulation & Morphogenetic movements. - Variation in gastrulation in Sea Urchin, Frog, Avian and Mammalian embryo. - Neurulation, Organogenesis of Eye, limb, Heart and Gonads.	20
III	Late Embryonic Development - Metamorphosis in Amphibians. - Axis specification in Drosophila: Role of maternal genes, patterning of early embryo by zygotic genes- gap genes, pair- rule genes, segment polarity genes. - Sex determination approaches in developmental biology. - The Stem Cell concept: Embryonic and adult stem cell, Disorders. - Embryonic and adult stem cell: Blood and lymphocyte lineages, haematopoiesis.	20
IV	Regeneration: Epimorphic regeneration of salamander limb; Morphogenesis regeneration in hydra. Inborn errors of translation: Teratogenesis environmental assaults on human development- Teratogenic agents like alcohol, retinoic acid etc. Postembryonic development: Growth, cell proliferation, growth hormones; aging- genes involved in alteration in timing of senescence. Programmed cell death: Apoptosis, Autophagy and Necrosis. Garbha Sanskara - Epigenetics and Environmental Influence Ancient Indian practices influencing foetal and mental physical health: a) Music, mantra, maternal mood, diet, and lifestyle b) Parallels with epigenetic mechanisms (e.g., maternal stress DNA methylation)	20

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V	Techniques, Ethical, Legal, and Social Issues (ELSI) in Development • Gene knockout and gene knock-in (CRISPR-Cas9, TALENS, ZFNs), RNA interference (RNAi) and gene silencing in developmental studies. • Fate mapping and lineage tracing techniques. • Transgenesis and In situ hybridization in developmental tissues. • Ethics of human gene editing (CRISPR babies, Germline editing) • Intellectual property rights in genetic technologies. Public perception and misinformation about genetic interventions • Bioethical frameworks: Autonomy, justice, beneficence, non-maleficence.	15
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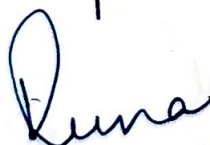
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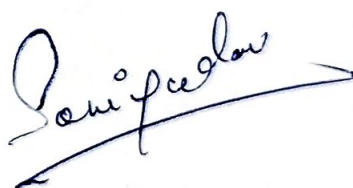
Part A – Introduction			
PROGRAMME: PG Diploma		Class:M.Sc.	2 Year/ III Semester
Session – 2026-27			
Subject – Zoology			
1	Course Code	PC- 31 (Paper-1)	
2	Course Title	Biology of gametes and its development	
3	Course Type	Core course	
4	Pre – requisite (if any)	To study this course a student must have had One Year PG diploma certificate of Four year (Hon's/Hon's with research degree course .)	
5	Course Learning Outcomes (CLO)	• Demonstrate a clear understanding of the structure, development, and function of male and female gametes. • To Understand laboratory techniques for observing and analysing gametogenesis in model organisms. • To know of cellular and molecular mechanisms regulating gamete formation and maturation. • Understand the effects of environmental and genetic factors on gamete development through experimental observation.	
6	Credit Value	04	
7	Total Marks	Max. Marks: 60+40 =100	Min. Passing Marks: 40


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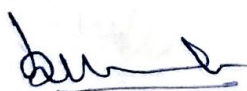
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Part B – Content of the Course

Total No. of Lectures – Tutorials – Practical (in hour per week) : 3 hour per week

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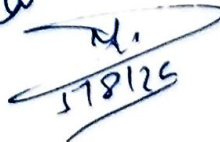
Unit	Topics	No. of Lectures
I	- Gametogenesis Study: Microscopic study of spermatogenesis and oogenesis using prepared slides. - Sperm Morphology and Motility: Collection and staining of sperm samples (e.g., fish, frog, or mammal). - Oocyte Maturation: Study of oocyte growth stages in amphibians (like <i>Xenopus</i> oocytes). - Gamete Viability Testing: Performing viability staining (e.g., Eosin - Nigrosin staining) to differentiate live and dead spermatozoa.	25
II	- Study of Fertilization Mechanisms: Demonstration (through Youtube and other online platform) of fertilization membrane formation in <i>sea urchin</i> or <i>starfish</i> eggs post-fertilization. - Hormonal Regulation of Gametogenesis (Demonstration through online platform like Youtube): Discussion or small experimental setups showing the effect of hormones (like FSH, LH) on gamete development (using model organisms or cell cultures).	25
III	- Cryopreservation Techniques: Introduction to methods of gamete cryopreservation (especially sperm freezing techniques). - Gamete Abnormalities: Study of morphological abnormalities in sperm cells under the microscope.	10


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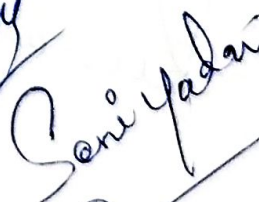

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Theory syllabus

Scheme A-1(For course of science Discipline having Major Practicum Component)

Part A - Introduction			
PROGRAMME : PG Degree	Class: M.Sc.	II Year/III Semester	Session- 2026-27
Subject- Zoology			
1	Course Code	CC-32 (Paper-II)	
2	Course Title	Animal physiology and Molecular Endocrinology	
3	Course type	Core Course	
4	Pre- requisite (if any)	To study this course a student must have had One Year PG diploma certificate or Four year (Hon's/Hon's with research degree course).	
5	Course Learning Outcomes (CLO)	- Describe the structure and function of major organ systems (e.g., circulatory, respiratory, nervous, excretory, muscular, and digestive systems) across animal groups. - To Explain physiological mechanisms like homeostasis, nerve impulse transmission, muscle contraction, and thermoregulation. - Understand major endocrine glands (pituitary, thyroid, adrenal, pancreas, gonads) and understand their structure and hormonal functions and dis-function. - Understand the role of hormones in regulating processes like growth, metabolism, reproduction, and stress response. - careers in physiology research, endocrinology labs, biomedical sciences, pharmaceutical R&D, and hormone-based diagnostics and therapies.	
6	Credit Value	06	
7	Total Marks	Max. Marks: 60+40	Min. Passing Marks: 40

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Part B - Content of the Course

Total No. of Lectures-Tutorials-Practical (in hour per week): 3 hour per week L-T-P

Unit	Topics	No. of Lectures
I	Tridosha System and Physiological Functions • Vata: Nervous system & locomotion • Pitta: Metabolism & thermoregulation • Kapha: Structure & stability Introduction To Digestion, Respiration And Excretion Systems: • Definition, Divisions of physiology, Relationship of physiology with other sciences, Significance of the study. • Digestive system in man, Physiology of digestion, Absorption and Assimilation, Gastrointestinal hormones and their control in digestion. • Respiratory system in Human, Types and mechanism of respiration-Transportation of gases, Control of respiration. • Excretory system of human, Structure and functions of nephron, Urine formation and its regulation.	18
II	Cardio vascular system and nervous system: • Blood: Composition, Haemopoiesis, formed elements, Blood volume and its regulation, Haemostasis. • Types of heart, Structure of human heart, Heart beat and Cardiac cycle, Blood pressure, ECR and its application. • Types and functions of neurons, Central and Peripheral Nervous System, Synapse and its transmission, Resting and action potential, Neuro-muscular junction.	16
III	Effectors And Receptors: • General structure and types of muscles, Sarcomere, Ultra structure of skeletal muscle, Mechanisms of muscle contraction, Chemical changes during muscle contraction, Kymograph. • Physiology of vision, hearing and tactile response. • Thermoregulation in animals. Tolerance to high temperature, cold and freezing, Physiology of hibernation and aestivation. • Osmo-ionic regulation in freshwater and marine fishes and crustaceans Response to hyper and hypo-osmotic media. Adaptation to pressure in high altitude - Buoyancy.	18
IV	Molecular Endocrinology • Basic concept of endocrinology, discovery of hormones as chemical signals for regulation of physiological processes. • Evolution of chemical communication in animal systems and its classification. • Structure of peptide and protein hormones: Storage and secretion of hormones, molecular mechanisms of regulation. Transcriptional and post transcriptional mechanisms of hormone biosynthesis and secretion.	20

	• Phylogenetic analysis of hormonal structures and functions. • Inhibitors of hormone biosynthesis and their use.	18
V	Nature of hormonal effects and actions: • Discovery of receptors in target tissues. Mechanisms of hormone action and signal attenuation. Signal discrimination, signal transduction and signal amplification in hormone regulated physiological processes. • Structural requirements for successful hormone-receptor interactions. Receptor antagonists and their applications. • Metabolism of hormones by target and non-target tissues. of hormones. • Hormones and behaviour- cellular and molecular actions of semiochemicals.	18

Sumit
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Sharma

Pr Aditya

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Practical syllabus Scheme A-1(For course of science Discipline having Major Practicum Component)

PROGRAMME : PG Diploma		Part A - Introduction		Session 2026-2027
		Class: M.Sc.	II Year/IIISemester	
		Subject- Zoology		
1	Course Code	PC-32 (Paper-II)		
2	Course Title	Animal physiology and Molecular Endocrinology		
3	Course type	Core Course		
4	Pre- requisite (if any)	To study this course a student must have had One Year PG diploma certificate or Four year (Hon's/Hon's with research degree course).		
5	Course Learning Outcomes (CLO)	• Understand and apply basic experimental techniques used in animal physiology • Identify major histological structures and correlate structure to function through microscopic studies. • Analyze hormone functions and mechanisms by Demonstrate understanding of hormone production, secretion, and receptor-mediated actions through practical experiments and virtual labs. • Evaluate the effects of hormonal and neural control in maintaining homeostasis (thermoregulation, osmoregulation, metabolic regulation).		
6	Credit Value	04		
7	Total Marks	Max. Marks: 60+40		Min. Passing Marks: 40

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Part B – Content of the Course		
Total No. of Lectures – Tutorials – Practical (in hour per week): 3 hour per week		
L-T-P		
Unit	Topics	No. of Lectu
I	- Digestive System: Study of digestive enzymes: Amylase, Pepsin, Trypsin activity experiments. - Study of human alimentary canal (model/chart/dissection of goat/rat stomach if permitted). - Qualitative tests for digestion products (glucose, fatty acids, amino acids). - Measurement of lung volumes and capacities using a <i>spirometer</i>. - Study of the structure of human respiratory organs (models/charts). - Microscopic study of kidney (histology slides) - cortex, medulla, nephron.	25
II	- Estimation of haemoglobin content using Sahli's method. - Measurement of blood pressure using sphygmomanometer. - Recording of heart sounds (demonstration of stethoscope use). - Study of human heart model and cardiac cycle stages (with charts/models).	15
III	- Microscopic study of muscle types (skeletal, smooth, cardiac muscle slides). - Thermoregulation and Osmoregulation: Study of behavioral responses to temperature (earthworm/fish models if available). - Study of hormone assays (like ELISA for insulin demonstration if feasible) - Histological study of endocrine glands (thyroid, pancreas, adrenal slides).	20

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