COURSE OUTLINE AND SYLLABUS FOR M.Sc., ZOOLOGY UNDER CBCS SCHEME

SEMESTER-I

Sl. No	Paper	Title of the Paper	Instruction Hrs per Week	Credits	Duration of the Exam (Hrs)	Marks		
						IA Marks	Exam Marks	Total Marks
1	CPT-1.1	Animal Systematics	4	4	3	20	80	100
2	CPT-1.2	Biology of Non-Chordates	4	4	3	20	80	100
3	CPT-1.3	Molecular Cell Biology	4	4	3	20	80	100
4	SPT-1.4A	Computer Applications & Methods in Biology	4	4	3	20	80	100
	SPT-1.4B	Aquatic Biology						
5	CPP-1.5	Animal Systematics	4	2	4	10	40	50
6	CPP-1.6	Biology of Non-Chordates	4	2	4	10	40	50
7	CPP-1.7	Molecular Cell Biology	4	2	4	10	40	50
8	SPP-1.8A	Computer Applications & Methods in Biology	4	2	4	10	40	50
	SPP-1.8B	Aquatic Biology						
Total				**24**				**600**

SEMESTER-II

Sl. No	Paper	Title of the Paper	Instruction Hrs per Week	Credits	Duration of the Exam (Hrs)	Marks		
						IA Marks	Exam Marks	Total Marks
1	CPT-2.1	Biology of Chordates	4	4	3	20	80	100
2	CPT-2.2	Developmental Biology	4	4	3	20	80	100
3	SPT-2.3A	Molecular Genetics	4	4	3	20	80	100
	SPT-2.3B	Wildlife Biology & Conservation						
4	OET-2.4	Human Physiology	4	4	3	20	80	100
5	CPP-2.5	Biology of Chordates	4	2	4	10	40	50
6	CPP-2.6	Developmental Biology	4	2	4	10	40	50
7	SPP-2.7A	Molecular Genetics	4	2	4	10	40	50
	SPP-2.7B	Wildlife Biology & Conservation						
8	OEP-2.8	Human Physiology	4	2	4	10	40	50
Total				**24**				**600**

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SEMESTER-III

Sl. No	Paper	Title of the Paper	Instruction Hrs per Week	Credits	Duration of the Exam (Hrs)	Marks		
						IA Marks	Exam Marks	Total Marks
1	CPT-3.1	Biology of Reproduction	4	4	3	20	80	100
2	CPT-3.2	Animal Physiology	4	4	3	20	80	100
3	SPT-3.3A	Environmental Biology	4	4	3	20	80	100
	SPT-3.3B	Biodiversity						
4	OET-3.4	Applied Zoology	4	4	3	20	80	100
5	CPP-3.5	Biology of Reproduction	4	2	4	10	40	50
6	CPP-3.6	Animal Physiology	4	2	4	10	40	50
7	SPP-3.7A	Environmental Biology	4	2	4	10	40	50
	SPP-3.7.2B	Biodiversity						
8	OEP-3.8	Applied Zoology	4	2	4	10	40	50
Total				**24**				**600**

SEMESTER-IV

Sl. No	Paper	Title of the Paper	Instruction Hrs per Week	Credits	Duration of the Exam (Hrs)	Marks		
						IA Marks	Exam Marks	Total Marks
1	CPT-4.1	Evolutionary Biology	4	4	3	20	80	100
2	CPT-4.2	Animal Behaviour	4	4	3	20	80	100
3	SPT-4.3A	Endocrinology	4	4	3	20	80	100
	SPT-4.3B	Parasitology						
4	CPD-4.4	Project/ Dissertation	4	4	4	20	80	100
5	CPP-4.5	Evolutionary Biology	4	2	4	10	40	50
6	CPP-4.6	Animal Behaviour	4	2	4	10	40	50
7	SPP-4.7A	Endocrinology	4	2	4	10	40	50
	SPP-4.7B	Parasitology						
8	CPPP-4.8	CPPP – Presentation, Colloquium & Viva	4	2	4	10	40	50
Total				**24**				**600**

NOTE:

- *Compulsory field visit & Study Tour of about 10 days period to be undertaken during III semester.*
- *Candidate has to submit the detailed tour report along with 3.7 Examination.*

**** 4.4: CPD: Project Commences from the beginning of III semester and submission of Dissertation in IV semester.***

CPT: Core Paper Theory
SPT: Special Paper Theory
OET: Open Elective Theory
CPD: Dissertation/ Project work
CPP: Core Paper Practical
SPP: Special Paper Practical
OEP: Open Elective Practical
CPPP: VIVA

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2.6.1 Zoology

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Key Indicator - 2.6 Student Performance and Learning Outcomes (30)

2.6.1 Programme outcomes, Programme specific outcomes and course outcomes for all Programmes offered by the institution are stated and displayed on website and communicated to teachers and students

Describe Course Outcomes (COs) and mechanism of communication within a maximum of 500 words

Response:

Outcome Based Education (OBE) is been implanted in the Department of Studies and Research in Zoology Tumkur University since 2015 as OBE gives Zoology students what is expected after finishing M.Sc. in Zoology course. From OBE the Program specific (PSO_S) outcome, Program Outcome (PO_S) and Course outcomes (CO_S) are evolved . OBE helps Zoology students to achieve the outcomes which is very important before leaving the University

Mechanism of communication:

1. Conducting workshops for developing the Programme and Course outcomes and Learning outcomes at University level
2, Programme Handbook and assessment tools are made available online for use of all faculty and staff
3. Programme learning outcomes are also available on website for each academic programme

2.6.2 Attainment of Programme outcomes, Programme specific outcomes and course outcomes are evaluated by the institution Describe the method of measuring attainment of POs , PSOs and COs in not more than 500 words and the level of attaiment of POs , PSOs and COs.

Response:

The process of M.Sc. Zoology course outcome assessment is based on Internal and Semester Examination, Semester Assignments and Extra circular activities of Zoology students. Each question in internal or Semester Examination /Semester end /Assignment/ Seminar etc. are tagged to corresponding course outcome. The following Processes and Tools are used for the Attainment of course Outcomes.

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1. Internal Examination:

This type of Examination is carried out at the Department with the help of HOD and Faculties members to Assess the Internal marks of each paper present in the Curriculum of Zoology course.

2. Semester Examination:

This type of Examination is carried out during the Examination sessions which are held end of the semester. Each Exam is focused in attaining the course Outcomes semester End examination is a metric for assessing whether the COs of the department are attained or not examination is more focused on attainment of course outcomes and program outcomes.

3. Assignment:

Each and every Zoology students is assigned with course related tasks during every course work and assessment is done based on their performance, marks are assigned depending on their innovation in solving/ deriving the topic given to them.

4. Seminars:

Every Zoology student is assigned a topic related to the course and the students presented his/her seminar topic through presentation and the marks are assigned depending his/her performance and how the seminar is presented.

Compulsory marks are formulated for the Assessment, Major projects which are mandatory of each student related to the course. The performance of the zoology student in the examination during the semester in each course is used to computer the level of direct attainment of the Cos. The questions of each examination are tagged to the course.

Based on the results of implementation of outcome Assessment, Gaps in the desired target and the result actually achieved for each programme are identified. In the outcome assessment implementation report, Department also propose the Action plan to address these gaps which serves as an input during the programme review and strategic planning of the Department.

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Course outcomes
M. Sc. Zoology
Semester-1

Code	Course title	Course type	Learning methods	HPW(HOURS PER WEEK)	Credits
CPT-1.1	Animal Systematics	Core paper	-Black board -Power point -videos	4	4

After successful completion of this course students are able to:

Unit - I

- Understand the biodiversity of living world and rules of binomial nomenclature.
- Learn about basic science taxonomy and systematics.
- Studied the principles of taxonomy and its biological classification of plant and animal species.

Unit - II

- Understand the theories of biological classification and its arrangement by ascending order of taxonomic categories and Hierarchy.
- Learn some examples of organisms including their taxonomic categories.
- Understand the higher taxa and taxonomic aids.

Unit - III

- Learn the skills of preservation of specimens.
- Study the taxonomic procedure for collection, preservation and maintenance of specimens.
- Learn the scientific naming of organisms based on the principle and criteria provided ICZN.

Unit - IV

- Learn the general characters and classification of Invertebrate phyla from Protozoa to Echinodermata.
- Know the general characters and classification of minor phyla.

Unit - V

- Know the general characters and classification of Protochordates.
- Understand the general characters and classification of Chordates up to fishes to mammals.

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Course outcomes
M. Sc. Zoology
Semester-1

Code	Course title	Course type	Learning methods	HPW(HOURS PER WEEK)	Credits
CPT-1.2	Biology of Non-Chordates	Core paper	-Black board -Power point -videos	4	4

After successful completion of this course students are able to:

Unit - I

- Understand the movements of microorganisms.
- Study the locomotion in arthropods and its locomotory organs.

Unit - II

- Understand the food and feeding habits in non-chordates.
- Learn the procedure of digestion that occurs in non-chordates.
- Know the filter feeding mechanism in polycheats, molluscans, echinoderms.
- Study the different types of nutrition like symbiotic nutrition.

Unit - III

- Know the different types of respiratory organ and also respiratory pigments and their functions.
- Study the mechanism of respiration in lower organisms.
- Know the different types of respiratory organs and its mechanism of excretion.

Unit - III

- Know the primitive nervous system in Coelenterata, Echinodermata.
- To know the advance nervous system in Annelida and Arthropoda.

Unit – IV

- Study the patterns of reproduction in invertebrates.
- Learn about larval form of free living and parasites.

Unit - VI

- Study the general characters and affinities of minor phyla.

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Course outcomes
MSc Zoology (CBCS)
Semester – I

Code	Course title	Course type	Learning methods	HPW (hours per week)	Credits
CPT- 1.3	**Molecular Cell Biology**	Core Paper	• Black board • PPT • VIDEOS	4	4

After successful completion of this course students are able to:

Unit – I

- Learn the basic principles of molecular cell Biology.
- Understand the central dogma of molecular Biology.
- Study the scope of modern cell Biology and synthetic Biology.

Unit – II

- Understand the biochemistry of cell.
- Know the structure and classification of biomolecules - proteins, carbohydrates, lipids and nucleic acids.
- Study the structure of proteins- primary, secondary and tertiary structures.

Unit – III

- Understand the structural and functional aspects of bio-membranes at molecular level.
- Study the molecular aspects of modifications of membranes.
- Know the communication between cell to cell and their recognition.

Unit – IV

- Know the molecular organization and function of eukaryotic organelles.
- Understand the molecular organization and functions of cytoskeletal structure- microfilaments, microtubules, cilia and flagella.

Unit – V

- Study the molecular anatomy of eukaryotic chromosomes.
- Know the different types of chromosomes, heterochromatin.
- Understand the structure and functions of specialized chromosomes- polytene and Lampbrush chromosomes.

Unit –VI

- Molecular organization of genome- structure of gene.
- Understand the molecular aspects of gene transcription, post-transcriptional processing of mRNA.
- Know the molecular basis of reverse transcription.

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Unit –VII

- Understand the molecular events during different stages of cell cycle.
- Significances of cyclins and cyclin-dependent kinases in cell cycle.
- Molecular regulation of CdK-cyclin activity.

Unit –VIII

- Know the basic principles of biology of aging at molecular level.
- Understand the molecular biology of cancer cell- carcinogenesis.
- Study on the molecular mechanism and significance of apoptosis.

Unit – IX

- Study of cellular and molecular basis of immunity.
- Know the types of immune response.
- Understand the genetic control of immune function.

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Course out comes
M. Sc. Zoology
Semester-1

Code	Course title	Course type	Learning methods	HPW(HOURS PER WEEK)	credits
SPT-1.4	Computer Applications and Methods in Biology	Soft paper	-Black board -Power point -videos	4	4

After successful completion of this course students are able to:

Unit – I

- Learn the hardware and software components computer.
- Know the knowledge about maintenance of computer system, operating system and programming languages.
- Study the scope and application of bioinformatics.

Unit – II

- Understand the use of computer assisted teaching.
- Study molecular modelling and image analysis.
- Know the knowledge about computer interfacing equipment's like microscope and scanning and micrometric analysis.

Unit - III

- Know the concept of data processing and plotting.
- Know the how to use Microsoft office.
- Understand the application of Coral draw.

Unit - IV

- Study the concept of computer networking cable and wifi connection.
- Learn the access of internet and internet browser, search engine and information retrieval.
- Know the knowledge about cloud computing for data storage.

Unit - V

- Study the different types of microscope and their working methods.
- Know the importance of microscopes in field of science and laboratories.
- Study the process involved in the preparation of permanent slides for histological and histochemical staining techniques and its uses.

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Unit - VI

- Know the knowledge about cell and tissue culture and types of culture, cell lines and culture media.
- Understand the applications of immune florescence and vital stain.

Unit - VII

- Study the separation instrument techniques like chromatography and gel electrophoresis.
- Know the application and methods of centrifugation and cell fractionation.
- Understand the scope of spectroscopy, flow cytofluorimetry and its working principal.

Unit - VIII

- Know the concept of radio isotopes and tracer technique and properties of radio isotopes.
- Understand the unit of measurement of radio activity, auto radiography and utility.
- Study the concept of radio immunoassay, radiometric enzyme assay and liquid scintillation counters.

Unit - IX

- Learn how to care and handling laboratory animals.
- Understand the goals and objectives of CPCSEA.
- Know the alternatives for use of animals for laboratory experiment to prevent vivisections.

Unit - X

- Know how to write science report, paper and bibliography.
- Understand citation index and impact factors.
- Know the working procedure and application of microphotography, micrometry and field photography.
- Know the concept of biostatistics and how to calculate biostatistics problems.
- Understand the significance of t-test, analysis variance (ANOVA).

Course Outcomes
M. Sc. Zoology II semester

Code	Course tittle	Course types	Learning methods	Hours per week	credits
SPT-2.3A	Molecular Genetics	Special paper	• Black board • Ppt • Videos	4	4

On completion of the course, students are able to,

Unit I

- Understand the history and scope of Molecular Genetics.
- The basic principles of Mendelian genetics, population genetics and heredity and gives an overview on the Deviations from Mendelian genetics.
- Learn to identify the DNA as genetic material by understanding its properties and storage and mechanism of transmission of genetic information.

Unit II

- Understand the semiconservative method of replication of DNA.
- Know the applications of DNA polymerases and Ligases in DNA replication.
- Learn about the circular DNA and its replication in prokaryotic cell and eukaryotic organelles.

Unit III

- Learn about molecular aspects of eukaryotic and prokaryotic gene transcription.
- Identify different types of RNA molecules based on their structure and functions.
- Learn the post-transcriptional process- Mechanism of 5'cap formation, 3' polyA tail formation and splicing in eukaryotic mRNA processing.

UNIT IV

- Understand the basics of genetic code.
- Structures and applications of Transfer RNA and Amino synthetases in translation process.
- Learn the process of translation – polypeptide chin synthesis, in eukaryotic and prokaryotic cells. Polycistronic mRNA.

UNIT V

- Understand the molecular aspects of gene regulation in prokaryotic and eukaryotic cell.
- Learn about the regulation of gene expression in Lac-operon and other operon model of *E.coli* bacteria.
- Know the auto regulation and feedback initiation in gene regulation.

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UNIT VI

- Know the types of mutations, molecular basis of mutations.
- Learn about intercalating substances.
- Understand the transposable elements and their significances.

UNIT VII

- Study about the stages of lytic cycles of bacteriophages.
- Understand the gene regulation in T_4, T_7 phage – lytic and lysogenic cycle.

UNIT VIII

- Understand the DNA repair.
- Discuss about DNA recombination.
- Know the causes of genetic disorders and gene therapy.

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Course out comes
M.Sc. Zoology
Semester-II

Code	Course title	Course type	Learning methods	HPW(HOURS PER WEEK)	Credits
CPT-2.1	Biology of Chordates	Core paper	-Black board -Power point -videos	4	4

After successful completion of this course students are able to:

Unit-I

- Know the concept of origin of chordates based on theories.
- Learn about Protochordata and life cycle of Salpa, Doliolium and Amphioxus.
- Know the significance of retrogressive metamorphosis.

Unit-II

- Study the origin and evolution of vertebrates groups Agnatha, placoderms and chondrichthyes.
- Understand the lateral line system in fishes and its role.
- Know the causes of migration in fishes.

Unit-III

- Know the concept of origin and evolution in amphibians and how parental care how in amphibian.
- Understand the Neoteny adaptive radiation.

Unit-IV

- Know the concept of origin and evolution of temporal arcades and fossae of reptiles.
- Understand adaptive radiation in living reptiles.
- Study the poisonous and non-poisonous snakes in India.

Unit-V

- Understand the mechanism of flight in birds and their aerial adaptations.
- Know the courtship and breeding behaviour in aquatic and migratory birds.

Unit-VI

- Know the concept of origin and evolution of mammals.
- Understand the adaptative radiation in marsupials.
- Know more about the evolution of mammalian ear ossicles.

Course out comes
M. Sc. Zoology
Semester-II

Code	Course title	Course type	Learning methods	HPW(HOURS PER WEEK)	Credits
CPT-2.2	Developmental Biology	Core paper	-Black board -Power point -videos	4	4

After successful completion of this course students are able to:

Unit-I

- Know the basic concepts about developmental biology.
- Study the issues related to developmental biology.
- Understand the anatomical and experimental approach to developmental biology.

Unit-II

- Understand the concept about gene and the embryological origin of gene theory.
- Learn about nulceo-cytoplasmic interaction in acetabularia and frog during early development.
- Know the advantages of stem cell research and regenerative medicines.

Unit-III

- Understand the concept of early embryonic development.
- Know the strategies for monospermy and conservation of species specificity.
- Study the cleavage and blastulation process in Drosophila, amphioxus, frog, mouse and the process blastulation & gastrulation in chick.

Unit -IV

- Understand the early development in Drosophila.
- Learn the experimental analysis in early development of sea urchin.

Unit-V

- Understand the axis formation in amphibians and the progressive determination of amphibian axis.
- Know the primary embryonic induction and regional specificity of induction in amphibians.
- Learn about human organogenesis.

Unit-VI

- Understand the post embryonic and abnormal development occurs in organisms.
- Learn the concepts in regeneration in hydra, planaria and salamander limb.
- Know the concepts of metamorphosis and morphological, biochemical changes and hormonal control of metamorphosis. Concepts of Teratology and aging.

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Course Outcomes
M. Sc. Zoology II semester

Code	Course tittle	Course types	Learning methods	Hours per week	credits
SPT-2.3A	Molecular Genetics	Soft paper	• Black board • PPt • Videos	4	4

On completion of the course, students are able to,

Unit I

- Understand the history and scope of Molecular Genetics.
- The basic principles of Mendelian genetics, population genetics and heredity and gives an overview on the Deviations from Mendelian genetics.
- Learn to identify the DNA as genetic material by understanding its properties and storage and mechanism of transmission of genetic information.

Unit II

- Understand the semiconservative method of replication of DNA.
- Know the applications of DNA polymerases and Ligases in DNA replication.
- Learn about the circular DNA and its replication in prokaryotic cell and eukaryotic organelles.

Unit III

- Learn about molecular aspects of eukaryotic and prokaryotic gene transcription.
- Identify different types of RNA molecules based on their structure and functions.
- Learn the post-transcriptional process- Mechanism of 5'cap formation, 3' polyA tail formation and splicing in eukaryotic mRNA processing.

UNIT IV

- Understand the basics of genetic code.
- Structures and applications of Transfer RNA and Amino synthetases in translation process.
- Learn the process of translation – polypeptide chin synthesis, in eukaryotic and prokaryotic cells. Polycistronic mRNA.

UNIT V

- Understand the molecular aspects of gene regulation in prokaryotic and eukaryotic cell.
- Learn about the regulation of gene expression in Lac-operon and other operon model of *E.coli* bacteria.
- Know the auto regulation and feedback initiation in gene regulation.

UNIT VI

- Know the types of mutations, molecular basis of mutations.
- Learn about intercalating substances.
- Understand the transposable elements and their significances.

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UNIT VII

- Study about the stages of lytic cycles of bacteriophages.
- Understand the gene regulation in T_4, T_7 phage – lytic and lysogenic cycle.

UNIT VIII

- Understand the DNA repair.
- Discuss about DNA recombination.
- Know the causes of genetic disorders and gene therapy.

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Course Outcomes
M. Sc. Zoology II semester

Code	Course tittle	Course types	Learning methods	Hours per week	credits
OET-2.8	Human Physiology	Open elective paper	• Black board • PPt • Videos	4	4

On completion of the course, students are able to,

Unit- I

- Know the functional organization of human body.
- Understand the internal environmental and homeostasis of cell.
- Study the general physiology and function of a cell.

Unit – II

- Understand the membrane physiology – transport across membrane.
- Know the anatomy and physiology of muscular system.
- Study of cardiac problems.

Unit- III

- Understand the composition of blood, blood groups, transfusion and artificial blood.
- Know the blood circulation in humans.
- Learn the various blood related problems in humans.

Unit -IV

- Understand the functional morphology of the gastrointestinal tract.
- Know the physiology of digestion and absorption.
- Identify various problems related to gastrointestinal tract.

Unit -V

- Able to enhance the structural and physiology of human respiratory system.
- Understand the mechanisms of transport of respiratory gases.
- Identify the disorders related to respiratory system.

Unit-VI

- Know the structure and function of excretory system.
- Understand the physiology of excretion.
- Identify the diseases related to excretory system.

Unit–VII

- Understand the general organizations of nervous system.
- Study the structure, conduction of nerve impulse.
- Illustrate the functional differentiation of brain and mental related problems.

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Unit –VIII

- Enumerate physiology of reproduction and hormone roles in reproduction.
- Know the physiology of pregnancy and parturition.
- Understand reproductive technologies and pre-natal identification of sex and gender bias.

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Course outcomes
M. Sc. Zoology (CBCS)
Semester – III

Code	Course title	Course type	Learning methods	HPW (hours per week)	Credits
CPT- 3.1	Biology of Reproduction	Core Paper	• Black board • PPT • VIDEOS	4	4

After successful completion of this course students are able to:

Unit – I

- Understand the overview of reproduction and its types
- Understand the process of Gametogenesis.
- Students will learn different methods of Asexual Reproduction.

Unit – II

- Know about Sex differentiation and Sex determination.
- Understand about the development of gonads and gonadal ducts.
- Know the importance of each gonadal duct in particular sex.
- Understand the role of law of Segregation in Sex differentiation.
- Understand the Biosynthesis of Gonadal Hormones and their control in both the Sexes.

Unit – III

- Know the Reproductive cycles in Non-mammalian Indian Vertebrates

Unit – IV

- Understand the Anatomy of Male Reproductive System.
- Understand the hormonal control of spermatogenesis and role of Androgens.

Unit – V

- Understand the Morphology and Hormonal regulation of Male Reproductive Organs.
- Know about Biochemistry of Semen and Biology of Spermatozoa.

Unit – VI

- Understand the Anatomy of Female Reproductive System.
- Understand the hormonal control of Folliculogenesis and Physiological roles of Estrogens and the histo-architecture of ovary.
- Know the difference between Estrous cycle and menstrual cycle and their Hormonal regulation.

Unit – VII

- Understand the sequence of events and the role of mediators during Implantation.

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- Study the structural and functional aspects of placentation and role of Placental hormones.
- Understand metabolic activity and hormonal control during Pregnancy.

Unit – VIII

- Understand the activation and stimulus during Parturition in different animal models.
- Hormones and other factors' influence on Parturition.
- Know the morphological and functional development of mammary glands and influence of Hormones on Milk ejection.

Unit – IX

- Understand the various reproductive technologies- IVF, GIFT.
- Know the fertility control in Male and Female.

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Course Outcomes
M. Sc. Zoology (CBCS)
III semester

Subject code	Course Title	Course Type	Learning Methods	Hours per week	Credits
CPT-3.2	Animal Physiology	Core paper	Power point, Black board, Videos	4hrs	4

After successful completion of this course students are able to:

Unit-I

- Understand the basics of animal physiology and the basic principles of food and energy in various animals.
- Study the feeding digestion mechanism in animals.
- To know the metabolism and effects of various factors on metabolism.

Unit-II

- Understand the mechanism of respiration in different vertebrates and invertebrates.
- Know the mechanisms of transport of respiratory gases in animals.
- Study the general principles of circulation in both vertebrates and invertebrates.

Unit-III

- Understand the effects of temperature on animals of different altitudes and habitats.
- Know the temperature regulation in birds and mammals.

Unit-IV

- Understand the water significance and osmatic regulation in aquatic vertebrates and invertebrates.
- Know the influence of hormones and osmoregulation in aquatic animals.
- Study the different patterns of excretion in animals.

Unit-V

- Understand the basic principles of enzymatic actions.
- Know the significant role of enzymes in various metabolic activities of animals.

Unit-VI

- Understand the mechanisms of movement and locomotion in animals.
- Know the functional mechanisms of sensory organs.
- Study the transmission of nerve impulses.

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Course Outcomes
M. Sc. Zoology (CBCS)
III semester

Code	Course tittle	Course types	Learning methods	Hours per week	credits
SPT-3.3A	Environmental Biology	Soft paper	• Black board • PPt • videos	4	4

On completion of the course, students are able to,

Unit -I

- Understand the layers of earth environment- Atmosphere, hydrosphere, and lithosphere.
- Study the different bio-geographical realms of the world.

Unit II

- Understand the basic principles of development and evolution of ecosystems.
- Study the components of ecosystem.
- Know the different types of ecosystems including their habitats.

Unit III

- Understand the types of natural resources- Renewable and non-renewable resources.
- Know the effects of over exploitation of natural resources.
- Learn to adapt conservation and sustainable management.
- Study the effects of modern agricultural methods on food resources, land resources and mineral resources.

UNIT IV

- Understand the definition, causes, effects and control measures of environmental pollution.
- Know the causes, effects and control measures of solid waste and biomedical wastes.

UNIT V

- Understand the impact of toxic pollutants on flora, fauna and humans.
- Know the biodegradation, biotransformation, bio magnification and bioaccumulation of toxicants.
- Learn the monitoring physical and chemical methods of environmental pollutants.

UNIT VI

- Understand the basic mechanisms of disaster management- floods, earthquake, cyclone and landslides.
- Know the effects of climate change- global warming, ozone layer depletion, acid rain.

UNIT VII

- Understand the values and ethics of human environment and health.
- Know the effects of population growth and other issues on environment.

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- Study of human rights.

UNIT VIII

- Learn the environment and social issues.
- Know the role of educational institutes and other agencies on environmental awareness.
- Understand the environmental protection act and related acts.

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Course outcomes
M. Sc. Zoology (CBCS)
Semester – III

Code	Course title	Course type	Learning methods	HPW (hours per week)	Credits
OET -3.4	Applied Zoology	Open Elective Paper	• Black board • PPT • VIDEOS	4	4

After successful completion of this course students are able to:

Unit – I

- Understand the scope and methods of sericulture.
- Know the life cycle of silk moth with different stages of life cycle.
- Have the skills on rearing the silkworm.
- Inculcate the applications of sericulture in their future life.

Unit – II

- Understand the history and scope of Apiculture.
- Identify the different species of honey bee and their distributions.
- Learn the significance and management of apiculture.
- Develop the skills of application of honey bee by-products.

Unit – III

- Understand the scope and methods of vermiculture.
- Learn the uses of earthworm for biodegradation of organic waste materials.
- Study the techniques of vermiculture.

Unit – IV

- Learn the economic significance of aquaculture.
- Know the different techniques of Fin-fish and shell-fish culture in India.
- Adapt techniques of prawn, edible bivalve and pearl culture in their life.

Unit – V

- Know the history, importance and scope of dairy.
- Learn the techniques of different dairy breeds and their management.
- Study the principles and methods of breeding.
- Understand the applications of dairy products.

Unit –VI

- Know the history, importance and scope of poultry.
- Learn the techniques of different poultry breeds and their management.
- Understand the economic values of poultry products.
- Identify and study the poultry pathogens and their diseases.

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Unit –VII

- Understand the scope and significance of lac culture.
- Learn the techniques of lac culture.
- Know the applications of products of lac culture.

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Course outcomes
M. Sc. Zoology (CBCS)
Semester – IV

Code	Course title	Course type	Learning methods	HPW (hours per week)	Credits
CPT- 4.1	Evolutionary Biology	Core Paper	• Black board • PPT • Videos	4	4

After successful completion of this course students are able to:

Unit – I

- Know the overview of landmarks in Evolutionary Biology.
- Understand the basic concepts in Evolutionary Biology.
- Learn the period of evolution.

Unit – II

- Understand the concept of organic evolution.
- Know the evolution through ages – Geological time scales.
- Learn the evidences of organic evolution.

Unit – III

- Learn the contributions of Charles Darwin, Alfred Russell Wallace and the Thomas Malthus in field of evolutionary biology.
- Understand the concepts of Darwinism, Neo-Darwinism and Lamarckian concepts.
- Know the importance of Hardy-Weinberg Laws of genetic equilibrium.

Unit – IV

- Understand the biological and phylogenetic concepts in speciation.
- Know the pattern and mechanism of reproductive isolation.
- Learn the models of speciation- Allopatric, sympatric, Strasipatric.

Unit – V

- Understand the origin of higher categories.
- Know the micro and macro evolution.

Unit –VI

- Understand the evolution of life histories.
- Enumerate evolutionary age and size at maturation, life history trade-offs.
- Know the evolutionary life span and ageing.

Unit –VII

- Understand the hypothesis, advantage and disadvantages of sex and recombination in evolution. Learn the sex ratio, sex allocation and sex determination.
- Understand the impact of evolutionary biology on medicines.

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Course Outcomes
M. Sc. Zoology (CBCS)
IV semester

Code	Course tittle	Course types	Learning methods	Hours per week	credits
CPT- 4.2	Animal Behaviour	Core paper	• Black board • Ppt • Videos	4	4

On completion of the course, students are able to,

Unit I

- Know the History of science of Animal behaviour.
- Study of Diversity and Unity in the behaviour of animals.
- Understand the complex type of behaviour seen the animals

Unit -II

- Understand the various learning types- Accommodative &Associate learning.
- Study of hormonal actions in the early development of behaviour in animals.
- Know the genetic basis and neural control of behaviour in animals.

Unit- III

- Learn the various forms of Stereotyped behaviour- Kinesis, Taxis, Orientation and Reflexes

Unit -IV

- Understand the various models of motivation in the behaviour of animals.
- Know the Conflict behavioral patterns seen in animals at different situations.

Unit -V

- Know the various actions of stimuli in the communication of animals.

Unit -VI

- Understand the ecological aspects of behaviour in animals- food selection, habitat selection etc.

Unit-VII

- Study the ritual & courtship behaviour shown by the animals in the selection of opposite sex.

Unit –VIII

- Understand the Social organizations in Insects and Primates

Unit –XI

- Understand the role of Pineal gland in the hormonal control of biological cycles.
- Know the various types of biological rhythms- Circadian and Circannual Rhythms.

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Unit –X

- Study the biological actions of Pheromones in vertebrates and Invertebrates.
- Know the social life in insects-Termites and Honeybee.
- Understand the hormonal actions in the metamorphosis of insect and Crustacea.

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Course out comes
M. Sc. Zoology (CBCS)
IV- Semester

Code	Course title	Course type	Learning methods	HPW(hours per week)	Credits
SPT- 4.3A	Endocrinology	Soft paper	-Black board -Power point -videos	4	4

After successful completion of this course students are able to:

Unit-I

- Study the evolution of endocrine function and hormones as biological signals.
- Study the concept of neuroendocrine system, and also what are the methods used in endocrine research.

Unit-II

- Know the nature of hormone action and its hormone receptors such as membrane, cytosolic and nuclear receptors.
- Study the mechanism of signal transduction and role of G-protein in signal transduction.
- Understand the concept cyclic AMP and the second messenger.

Unit-III

- Study the structure of hypothalamohypophysial complex in vertebrates.
- Study the comparative account of hypothalamic regulation of pituitary function.
- Study the hormonal feedback systems.

Unit -IV

- Study the comparative morphology of the pineal gland in vertebrates.
- Know the how biosynthesis and metabolism occur in melatonin
- Know the function of pineal gland in different vertebrates.

Unit-V

- Know the concept of pituitary glands; comparative morphology, chemistry and biological actions of anterior and posterior pituitary hormones.

Unit -VI

- Know the concept of evolution of thyroid function in vertebrates and its biosynthesis and biological actions of thyroid hormones.
- Study the parathyroid hormones and calcium homeostasis: parathormone, calcitonin, vitamin D and their interaction.

Unit –VII

- Understand the biosynthesis and biological action of hormones of adrenal glands.
- Study the biosynthesis and physiological action of adrenal catecholamines.

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Unit –VIII

- Know the chemical and physiological action of GI hormones of the gastro intestinal tract and pancreas.
- Understand the glucose homeostasis.

Unit –IX

- Study the action of hormones in the regulation of carbohydrate, lipid and protein metabolism.

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