



SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)
MASTER OF SCIENCE IN ZOOLOGY



National Education policy-2020
(Effective from session 2024-25)



SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Programme Outcomes

On completion of programme students will be able to

- To give comprehensive understanding about the principles of taxonomy, cellular and molecular biology, genetics, ecology and evolution
- To acquire knowledge on the various aspects of zoological sciences, cell biology, genetics, taxonomy, physiology, applied zoology, general embryology and public health
- To recognize the scientific facts behind natural phenomena
- To develop insight and improve their analytical communication and professional skills
- To understand the applications of zoological sciences in Biotechnology, Apiculture, Poultry, Fisheries, Aquaculture, Agriculture and vermiculture
- To gained the knowledge to use modern sophisticated equipment's and tools



SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Faculty of Science

Two Years M. Sc.

Programme Scheme of Teaching and Examination

M. Sc. I Semester Zoology

(Effective from the Academic Year 2024-2025)

SN	Course Code	Course Title	Hours/Week			Credits	Maximum Marks			Sem End Exam Duration (Hrs.)
			L	T	P		Continuous Evaluation	Sem. End Exam	Total	
1.	DUZOC101	Paper I: BIOSYSTEMATICS AND TAXONOMY	4	1	-	5	30	70	100	3
2.	DUZOC102	Paper II: STRUCTURE AND FUNCTION OF INVERTEBRATES	4	1	-	5	30	70	100	3
3.	DUZOC103	Paper III: ENDOCRINOLOGY	4	1	-	5	30	70	100	3
4.	DUZOC104	Paper IV: CELL AND MOLECULAR BIOLOGY	4	1	-	5	30	70	100	3
5.	DUZOP01	Lab course: I (Combining Paper I and II)	-	-	4	2	15	35	50	5
6.	DUZOP02	Lab Course: II (Combining Paper III and IV)	-	-	4	2	15	35	50	5
7.	DUZOP03	Computer Application and Bioinformatics	-	-	2	2	15	35	50	2
TOTAL						26			550	



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Course Title	Paper I: Biosystematics and Taxonomy				
Course Code	DUZOC101				
Course Credits	L	T	P	Details	
	4	1		5	
Prerequisites	Basic Knowledge Biosystematics and Taxonomy				
Course objectives	To understand the basics of Biosystematics and Taxonomy				
Course Contents	UNIT – I • Definition & basic concept of biosystematics & taxonomy. • History, Problems, aims and tasks in taxonomy. • Taxonomy as a profession. • Importance & application of biosystematics in biology. • Chemotaxonomy. • Cytotaxonomy. UNIT – II • Taxonomic attributes. • Theories of biological classification (Essentialism, Nominalism, Empirism, Cladism and evolutionary classification). • Species Concept - Typological, Nominalistic, Biological & evolutionary species concept, difficulties in application of biological species concept. • Polytypic species. • Speciation –Allopatric, sympatric & parapatric speciation, factors affecting speciation. UNIT – III • Taxonomic procedures. • Taxonomic collection. • Curing of animals & Process of Identification. • Preservation of specimens. • Taxonomic Keys - Types, merits & demerits. • International code of Zoological Nomenclature (ICZN). • Interpretation of rules of nomenclature. UNIT – IV • Hierarchy of categories. • Bio-geographical zones of India. • Origin and Types of biodiversity & ecotones. • Threats of biodiversity. • Biodiversity conservation practices (in-situ & ex-situ & gene banks). • Molecular perspectives on conservation of biodiversity. • Origin of reproductive Isolation (Prezygotic & Post zygotic mechanisms).				



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Course outcomes	<i>After successful completion of these courses the student would be able:</i> • To understand the relevance of Biosystematics and its importance in resolving classical and applied research problems • To understand the importance and applications of various species concepts and speciation in systematics; they will also be able to understand the merits and demerits of various schools of biological classification • To versed with the collection and identification techniques and use of various tools in taxonomy as well as learn to use taxonomic keys as a cognitive aid • To understand the basic principles of ICZN and their interpretations in resolving various taxonomic problems • To help students acquire an in-depth knowledge on the field of diversity and relationship in the animal world • To appreciate the concept of biological conservation and the relationships between organisms and their surroundings
Text and References	1. Biosystematics & Taxonomy: Dr.R.C.Tripathi, University Book House, JAIPUR. 2008 2. Theory & Practice of Animal Taxonomy: V.C. Kapoor, 5th Edition Oxford & IBH Publishing Co. 2008 3. Principle of Animal Taxonomy: G.G. Simpson, Oxford & IBH Publishing Co. 1 January 2012 4. Biodiversity: E.O. Vilson, Acadmic Press Washington DC.1988 5. The Biology of Biodiversity:M. Kato, Springer. 2012 6. Molecular Markers - Natural History & Evolution: J.C. Avise. 2004 Sinauer Associates Inc U.S.



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Course Title	Paper II: Structure and Function Of Invertebrates				
Course Code	DUZOC102				
Course Credits	L	T	P	Details	
	4	1		5	
Prerequisites	NIL				
Course objectives	To understand the Invertebrates Evolution.				
Course Contents	UNIT – I Coelom • Organization of Coelom: Origin and development. • Acoelomate, Pseudocoelomate and Coelomate • Protostomia and Deuterostomia. Locomotion • Origin of Locomotion: Types and structure of cilia and flagella. • Flagellar and ciliary movements in Protozoa. • Hydrostatic movement in coelenterate, annelid and Echinodermata. UNIT –II Nutrition • Lower Metazoan - Patterns of feeding and digestion in Porifera and Coelenterate • Filter feeding - in Polychaeta and Mollusca. Respiration • Organs of Respiration: Structure and function of gills, buck lungs and trachea in Invertebrates. • Respiratory Pigments and their function. • Mechanism of Respiration and transport of gases. UNIT -III Excretion • Organs of excretion: Coelom, Coelom duct, nephridia and Malpighian tubules. • Mechanism of Excretion in invertebrate. • Osmoregulation in invertebrate. Nervous System • Structure of Primitive Nervous system in Coelenterate and Echinodermata. • Advanced Nervous system in Annelida, Arthropoda (Crustacea and Insecta), and Mollusca(CEPHALOPODA) UNIT -IV Invertebrate Larva				



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	• Free living larvae of Invertebrates. • Study of larval forms of parasitic invertebrates. • Larval forms of Crustacea, Mollusca and Echinodermata. • Survival strategies and evolutionary significance of larval forms. Minor Phyla • Organization and General Characters of Rotifera. • Organization and General Characters of Ectoprocta. • Organization and General Characters of Endoprocta. • Organization and General Characters of Nemertina.
Course outcomes	<i>After successful completion of these courses the student would be able:</i> • To understand the development of organisms through presence or absence of coelomic cavity and describe different types of evolutionary development along with and account of locomotion • To explain the types of nutrition and digestive system of organisms • To relate the structure, function and mechanisms of respiration and excretion of the organisms. • To appreciate the advanced nervous coordination in higher phyla of invertebrates • To acquire knowledge about life cycle, larval forms of invertebrates and understand the significance of minor phyla • To acquire skills in teaching the structural and functional features of invertebrate and vertebrate lifeforms • To become very competent in research or teaching fields
Text and References	1. Invertebrate Structure and function: E.J.W. Barrigton, English language Book society UK.1997 2. Invertebrate Zoology: Robert Barnes IVth Edition, Holt Saunders International Edition Japan.1981 3. The Cambridge Natural History Vol 1 – 9: S. F. Harmer, A.E. Shipley, Todays & TomorrowsBook agency, N Delhi India.2015 4. A Text book of Zoology, Invertebrate: Parker Hasvell, Marshall & Williams. AITBS Publishing &Distributers, Delhi.2020



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Course Title	Paper III: Endocrinology				
Course Code	DUZOC103				
Course Credits	L	T	P	Details	
	4	1		5	
Prerequisites	NIL				
Course objectives	The students will understand the significance Hormones and their Biosynthesis.				
Course Contents	UNIT – I • Endocrine Glands: Pituitary, adrenal, thyroid, ovary, testes and pancreas. • Classification of Hormones. • Hormone release and transport. • Gastro -intestinal hormones. UNIT – II Mechanism of Hormone action – • Hormones and their receptors: cell surface receptor, intra-cellular receptor. • Signaling through G-protein linked receptor. • Mode of action of protein hormone. • Mode of action of steroid hormone. • Mode of action of amino acid derivative hormone. UNIT - III • Hormonal regulation of Carbohydrate and lipid metabolism. • Biosynthesis of steroid hormones. • Biosynthesis of amino acid derivative hormones. • Biosynthesis of catecholamine hormone. UNIT - IV Neuro-endocrinology • Neuroendocrine system. • Neural control of endocrine system. • Endocrinal regulation of gametogenesis. • Endocrinal regulation of lactation, pregnancy and parturition.				



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Course outcomes	<i>After successful completion of these courses the student would be able:</i> • To gain knowledge of the distribution, morphology/anatomy of endocrine glands and their role in chemical integration. Phyletic distribution of the hormones will be understood • To understand the role of chemical messengers in cellular communication and signaling pathways • To introduced to the molecular mechanisms of action of many of these mediators and will start to appreciate biochemical and signaling events at the cellular and whole animal level • To gain information's about biosynthesis of various hormones and understand the metabolic disorders concerns with them • To appreciate the link between nervous and endocrine system and their role in various life supporting mechanisms • To explain consequences of the hormonal irregulating.
Text and References	• Comparative vertebrate Endocrinology: Gorbman & Bern. Cambridge university 1982 • Human Physiology: Dr. C. C. Chattergee. CBS Publishers 2022 • Comparative Endocrinology: Barrington. Oxford University 1975 • Applied Animal Endocrinology: Squires.CABI Publishing 2003 • Endocrinology: Basic & Clinical principles: Melmed & Cohn,.Human Press 2010



SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Course Title	Paper IV: Cell and Molecular Biology				
Course Code	DUZOC104				
Course Credits	L	T	P	Details	
	4	1		5	
Prerequisites	NIL				
Course objectives	To understand cell ultrastructure and cell organelles functions.				
Course Contents	UNIT-I <i>Fundamentals of molecular biology -</i> • Properties of cells. • Types of cells. • Evolution of Eukaryotic cells. <i>Ultra structure & function of cell organelles -</i> • Mitochondria – Biogenesis, Structure of mitochondrial membrane, cristae, Respiratory Chain complex, Energy conservation during Oxidative phosphorylation (ATP synthesis). • Ribosome – Types, structure, biogenesis & functions. • Golgi body – Ultra (EM) structure, fenestration, biogenesis & functions. • Endoplasmic reticulum - structure & function UNIT - II <i>Ultra structure and functions of cell organelles -</i> • Lysosome – structure, polymorphism in Lysosome, function. • Microbodies - Microsome and Peroxisome. • Nucleus: Structure and function <i>Structure of DNA & RNA</i> • Chromosomes –Nucleosome model, Euchromatin & heterochromatin, Giant chromosomes(Polytene, Lamp brush etc.). • Microtubules - Structure and function. UNIT – III • Bio membranes - Structure, Molecular composition and arrangement of bio-membranes. • Function of Bio membranes • Patterns of transport - Passive (Osmosis and Diffusion) and Active transport. • Membrane pumps: Sodium potassium pump, Calcium-ATPase pump, ATP dependent proton pump. UNIT – IV				



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	• Cell surface receptor: - Membrane receptor for extracellular matrix. • Second messenger system- c AMP as a second messenger, Lipid derived second messenger, Roll of Ca^{++} as second messenger. • Signal transduction –Signaling through G protein coupled receptors, GTPase cycle, Protein kinase mechanism – cAMP activated Protein kinase mechanism, • Electrical properties of cell and synaptic transmission. • Biology of cancer –Oncogenes, tumor suppressor genes, cancer and cell cycle. Metastasis, interaction of cancer cells with normal cells, apoptosis and therapeutic interventions of uncontrolled cell growth.
Course outcomes	<i>After successful completion of these courses the student would be able:</i> • To understand the key concepts of biology at physiological, biochemical, molecular and cellular level. • To imparts knowledge about structural and functional organization of a typical prokaryotic and eukaryotic cell structures and evolution of eukaryotic cell. • To understand about cell regulatory mechanisms and key concepts about signal transduction mechanisms. • To identify link between genetics and cancer with emphasis on oncogenes, tumor suppressor genes, apoptosis, metastasis and relation of cell cycle to cancer. • To acquire skills in teaching the structural and functional features of invertebrate life forms.
Text and References	• MOLECULAR CELL BIOLOGY: Lodish, W.H. Freeman & Co. NewYork.2016 • PRINCIPLES OF BIOCHEMISTRY: Lehninger, Fourth Edition - David L. Nelson, Michael M .Cox. W H FREEMAN 2001 • MOLECULAR CELL BIOLOGY: Lodish M. Baltimore, Scientific American books. W H FREEMAN 2016 • ESSENTIALS OF CELL & MOLECULAR BIOLOGY: Roberties & Roberties, Halt Saunders International Edition.1981 • CELL & MOLECULAR CELL BIOLOGY: Gerald Karp, Willey & Sons Co. 2019 • MEDICAL CELL BIOLOGY: Flickinger, E.J. Brown J.C. Halt Saunders International Edition. 1997 • CELL BIOLOGY: Powar C.B. Himalaya Publishing House.2015



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Course Title	Lab course: I (Combining Paper I and II)				
Course Code	DUZOP01				
Course Credits	L	T	P	Details	
			4	2	
Prerequisites	NIL				
Course objectives	To understand the practical approach of basics of Taxonomy and specimens.				
Course Contents	1. Study of museum specimens from protozoa to minor phyla. 2. Study of permanent and histological slides of invertebrate (protozoa to minor phyla). 3. Collection, identification and preservation of animals. 4. Permanent slide preparation of preserved materials. 5. Alternative methods of dissection: prawn, earthworm, cockroach, snail. Leech and octopus. 6. Exercise from taxonomy (Taxonomical keys, index preparation).				



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Course Title	Lab Course: II (Combining Paper III and IV)				
Course Code	DUZOP02				
Course Credits	L	T	P	Details	
			4	2	
Prerequisites	NIL				
Course objectives	To understand the practical approach of basics of Cell Biology, Molecular Biology and Endocrinology.				
Course Contents	1. Study of permanent slides of various endocrine glands of vertebrates. 2. Histological studies of endocrine glands of vertebrates. 3. Preparation of Permanent slides of endocrine glands of fish. 4. Hormone based diagnostic study 5. Hormone assay. 6. Alternative methods of dissection of endocrine glands of vertebrate. 7. Cytological experiments: • Study of various stages of mitosis & meiosis cell division. • Study of giant chromosomes through slide preparation. • Slide preparation of mitochondria/ Barr body from oral smear and blood.				



SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Course Title	Computer Application and Bioinformatics				
Course Code	DUZOP-03				
Course Credits	L	T	P	Details	
	1		2	2	
Prerequisites	NIL				
Course objectives	The basic objective is to give students an introduction to the basic practical knowledge of computer and techniques of bioinformatics.				
Course Contents	Unit I: Computer Basics, Introduction to computer networks, LAN, MAN, WAN & Internet, Internet applications. Introduction to MS office, working with documents, worksheets and presentations. Unit II: Concepts of Programming languages, Introduction to 'C' language, flowcharts and algorithms, introduction to data structure and database concepts, Object oriented concepts. Unit III: Database concepts: Introduction, Key features, History; Database management systems, Types of database management systems, Structured Query language; Index: Introduction and forms; Biological Database: Introduction and Types.				
	Unit IV: Bioinformatics: Introduction, Bioinformatics databases, Importance of Bioinformatics; Analytical approaches, Components of Bioinformatics, Useful sites for researchers, Commercial use of bioinformatics; Bioinformatics in Life Sciences, Biocomputing, Bioinformatics in the area of genomics, Technical and legal issues, Role of Bioinformatician. Unit V: DNA sequence analysis: Gene structure and DNA sequences, Features of DNA structure analysis, DNA libraries and ESTs, Effect of EST data on DNA databases; Pair wise and multiple sequence alignment techniques; Phylogenetics; Analysis of Gene expression: Overview of microarray analysis, Micro arrays as tools for Gene expression analysis				
Course outcomes	1. To give students knowledge of and competence in use of bioinformatical methods central to conduction of molecular biological research projects. 2. Emphasis on bioinformatics related to exploration of proteins and includes analyses of sequences, database searches, sequence comparison, visualization and analysis of protein structures, and introduction to phylogenetic analyses. 3. Give an introduction to analysis of DNA sequences, genes and genomes, gene expression and systems biology. 4. To give students a basic competences in the use of bioinformatical tools. 5. Emphasizes the learning of bioinformatical tools in light of the student's knowledge of molecular biology. 6. Study the meaning and structure of biological information available in the existing databases.				



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Text and References	1. Arthur M Lesk. 2005. Introduction to Bioinformatics(Ed:2). Oxford university press, National York. 2. Attwood, T.K. and Parry smith, D.J. 2001. Introduction to Bioinformatics .Pearson Education (Singapore) Pvt. Ltd., National Delhi. 1. Andreas D. Baxevanis and B. F. Francis Ouellette. 2005. Bioinformatics- A Practical guide to the analysis of Genes and Proteins (Ed:3). John Wiley & Sons, Inc., Publications, US. 2. David W Mount. 2004. Bioinformatics: sequence and Genome analysis(Ed:2). Cold Spring Harbor Laboratory Press, Cold Spring Harbor, National York. 3. Rastogi, S.C., Menderatta, M. and Rastogi, P. 2004. Bioinformatics -concepts, skills and applications. CBS Publishers & Distributors, National Delhi
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MASTER OF SCIENCE IN ZOOLOGY



National Education policy-2020
(Effective from session 2024-25)



SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Programme Outcomes

On completion of programme students will be able to

- To give comprehensive understanding about the principles of taxonomy, cellular and molecular biology, genetics, ecology and evolution
- To acquire knowledge on the various aspects of zoological sciences, cell biology, genetics, taxonomy, physiology, applied zoology, general embryology and public health
- To recognize the scientific facts behind natural phenomena
- To develop insight and improve their analytical communication and professional skills
- To understand the applications of zoological sciences in Biotechnology, Apiculture, Poultry, Fisheries, Aquaculture, Agriculture and vermiculture
- To gained the knowledge to use modern sophisticated equipment's and tools



SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Faculty of Science

Two Years M. Sc.

Programme Scheme of Teaching and Examination

M. Sc. II Semester Zoology

(Effective from the Academic Year 2024-2025)

SN	Course Code	Course Title	Hours/Week			Credits	Maximum Marks			Sem End Exam Duration (Hrs.)
			L	T	P		Continuous Evaluation	Sem. End Exam	Total	
1.	DUZOC201	Papar I: POPULATION GENETICS & EVOLUTION	4	1	-	5	30	70	100	3
2.	DUZOC202	Papar II: Structure and REPRODUCTIVE BIOLOGY	4	1	-	5	30	70	100	3
3.	DUZOC203	Papar III: TOOLS & TECHNIQUE IN BIOLOGY	4	1	-	5	30	70	100	3
4.	DUZOC204	Papar IV: ENVIRONMENTAL PHYSIOLOGY	4	1	-	5	30	70	100	3
5.	DUZOP205	Lab course: I (Combining Papar I and II)	-	-	4	2	15	35	50	5
6.	DUZOP206	Lab Course: II (Combining Papar III and IV)	-	-	4	2	15	35	50	5
7.	DUZOSEC207	RESEARCH METHODOLOGY	2	-	-	2	15	35	50	2
TOTAL						26			550	



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Course Title	Paper I: POPULATION GENETICS & EVOLUTION				
Course Code	DUZOC 201				
Course Credits	L	T	P	Details	
	4	1		5	
Prerequisites	NIL				
Course objectives	To understand the basics of Genetics and Genotypic evolution.				
Course Contents	UNIT -I - Quantifying genetic variability: Genetic variation, Allele frequencies. - Genetic structure of natural populations: Introduction, Optimum phenotypes & selection pressure. Kinds of selection, genetic variability, Canalization, genetic homeostasis. - Phenotypic variation: Loss of genetic variations, genetic load, genetic death, mutational & segregation loads, - Genetic Equilibrium: Balancing selection, mutation drift balance, Mutation selection balance. UNIT - II - Analysis of quantitative traits: Quantitative traits and natural selections. - Estimation of heritability: Narrow sense & Broad sense Heritability. - Genotype environmental interactions. Phylogenetic & Biological concept of species. - Pattern & Mechanism of Reproductive Isolation. - Modes of speciation (Allopatric, Sympatric & Para patric.) UNIT - III - Concept of Evolution: Microevolution, Meso evolution and macroevolution. - Theories of evolution with an emphasis on Darwinism. Emergence of Neo–Darwinism, neutral theory of Evolution. - Molecular Clock. - Neo -Darwinism: Hardy - Weinberg law of genetic equilibrium. UNIT - IV - Modern Synthetic theory of Evolution. - Molecular evolution: Gene evolution, gene families, Molecular drive. - Natural selection, Mutation, Genetic drift, Migration, Meiotic-drive. - Evolution of horse and man.				



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Course outcomes	<i>After successful completion of these courses the student would be able:</i> • To gain command on genetic structure and phenotypic variation in natural population. • To quantify different genetic problems. • To explain the evolutionary concepts and theories, molecular clock and its significance and test the genetic equilibrium in a population using Hardy-Weinberg law. • To understand the basic concepts and theories of Lamarck and Darwin. • To comprehend concepts like modern synthetic evolution while appreciating evolutionary laws of natural selection, genetic drift, migration and meiotic drive. • To explain how the molecular record provides evidence for evolution understood the human and horse origin and evolution.
Text and References	• Gene & Evolution: Jha A.P. John Publication, New Delhi. 2009 • Evolution & Genetics: Merrel D.J. Holt Rinehart & Winston INC. 1962 • The Genetics & Origin of Species: Dobzhansky, Columbia University Press. 1951 • Species Evolution - The Role of Chromosomal Change: King M. Cambridge University Press, Cambridge. 1995 • A Primer of Population Genetics - Hartl D.L. Suinaer Associates INC, Massachusetts. 1999 • Evolutionary Genetics: Smith J.M. Oxford University Press, New York 1989. • Evolutionary Biology: Futuyama D.J. Suinaer Associates INC publishers, Dunderland. 1998 • Evolution: Strikberger M.W. Johns & Bartett Publishers, Boston London. 2014



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Course Title	Paper II: REPRODUCTIVE BIOLOGY				
Course Code	DUZOC202				
Course Credits	L	T	P	Details	
	4	1		5	
Prerequisites	NIL				
Course objectives	To understand the Reproduction and Gonads functions.				
Course Contents	UNIT- I • Anatomy and histology of testis, structure and function of Leydig cell and Sertoli cells. • Spermatogenesis, Spermatogenesis and hormonal regulation.. • Structure of vertebrate sperm. • Composition and function of seminal and prostatic fluid. • Transportation of sperm. UNIT II • Anatomy and histology of ovary. • Types of eggs in vertebrates.. • Oogenesis. • Ovarian follicular growth, hormonal regulation of oogenesis. • Puberty, menarche and menopause . UNIT III • Fertilization and its biochemistry. • Post fertilization events. • Cleavage, blastula, gastrulation and fate map. • Organogenesis in mammals. UNIT IV • Placentation. • Extra embryonic membrane in mammal. • Metamorphosis (progressive & retrogressive). • Regeneration.				
Course outcomes	<i>After successful completion of these courses the student would be able:</i> • To understand the fundamentals of gametogenesis • To gain in-depth knowledge on female hormonal coordination and control during milestone events of the ovarian cycle from menarch to menopause with biochemistry of fertilization • To understand the basic concepts of post fertilization and organogenesis in mammals • To understand the stages of implantation, establishment of placenta and process of metamorphosis				



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Text and References

1. Foundation of Embryology: Bradley N.Patten, McGraw Publication.1981
2. Fertilization in Animal: Brain Dale, Arnold Heiniman, Gulab Vazerani Publication.2001
3. Developmental Biology: N.J. Berril, Tata McGraw Hill Publication N. Delhi.1971
4. Embryology of Vertebrates: Nelson. Mc GROWHill Book company1953



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Course Title	Paper III: TOOLS & TECHNIQUE IN BIOLOGY				
Course Code	DUZOC203				
Course Credits	L	T	P	Details	
	4	1		5	
Prerequisites	NIL				
Course objectives	The students will understand the significance Hormones and their Biosynthesis.				
Course Contents	• UNIT -1 • <i>Principles and uses of analytical instruments.</i> ○ Balances – different parts & uses. ○ pH meter – Principle, construction, types & uses. ○ Colorimeters – Principle, construction, types & uses. ○ Spectrophotometer – Principle, construction, types & uses. ○ Ultra centrifuge – Principle, construction, types & uses. ○ Spectro fluorometer– Principle, construction, types & uses. ○ Radioactivity counter– Principle, construction, types & uses. • UNIT – II • <i>Microscopy.</i> ○ Principles of light transmission, ○ Phase contrast microscope – principle, construction & uses ○ Fluorescence microscope – principle, construction & uses ○ Transmission electron microscope (TEM) – principle, construction & uses ○ Scanning Electron microscopes (SEM) – principle, construction & uses ○ Immunological Techniques-ELISA and RIA • <i>Biosensors –</i> ○ Types and applications. • UNIT-III • <i>Separation techniques in biology:-</i> ○ Chromatography – Principle, process (method) & uses of Paper, Thin layer & Ion Exchange chromatography. ○ Gel Electrophoresis – Principle, process (method) & uses. ○ Centrifugation – Principle, process (method) & uses of Density gradient centrifugation and Unitgravity centrifugation. ○ Flow cytometry – Principle, process (method) & uses • UNIT – IV • <i>Cell culture -</i> ○ Culture media –NAM and PDA , ○ Cell harvesting methods, ○ Cell proliferation measurements. • <i>Sterilization techniques –</i> ○ Chemical and physical methods of sterilization ○ Principle, Construction and Uses of Autoclave and Laminar Air Flow • <i>Cryopreservation –</i> ○ different process & uses. • Basic concept and application of Remote sensing and GIS in biology.				



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Course outcomes	<i>After successful completion of these courses the student would be able:</i> • To acquaint with techniques of sterilization, cell culture and cryopreservation as well as understand the basic concept and application of remote sensing and GIS technology • To understand the basic principle and uses of analytical instruments like pH meter, centrifuge and working principle of Geiger Muller radioactivity counter • To explain the concepts of light and electron microscopy and immunological techniques • To understand and efficiently work with various separation techniques of chromatography and gelelectrophoresis • To gain the skills to explain the principle and applications of various biological techniques and concepts in biology
Text and References	• Practical Biochemistry: Wilson & Walker, Cambridge University Press, Cambridge.2010 • Text book of Biotechnology: Chatwal G.R. Anmol publications Pvt. Ltd. New Delhi.2002 • Tools of Biochemistry: Cooper T.G Wiley India Pvt Ltd 2011 • Microbiology: Sharma P.D. Rastogi publication, Meerut.2020



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Course Title	Paper IV: ENVIRONMENTAL PHYSIOLOGY				
Course Code	DUZOC204				
Course Credits	L	T	P	Details	
	4	1		5	
Prerequisites	NIL				
Course objectives	To understand the environmental adaptation in animals.				
Course Contents	UNIT – I • Adaptation: Pre adaptation and post adaptation, Causes of adaptation, Mechanism of adaptation, • Adaptive radiation: Adaptive radiation in mammals, Causes and Significance. • Acclimatization. • Mimicry and Coloration UNIT –II • Freshwater Adaptation in animals: Lentic habitat & Lotic habitat. • Marine water Adaptation in animals: Benthic Region, Pelagic Region and Deep Sea Region. • Estuaries Adaptation in animals. • Terrestrial Adaptation in animals: Desert, arboreal, Burrowing, Cursorial & Cave. • Aerial adaptation • Parasitic Adaptation UNIT –III • Basic concept of environmental stress and strain. • Role of hormone during stress and strain. • Homeostasis. • Thermoregulation (Comfort zone, body temperature, Physical, chemical and neural regulation). • Physiological response to body exercise. UNIT-IV • Osmoregulation: Fresh and marine fishes and in human beings. • Osmoregulation in human beings. • Physiological response to oxygen deficient stress. • Acid–base balance in mammals. • Meditation, yoga and their effects on digestive, respiratory and endocrine system. • Significance of body size.				



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Course outcomes	<i>After successful completion of these courses the student would be able:</i> • To explain the concept of adaptation and acclimatization. • To understand adaptive radiation in different aspects of terrain. • To explain the role of hormones during stress and homeostasis. • To understand the role of body size of organisms and effect of yoga and meditation on human physiology • To understand the life processes at various environmental condition
Text and References	• ANIMAL PHYSIOLOGY, MECHANISM AND ADAPTATION: Eckert, R., W.H. Freeman and Co. 1905 • BIOCHEMICAL ADAPTATION: Hochachka, P.W, and Somero S.N, Princeton, New Jersey. 2017 • ANIMAL PHYSIOLOGY, ADAPTATION AND ENVIRONMENT: Hochachka, P.W. and Somero S.N, Princeton, New Jersey Schiemidt Nielsen, Cambridge.1990 • GENERAL & COMPARATIVE ANIMAL PHYSIOLOGY: Hoar W.S. Princeton Hall of India.1975



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Course Title	Lab course: I (Combining Paper I and II)				
Course Code	DUZOP 205				
Course Credits	L	T	P	Details	
			4	2	
Prerequisites	NIL				
Course objectives	To understand the practical approach of basics of Developments and specimens.				
Course Contents	1. CULTURE AND CONTROLLED BREEDING OF DROSOPHILLA. 2. STUDY OF MORPHOLOGICAL VARIATIONS IN DROSOPHILA. 3. PRACTICALS BASED ON POPULATION ESTIMATION & POPULATION GENETICS. 4. EXERCISES BASED ON EVOLUTION. i. CONTRUCTION OF PHYLOGENETIC TREE. ii. EVOLUTIONARY RACES OF MAN. 5. IDENTIFICATION OF STAGES OF OOGENESIS & SPERMATOGENESIS. 6. IDENTIFICATION OF DEVELOPMENTAL STAGES OF GONADS. 7. IDENTIFICATION OF EMBRYONIC DEVELOPMENTAL STAGES IN FISH AND FROGS. 8. S TUDY OG EXTRAEMBRYONIC MEMBRANE IN CHICK. 9. IDENTIFICATION OF GAMETES. 10. STUDY OF GONADS (HISTOLOGY OF TESTES & OVARY) IN VERTEBRATES (THROUGH MICROTOMY).				



SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Course Title	Lab Course: II (Combining Paper III and IV)				
Course Code	DUZOP206				
Course Credits	L	T	P	Details	
			4	2	
Prerequisites	NIL				
Course objectives	To understand the Biotechniques.				
Course Contents	1. APPLICATIONS OF FOLLOWING EQUIPMENTS IN BIOLOGICAL TECHNIQUES: a. PH METER, COLORIMETER/SPECTROPHOTOMETER, CHROMATOGRAPHY (PAPER & THIN LAYER), CENTRIFUGE AND MICROSCOPE. 2. MEDIA PREPARATION. 3. STERILIZATION. 4. CULTURE OF BACTERIA. 5. DETERMINATION OF BLOOD PRESSURE UNDER NORMAL AND STRESSED CONDITION. 6. QUANTITATIVE ESTIMATION OF GLUCOSE LEVEL IN BLOOD. 7. OXYGEN CONSUMPTION OF ANIMALS UNDER STRESS.				



SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Course Title	Research Methodology				
Course Code	DUZODSE207				
Course Credits	L	T	P	Details	
	2	-	-	2	
Prerequisites	NIL				
Course objectives	The course aims to enable the students learn the concepts of Research techniques and it's applicability in the various minor and major researches. Fundamentals of research with specific reference to quantitative research methods would facilitate the students towards exploring the area of their interest.				
Course Contents	UNIT-I Research: An Introduction a) Types of Scientific Methods: Hypothetic-Deductive and Inductive Research b) Types of Research: Basic vs. Applied, Quantitative vs. Qualitative Research c) Principles of a Good Research UNIT-II The Research Process a) Stages of conducting a Research b) Problem and Hypothesis: Definition, Types c) Variables: Types, Operational definition UNIT-III Behavioural Research I a) Control of Extraneous Variables b) Laboratory experiments, Field Experiments c) Field study, Survey UNIT-IV Behavioural Research II a) Research: Causality and It's criteria b) Threats to Internal and External Validity c) Non-Experimental Research: Co-relational Research, Survey Research, Archival Research UNIT-V Sampling and Ethical Issues a) Sampling Issues: Representativeness and Adequacy b) Sampling Strategies: Probability and Non-probability Sampl				
Course outcomes	The paper focuses on the theoretical aspect of sampling methods, types of scientific methods and their usage in researches. It also enhances the students' knowledge about the stages of conductive research methods.				



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