

Bachelor of Science

Zoology

Syllabus

Faculty of Science

MAULANA AZAD UNIVERSITY, JODHPUR

B.Sc. Semester-I

Schemes for Internal Assessments and End Semester Examinations Semester-wise

Course	Subject	Code	Paper	CIA-I	CIA-II	ESE	Total
ELECTIVE COURSES	Botany	BSBO 111	Algae, Lichens and Bryophytes	10	10	80	100
		BSBO 112	Mycology, Microbiology and Phytopathology	10	10	80	100
		BSBO 121	Botany Lab-I	10	10	80	100
	Chemistry	BSCH 111	Inorganic Chemistry-I	10	10	80	100
		BSCH 112	Organic Chemistry-I	10	10	80	100
		BSCH 121	Laboratory Course-I	10	10	80	100
	Mathematics	BSMT 111	Algebra	10	10	80	100
		BSMT 112	Differential Calculus	10	10	80	100
		BSMT 113	Co-Ordinate Geometry in 2-Dimensions and 3-Dimensions	10	10	80	100
	Physics	BSPH 111	Mechanics	10	10	80	100
		BSPH 112	Electromagnetics	10	10	80	100
		BSPH 121	Physics Lab-I	10	10	80	100
	Zoology	BSZO 111	Taxonomy of Lower Non Chordate	10	10	80	100
		BSZO 112	Cytology and Genetics-I	10	10	80	100
		BSZO 121	Zoology Lab-I	10	10	80	100
	Public Health	PHLT 111	Human Biology	10	10	80	100
		PHLT 112	Introduction to Public Health	10	10	80	100
		PHLT 121	Human Biology and First Aid Lab	10	10	80	100
Core Courses	Compulsory Paper	BHN 131	General Hindi	10	10	80	100*
		BEN 131	General English	10	10	80	100*

B.Sc. Semester-II

Schemes for Internal Assessments and End Semester Examinations Semester-wise

Course	Subject	Code	Paper	CIA-I	CIA-II	ESE	Total
ELECTIVE COURSES	Botany	BSBO 211	Pteridophytes	10	10	80	100
		BSBO 212	Gymnosperms and Palaeobotany	10	10	80	100
		BSBO 221	Botany Lab-II	10	10	80	100
	Chemistry	BSCH 211	Physical Chemistry-I	10	10	80	100
		BSCH 212	Organic Chemistry-II	10	10	80	100
		BSCH 221	Laboratory course-II	10	10	80	100
	Mathematics	BSMT 211	Differential Equations	10	10	80	100
		BSMT 212	Integral and Vector Calculus	10	10	80	100
		BSMT 213	Co-ordinate Geometry in 3-Dimensions	10	10	80	100
	Physics	BSPH 211	Optics	10	10	80	100
		BSPH 212	Waves and Oscillations	10	10	80	100
		BSPH 221	Physics Lab-II	10	10	80	100
	Zoology	BSZO 211	Evolution and Biology of Higher Non Chordate	10	10	80	100
		BSZO 212	Molecular Biology and Genetics II	10	10	80	100
		BSZO 221	Zoology Lab-II	10	10	80	100
	Public Health	PHLT 211	Epidemiology	10	10	80	100
		PHLT 212	Biostatistics and Computer Applications	10	10	80	100
		PHLT 221	Epidemiology and Biostatistics Lab	10	10	80	100
Core Courses	Compulsory Paper	BES 231	Environmental Studies	10	10	80	100*

B.Sc. Semester-III

Schemes for Internal Assessments and End Semester Examinations Semester-wise

Course	Subject	Code	Paper	CIA-I	CIA-II	ESE	Total
ELECTIVE COURSES	Botany	BSBO 311	Anatomy of Angiosperms, Economic Botany and Ethnobotany	10	10	80	100
		BSBO 312	Cell and Molecular Biology	10	10	80	100
		BSBO 321	Botany Lab-III	10	10	80	100
	Chemistry	BSCH 311	Inorganic Chemistry-II	10	10	80	100
		BSCH 312	Physical Chemistry-II	10	10	80	100
		BSCH 321	Laboratory Course-III	10	10	80	100
	Mathematics	BSMT 311	Partial Differential Equation and Laplace Transform	10	10	80	100
		BSMT 312	Numerical Analysis	10	10	80	100
		BSMT 313	Dynamics of a Particle	10	10	80	100
	Physics	BSPH 311	Statistical and Thermal Physics	10	10	80	100
		BSPH 312	Electronic Devices and Circuits	10	10	80	100
		BSPH 321	Physics Lab-III	10	10	80	100
	Zoology	BSZO 311	Biology of Chordates	10	10	80	100
		BSZO 312	Immunology & Microbiology	10	10	80	100
		BSZO 321	Zoology Lab-III	10	10	80	100
	Public Health	PHLT 311	Determination of Health and Disease	10	10	80	100
		PHLT 312	Essentials of Demography	10	10	80	100
		PHLT 321	Demography Lab.	10	10	80	100

B.Sc. Semester-IV

Schemes for Internal Assessments and End Semester Examinations Semester-wise

Course	Subject	Code	Paper	CIA-I	CIA-II	ESE	Total
ELECTIVE COURSES	Botany	BSBO 411	Taxonomy and Embryology of Angiosperms	10	10	80	100
		BSBO 412	Cytogenetics, Genetics, Plant Breeding, Evolution and Biostatistics	10	10	80	100
		BSBO 421	Botany Lab-IV	10	10	80	100
	Chemistry	BSCH 411	Inorganic Chemistry-III	10	10	80	100
		BSCH 412	Organic Chemistry-III	10	10	80	100
		BSCH 421	Laboratory Course-IV	10	10	80	100
	Mathematics	BSMT 411	Optimization Techniques	10	10	80	100
		BSMT 412	Abstract Algebra	10	10	80	100
		BSMT 413	Statics	10	10	80	100
	Physics	BSPH 411	Electrodynamics	10	10	80	100
		BSPH 412	Quantum Mechanics	10	10	80	100
		BSPH 421	Physics Lab-IV	10	10	80	100
	Zoology	BSZO 411	Comparative Anatomy of Chordates	10	10	80	100
		BSZO 412	Animal Embryology	10	10	80	100
		BSZO 421	Zoology Lab-IV	10	10	80	100
	Public Health	PHLT 411	Fundamentals of Epidemiology	10	10	80	100
		PHLT 412	Biostatistics And Research Methods	10	10	80	100
		PHLT 421	Epidemiology and Biostatistics Lab	10	10	80	100

B.Sc. Semester-V

Schemes for Internal Assessments and End Semester Examinations Semester-wise

Course	Subject	Code	Paper	CIA-I	CIA-II	ESE	Total
ELECTIVE COURSES	Botany	BSBO 511	Plant Physiology and Biochemistry	10	10	80	100
		BSBO 512	Plant Tissue Culture	10	10	80	100
		BSBO 521	Botany Lab-V	10	10	80	100
	Chemistry	BSCH 511	Organic Chemistry-IV	10	10	80	100
		BSCH 512	Physical Chemistry-III	10	10	80	100
		BSCH 521	Laboratory Course-V	10	10	80	100
	Mathematics	BSMT 511	Metric and Vector Spaces	10	10	80	100
		BSMT 512	Complex Analysis	10	10	80	100
		BSMT 513	Hydrostatics	10	10	80	100
	Physics	BSPH 511	Atomic and Molecular Spectroscopy and Laser Physics	10	10	80	100
		BSPH 512	Solid State Physics	10	10	80	100
		BSPH 521	Physics Lab-V	10	10	80	100
	Zoology	BSZO 511	Animal Physiology	10	10	80	100
		BSZO 512	Ecology	10	10	80	100
		BSZO 521	Zoology Lab-V	10	10	80	100
	Public Health	PHLT 511	Epidemiology of Communicable and Non Communicable Diseases	10	10	80	100
		PHLT 512	Health Care Systems	10	10	80	100
		PHLT 521	Health Care System Lab	10	10	80	100

B.Sc. Semester-VI

Schemes for Internal Assessments and End Semester Examinations Semester-wise

Course	Subject	Code	Paper	CIA-I	CIA-II	ESE	Total
ELECTIVE COURSES	Botany	BSBO 611	Ecology and Environmental Biology	10	10	80	100
		BSBO 612	Recombinant DNA Technology	10	10	80	100
		BSBO 621	Botany Lab-VI	10	10	80	100
	Chemistry	BSCH 611	Inorganic Chemistry-IV	10	10	80	100
		BSCH 612	Physical Chemistry-IV	10	10	80	100
		BSCH 621	Laboratory Course-VI	10	10	80	100
	Mathematics	BSMT 611	Discrete Mathematics	10	10	80	100
		BSMT 612	Real Analysis	10	10	80	100
		BSMT 613	Computer Oriented Numerical Analysis	10	10	80	100
	Physics	BSPH 611	Nuclear Physics	10	10	80	100
		BSPH 612	Analog and Digital Electronics	10	10	80	100
		BSPH 621	Physics Lab-VI	10	10	80	100
	Zoology	BSZO 611	Biodiversity and Ethology	10	10	80	100
		BSZO 612	Applied Zoology	10	10	80	100
		BSZO 621	Zoology Lab-VI	10	10	80	100
	Public Health	PHLT 611	Health Education and Health Promotion and Communication	10	10	80	100
		PHLT 612	Global Health	10	10	80	100
		PHLT 621	Field Project	10	10	80	100

B.Sc. Zoology

Schemes for Internal Assessments and End Semester Examinations Semester-wise

Semester	Subject	Code	Paper	CIA-I	CIA-II	ESE	Total
I Sem.	Core Subjects	BSZO 111	Taxonomy of Lower Non Chordate	10	10	80	100
		BSZO 112	Cytology and Genetics-I	10	10	80	100
		BSZO 121	Zoology Lab-I	10	10	80	100
	Compulsory Paper	BHN131/ BEN131	Samanya Hindi/ General English	10	10	80	100*
II Sem.	Core Subjects	BSZO 211	Evolution and Biology of Higher Non Chordate	10	10	80	100
		BSZO 212	Molecular Biology and Genetics II	10	10	80	100
		BSZO 221	Zoology Lab-II	10	10	80	100
	Compulsory Paper	BES 231	Environmental Studies	10	10	80	100*
III Sem.	Core Subjects	BSZO 311	Biology of Chordates	10	10	80	100
		BSZO 312	Immunology & Microbiology	10	10	80	100
		BSZO 321	Zoology Lab-III	10	10	80	100
IV Sem.	Core Subjects	BSZO 411	Comparative Anatomy of Chordates	10	10	80	100
		BSZO 412	Animal Embryology	10	10	80	100
		BSZO 421	Zoology Lab-IV	10	10	80	100
V Sem.	Core Subjects	BSZO 511	Animal Physiology	10	10	80	100
		BSZO 512	Ecology	10	10	80	100
		BSZO 521	Zoology Lab-V	10	10	80	100
VI Sem.	Core Subjects	BSZO 611	Biodiversity and Ethology	10	10	80	100
		BSZO 612	Applied Zoology	10	10	80	100
		BSZO 621	Zoology Lab-VI	10	10	80	100

Semester-I		
BSZO 111: Taxonomy of Lower Non Chordate		45 Hrs
इकाई Unit	पाठ्यक्रम सामग्री Course Content	Hours/ Unit
I	<p>Taxonomy General principle, System of classification, Significance of classification, Need of classification, Binomial and trinomial nomenclature, Basis of classification</p> <p>Five kingdom concept Concept of Protozoa & Metazoa, Basis of classification- Level of body organization, Coelom, Symmetry, Segmentation.</p> <p>Embryogeny Diploblastic & Triploblastic, Protostomia & Deuterostomia</p>	09
II	<p>General characters and classification upto orders with suitable examples and economic importance of each Phyla: Protozoa, Platyhelminthes, Mollusca, Porifera, Aschelminthes, Echinodermata Coelenterata, Annelida, Ctenophora, Arthropoda</p>	09
III	<p>Paramecium Locomotion- Cillary beat, Mode of swimming Nutrition- Food and feeding, Digestion, Egestion Reproduction- Transverse Binary Fission, Conjugation, Autogamy, Cytogamy, Endomixis, Cytoplasmic particles Plasmodium Life cycle- asexual and sexual Symptoms and pathogenesis Malaria – control measures Sycon Cellular Organization- Different types of cells Canal System - Canal System in sponges, Significance Reproduction- Asexual Sexual: Spermatogenesis, Oogenesis, Fertilization Development – Early Embryonic Period –Cleavage , Stomoblastula Larval Period- Amphiblastula , Gastrula Metamorphosis</p>	09
IV	<p>Obelia Sense Organs - Statocyst Reproductive System & Life Cycle Sexual Reproduction Fertilization, Planula larva Development – Cleavage, Alternation of Generation Polymorphism - Definition & Origin Two Basic Forms- Polyp & Medusa Pattern- Dimorphic, Trimorphic, Polymorphic Significance Coral- Structure of Coral Polyp Coral Reef- • Kinds- a) Fringing b) Barrier c) Atoll Economic Importance</p>	09
V	<p>Taenia Reproductive System -Male Reproductive System, Female Reproductive System Development & Life Cycle- Copulation & Fertilization, Hexacanth, Capsule Formation, Cysticercus, Formation of Onchosphere, Infection of Primary Host Man</p>	09

	Hirudinaria Digestive System -Alimentary Canal, Food and feeding, Digestion Haemocoelomic System - Haemocoelomic Channels, Course of Haemocoelomic Fluid Circulation Reproductive System - Male Reproductive System, Female Reproductive System Life History & Development - Copulation, Fertilization, Cocoon Formation and development	
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RECOMMENDED READINGS

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Semester-I		
BSZO 112: Cytology and Genetics-I		45 Hrs
इकाई Unit	पाठ्यक्रम सामग्री Course Content	Hours/ Unit
I	Cell and cell Theory Prokaryotic & eukaryotic cells Bacteria – Structure, Types on the basis of shape and flagella, Gram positive and Gram negative bacteria, Reproduction in Bacteria (Asexual - Binary Fission, Budding, Conidia, Endospore, Antrospore, Sexual reproduction - Transformation, Transduction, conjugation), General Structure and characteristics of Virus (TMV, Phage) Elementary study of Microscopy Resolution and resolving power, Principle and application of the light microscope, Phase contrast microscope and interference microscope, Fluorescence microscope, Electron microscope (Scanning electron microscope and transmission electron microscope)	09
II	Cell membrane - Characteristic of cell membrane, Fluid mosaic model, Concept of unit membrane, Membrane molecules (lipids, carbohydrates and proteins) Transport across cell membrane – Passive, Facilitated, Active transport (Na ⁺ and K ⁺ pump), Symport and Antiport transporter, Pinocytosis, Phagocytosis, Exocytosis, Endocytosis, Carrier mediated Endocytosis.	09
III	Cell Organelles- Structure, Composition and Functions of - Endoplasmic reticulum (RER and SER), Golgi complex, Lysosomes, Ribosomes, Centrioles, Mitochondria.	09
IV	Cell cycle Mitosis- i) Phase and steps in division. ii) Spindle fibers and their functions Meiosis-i) Phases and steps ii) Synaptic membrane complex. iii) Chiasmata and crossing over.	09
V	Brief History of Genetics- Mendelism-Selection of pea plant, Mendelian laws and their significance, Recombination, Linkage, ABO blood group and its genotype.	09

RECOMMENDED READINGS

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Semester-I	
BSZO 121: Practical - Zoology Lab-I	45 Hrs
<ul style="list-style-type: none"> ➤ Dissections - Earthworm – Nervous System, Nerve Ring, Spermatheca & Nephridia and ovary ➤ Microscopic Preparation – Sponge Spicules, Gemmules, Obelia Colony, Neries Parapodium ➤ Identification And Systematic Position upto order of Following Museum Specimens- <ul style="list-style-type: none"> • Protozoa- Paramecium, Trypanosoma, Noctiluca, Opalina, Balantidium, Nyctotherus, Entamoeba • Porifera- Sycon, Hyalonema, Euplectella, Euspongia, Spongila • Coelentrata- Physalia, Porpita, Rhizostoma, Alcyonium, Corallium, Gorgonia, Pennatula • Paltyhelminthes- Fasciola, Taenia, Dugesia, Schistosoma • Aschelmenthes- Ascaris, Trichinella, Dracunculus, Wucheria ➤ Study of Prepared Slides- T.S Sycon, L.S Sycon, Ephyra Lrava, Mature & Gravid Proglottid of Taenia, Hexacanth, cysticercus larva (Bladder worm) T.S of Taenia. ➤ Experimental Zoology – <ul style="list-style-type: none"> • Test for Carbohydrate, Protein and Lipid • Determination of quality of milk – MBRT test and phosphatase test • Detection of presence of urea and starch in milk • Detection of adulteration in ghee and oil 	

RECOMMENDED READINGS

- Principles Of Animal Taxonomy – G.G Simpson- Oxford and IBH Publication.
- The Invertebrates – Mcneill Alexender – Cambridge University Press
- The Invertebrate Structure And Function – EJW Barrington- Thomas Nelson and Sons
- Text Book Of Zoology By T. J Parker And W.A Haswell- Vol I – Mcmillan and Co, London
- Invertebrates- Protozoa To Echinodermata Ashok Sharma – Narosa Publishing House
- The Invertebrates- Vol I- VI –L.H Hyman – Mcgraw Hill Co.
- A Text Book of Zoology – Invertebrates –Vishwanath – S Chand and Co, New Delhi
- Invertebrate Zoology- E.L Jordan , P.S.Verma – S.Chand and Co, New Delhi
- A textbook of Modern Zoology: Invertebrates- R.L. Kotpal – Rastogi Publication
- Theory and Practices of Animal Taxonomy- VC Kapoor – Oxford and IBH Publication.
- Genetics – P.K Gupta, Rastogi Publication
- Molecular Cell Biology – Lodish, K. Et. Al. - Freeman Publication
- Cytology Genetics And Evolution - P.K.Gupta –Rastogi Publication
- A Text Book Of Practical Zoology – Invertebrates – By S.S.Lal – Rastogi Publication, Merrut
- A Manual Of Practical Zoology – P.S. Verma, Tyagi, Agarwal- S Chand Publication.

Semester-II		
BSZO 211: Evolution and Biology of Higher Non Chordate		45 Hrs
इकाई Unit	पाठ्यक्रम सामग्री Course Content	Hours/ Unit
I	Origin of Life, Natural Selection, Genetic Basis of Evolution- Hardy-Weinberg Law, Evidences of Organic Evolution.	09
II	Variation, Isolation, Adaptation, Geological Time Scale and Distribution of Animals in Different Era.	09
III	Origin and Evolution of Horse and Man, Extinct Animals- a) Dinosaurs b) Archaeopteryx.	09
IV	Palaemon – Appendages, Digestive System, Respiratory System, Blood Vascular System, Sense Organs, Reproductive System & Reproduction, Economic importance.	09
V	Pila – Digestive System, Respiratory System, Blood Vascular System, Reproductive System and Reproduction. Asterias – Water Vascular System, Reproductive System, Life History and Developmental Stages, Regeneration.	09

RECOMMENDED READINGS

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Semester-II		
BSZO 212: Molecular Biology and Genetics II		45 Hrs
इकाई Unit	पाठ्यक्रम सामग्री Course Content	Hours/ Unit
I	Nuclear Organization: a) Structure and function of Nuclear Envelope, b) Nuclear matrix and Nucleolus, c) Chromosome Morphology- Chromonema, Chromomeres, Telomere, Chromatids, Primary and Secondary constriction, d) Chromosomes Types- Polytene chromosomes, Lampbrush chromosomes	09
II	DNA – Structure, DNA Replication a) Semi conservative mechanism of replication, b) Enzymes involves in Replication (Topoisomerase, Polymerase, Single Stabilizing Binding Protein (SSBP), RNAprimase. c) Okazaki fragments, d) Replication Forks-Leading and Lagging Strands	09
III	RNA – Structure, Types a) Transcription of RNA in prokaryotes and eukaryotes, b) Genetic Code. Traslation in prokaryotes and eukaryotes.	09
IV	Chromosomal Aberration – a) Structural (Translocation, Inversion, Deletion, Duplication), b) Numerica- i) Aneuploidy-Hypo – Monosomy, Nullisomy, Double Monosomy, Hyper – Trisomy, Double Tetrasomy and Polysomy. ii) Euploidy - Monoploidy & Polyploidy. c) Gene mutation.	09
V	Gene Interactions – Supplementary, Complimentary, Epistasis, Gene Expression, Lethal Genes, Pliotrophic Genes and Multiple Gene	09

RECOMMENDED READINGS

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Semester-II	
BSZO 221: Practical - Zoology Lab-II	45 Hrs
<ul style="list-style-type: none"> ➤ Dissections - Palaemon – General Anatomy, Study of Appendages, Digestive System, Nervous System. ➤ Microscopic Preparation- Palaemon- Hastate Plate, Statocyst, Pollen basket of honey bee, Mosquito mouth parts, Cyclops, Daphnia. ➤ Identification And Systematic Position up to order Of following Museum Specimens- <ul style="list-style-type: none"> • Annelida- Neries and Heteroneries Phase, Aphrodite, Pheretima, Hirudinaria Onchyophora-Peripatus • Arthropoda- Limulus, Aranea, Palaemon, Apus, Lepas, Balanus, Sacculina, Schistocerca, Pediculus, Lobster, Eupagurus, Cancer, Lepisma, Papilio, Bombyx, Apis, Julus, Scolopendra • Mollusca- Chiton, Mytilus, Ostrea, Teredo, Nautilus, Octopus, Pila Echinodermata- Pentaceros, Ophiothrix, Echinus, Holothuria, Antedon ➤ Study of Prepared Slides- <ul style="list-style-type: none"> • Annelida- T.S Nereis and Hirudinaria from Various Regions, Trocophore Larva Parapodia of Nereis and Heteronereis Arthropoda Larval Forms- Nauplius, Zoea, Megalopa, Mysis Mollusca - Glochidium Larva • Echinodermata- Pedicellariae ➤ Experimental Zoology <ul style="list-style-type: none"> • Immunological detection of blood groups • To calculate genetic variation in a population using Hardy – Weinberg’s law. • Genetic exercise based on genetic interaction. 	

RECOMMENDED READINGS

- The Invertebrates – M. Alexander – Cambridge University Press.
- The Invertebrate Structure And Function – EJW Barrington- Thomas Nelson And Sons.
- Text Book Of Zoology By T.J Parker And W.A Haswell- Vol I – Mcmillan And Co, London.
- Invertebrates- R.L. Kotpal – Rastogi Publication.
- A Text Book of Zoology – Invertebrates –Vishwanath – S Chand And Co.
- Invertebrate Zoology- E.L Jordan , P.S.Verma – S.Chand And Co, New Delhi.
- Invertebrates- Protozoa To Echinodermata Ashok Sharma – Narosa Publishing House.
- The Invertebrates- Vol I- VI –L.H Hyman – Mcgraw Hill Co.
- Genetics – P.K Gupta , Rastogi Publication.
- Molecular Biology And Genetic Engineering (Paperback) - P.K Gupta , Rastogi Publication.
- Genetics And Molecular Biology - By Hyde D R, Publisher: Tata Mcgraw Hill Education Private Limited.
- Molecular Cell Biology – Lodish, K et.al - Freeman Publication.
- Cytology Genetics And Evolution- P.K.Gupta –Rastogi Publication.
- A Text Book Of Practical Zoology – Invertebrates – By S.S.Lal – Rastogi Publication, Meerut.
- A Manual Of Practical Zoology – PS Verma, Tyagi, Agarwal- S Chand Publication.

Semester-III		
BSZO 311: Biology of Chordates		45 Hrs
इकाई Unit	पाठ्यक्रम सामग्री Course Content	Hours/ Unit
I	Classification and characters of phylum chordate-excluding extinct forms (up to orders), affinities of Hemichordates, Urochordates, cephalochordates.	09
II	Amphioxus-Digestive system, Circulatory system, Nervous system and reproductive system, larval forms. Petromyzon- Buccal funnel, Digestive system, Respiratory system, circulatory, nervous and sense organs, reproductive and larval forms.	09
III	Pisces- Types of fins, origin of fins, scales of fishes, accessory respiratory organs, parental care in fishes and migration. Amphibia- Neoteny and paedogenesis, parental care in amphibians.	09
IV	Reptiles-Identification of poisonous and non poisonous snakes. Dinosaurs and cause of its extinction. Snakes of desert. Aves- Flight adaptation, types of feet, migration in birds.	09
V	Mammals- Egg laying mammals, marsupials, insectivorous, gnawing, toothless mammals, and aquatic adaptation in mammals.	09

RECOMMENDED READINGS

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Semester-III		
BSZO 312: Immunology & Microbiology		45 Hrs
इकाई Unit	पाठ्यक्रम सामग्री Course Content	Hours/ Unit
I	Innate and acquired immunity, humoral and cell mediated immunity, cell and molecules of immune system, MHC (Major histocompatibility complex) -basic concepts.	09
II	Antigen – antigenicity of molecules. Antibody-structure & function of each classes of immunoglobulin. Antigen and antibody reactions.	09
III	Historical aspect of microbiology, Patterns of arrangement & structural organization of gram positive & gram negative bacteria.	09
IV	Bacteria -genetic material of bacteria, reproduction in bacteria, medical importance of gram negative and gram positive bacteria, role of microbes in pest control, waste water treatment (Preliminary idea).	09
V	Industrial microbiology – fermented food production – Dairy products, Alcoholic beverages and Vinegar. Methods of food preservation and microbial spoilage.	09

RECOMMENDED READINGS

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Semester-III	
BSZO 321: Practical - Zoology Lab-III	45 rs
<p>➤ Dissections – Scoliodon – General Anatomy, Brain , Afferent and efferent blood vessels, cranial nerves V,VII,IX,X and internal Ear.</p> <p>➤ Microscopic Preparation- placoid scales, identification of gram positive and gram negative bacteria</p> <p>➤ Identification And Systematic Position up to order Of following Museum Specimens-</p> <ul style="list-style-type: none"> • Hemichordata- Balanoglossus • Urochordata- Salpa, Doliolum, and Herdmania • Cephalochordata- Amphioxus • Cyclostomata- Petromyzon and Myxine • Pisces- Protopterus, Labeo, Hetropterus, Wallago, Clarias, Anabas, Exocoetus, Echeuis. • Amphibia- Necturus, Amphiuma, Ambystoma, Axolotol larva • Reptiles- Naja, Bungarus, Echeis, Hydrophis, Eryx, Ptyas, Ophiosaurus • Aves- Pavo, Choriotis, Francolinus • Mammals- Meriones, Funambulus, Rattus, Suncus, Hemiechinus <p>➤ Study of Prepared Slides-</p> <ul style="list-style-type: none"> • Hemichordata- Balanoglossus- section through proboscis and branchiogenital region • Cephalochordata- Amphioxus- T.S oral hood, pharynx, intestine, gonads, and caudal region • Rana- T.S through various organs-stomach, intestine, lung, liver, kidney, spleen, • Reptiles- V.S. skin • Aves- different types of feather • Mammals – T.S through various organs - stomach, intestine, lung, liver, kidney, spleen <p>➤ Experimental Zoology</p> <ul style="list-style-type: none"> • Immunoelectrophoresis • ELISA • Cell culture – Lymphocyte/ hepatocytes 	

RECOMMENDED READINGS

- Text book of Zoology Vol-1I Vertebrates – Parker & Haswell (Edited by Marshall & Williams) (ELBS & Macmillan)
- Vertebrate life- Pough and McFerland
- Life of Vertebrates . J. Z. Yong
- The Vertebrate body- Romer & Parsons
- Biology of Vertebrates- Walter & Sayles
- Chordate Zoology and Animal Physiology – by E.L.Jordan, and P.S.Verma, S. Chand Publication
- Chordate Zoology – R.L. Kotpal , Rastogi Publication, Meerut
- Microbiology – An Introduction – Gerard Tortora- Pearson Education
- A Text Book Of Microbiology – R. Ananthnaryan , C.K Jayaram Paniker
- Text Book Of Microbiology – Naveen Kango- Ik Publishing House
- Text Book Of Microbiology And Immunology – S.C Parija- Elsevier India
- Food Microbiology – SK Sinha, Ashok Kumar Sharma-Hb- Oxford Book Co
- Microbial Taxonomy And Culture Techniques- R P Singh- Kalyani Publisher.
- Introduction to immunology – Kuby.

Semester-IV		
BSZO 411: Comparative Anatomy of Chordates		45 Hrs
इकाई Unit	पाठ्यक्रम सामग्री Course Content	Hours/ Unit
I	Integument including structure & development of placoid scales, Feathers, & Hairs. Jaw suspensorium.	09
II	Comparative anatomy of Alimentary Canal, Respiratory System- Pisces, Amphibia, Reptiles, Aves & Mammals.	09
III	Heart and aortic arches, Urino genital system - Pisces, Amphibia, Reptiles, Aves & Mammals.	09
IV	Comparative anatomy of Brain & Sense organs - Pisces, Amphibia, Reptiles, Aves & Mammals.	09
V	Comparative anatomy of Endocrine systems - Pisces, Amphibia, Reptiles, Aves & Mammals. General accounts of hormones & mechanism of hormone action.	09

RECOMMENDED READINGS

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Semester-IV		
BSZO 412: Animal Embryology		45 Hrs
इकाई Unit	पाठ्यक्रम सामग्री Course Content	Hours/ Unit
I	Gametogenesis, vitellogenesis, types of eggs & sperms, parthenogenesis, physiology of fertilization.	09
II	Cleavages- Plains & Patterns of cleavage & significance, fate map. Blastulation, Gastrulation & its Significance.	09
III	Development of <i>Branchiostoma</i> up to gastrulation, Chick egg & its development up to formation of primitive streak. Extra embryonic membranes of chick.	09
IV	Development of Placenta in Rabbit, types & function of Placenta in Mammals, Various types of stem cells & their application.	09
V	Cloning of Animals: Nuclear Embryonic Transfer technique, Nuclear transfer technique, Twins & test tube babies, Identical Siemans & Fraternal Twins, Artificial inseminations. Teratogenesis.	09

RECOMMENDED READINGS

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Semester-IV	
BSZO 421: Practical - Zoology Lab-IV	45 Hrs
<ul style="list-style-type: none"> ➤ Dissections – Labeo – General Anatomy, Afferent and efferent blood vessels , Brain , cranial nerves V,VII, IX, and X, Weberian ossicles ➤ Microscopic Preparation- cycloid scales, ampulla of Lorenzi ➤ Osteology – Articulated and disarticulated bones of – Rana, Varanus, Gallus, and Oryctolagus ➤ Identification And Systematic Position up to order Of following Museum Specimens- <ul style="list-style-type: none"> • Pisces- Scoliodon, Zygaena, Pristis, Torpedo, Trygon, Belone • Amphibia- Hyla, Uraeotyphlus • Reptiles- Trionyx, Chelone, Varanus, Uromastix, Crocodilus, Gavialis. • Aves- Columba, Streptopelia • Mammals – Pteropus, Presbytis, Maccaca ➤ Study of Prepared Slides- <ul style="list-style-type: none"> • Scoliodon – T.S gills, scroll valve • Rana- T.S and L.S of developmental stages, T.S through various organs. • Aves – V.S of skin • Chick embryology – whole mount of developmental stages of chick of 18,24,36, 48,and 72 hours • Mammals – T.S through various organs- thyroid, testes, ovary adrenal gland, pancreas ➤ Experimental Zoology <ul style="list-style-type: none"> • Estimation of Lactate dehydrogenase • Estimation of alkaline phosphate 	

RECOMMENDED READINGS

- Text book of Zoology Vol-1I Vertebrates – Parker & Haswell (Edited by Marshall &Williams) (ELBS & Macmillan)
- Vertebrate life- Pough and McFerland
- Life of Vertebrates. J. Z. Yong
- The Vertebrate body- Romer & Parsons
- Biology of Vertebrates- Walter & Sayles
- Analysis of Vertebrate Structure- Hildebrand
- Comparative Anatomy of Vertebrates- G.C. Kent & R. Carr
- Chordate Zoology and Animal Physiology – by E.L.Jordan, and P.S.Verma, S. Chand Publication
- Chordate Zoology – R.L. Kotpal , Rastogi Publication, Meerut
- Developmental Biology – Scott Gilbert – PB- Palgrave Publication
- Foundations Of Embryology – Bradley M Patten And Carlson
- Introduction To Embryology – B.I Balinsky- Thomson Nelson Publication
- Embryology – Rajendra Kausik – Oxford Book Co
- Text Book Of Embryology - D.R. Khanna- Discovery Publishing House

Semester-V		
BSZO 511: Animal Physiology		45 Hrs
इकाई Unit	पाठ्यक्रम सामग्री Course Content	Hours/ Unit
I	Digestion – Structure of alimentary canal – salivary glands, stomach, intestine. Enzymes secreted in alimentary canal. Digestion of Carbohydrate, Protein & Fat. Omega 3 fatty acids and its importance. Respiration- Respiratory Organs, Respiratory Pigments, Mechanism of Breathing, Regulation of Breathing.	09
II	SYLLABUS MISSING	09
III	Blood- Composition and function of Blood, Blood Clotting, elementary idea about - Blood Pressure, Anemia and its types, Hemophilia. Causes of heart attack.	09
IV	Excretion – Structure of Kidney, Mechanism of Urine Formation and Elimination- Ultrafiltration, Selective reabsorption and Tubular Secretion, Urea Cycle. Factors affecting stone formation (in kidney and gall bladder) Co-ordination – Nerve impulse and its transmission – on neuron and between neuron (synaptic transmission), reflex action, types of reflexes.	09
V	Muscles – Types, Ultra structure, Muscle Proteins, Physiology of Muscle Contraction. Endocrine gland – location, structure and function of various endocrine glands- pituitary, thyroid, parathyroid, pancreas and adrenal - their hormones and diseases caused by deficiency.	09

RECOMMENDED READINGS

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Semester-V		
BSZO 512: Ecology		45 Hrs
इकाई Unit	पाठ्यक्रम सामग्री Course Content	Hours/ Unit
I	Ecosystem and its components, Energy flow, Food chain and Food Web, Biotic Community, Ecological Succession.	09
II	Terrestrial Ecosystem- Forest Ecosystem, Grassland Ecosystem, Desert Ecosystem (Thar Desert), Aquatic Ecosystem - Fresh water ecosystem, Marine ecosystem.	09
III	Laws of Limiting Factors, Physical Factors- Temperature, Light, Soil.	09
IV	Biotic Factors- Competition, Predation, Parasitism, Commensalism, Mutualism, Population Ecology, Characteristics of population.	09
V	Environmental Pollution-Causes, Effect and Control of- Soil Pollution, Air Pollution, Water Pollution, Noise Pollution, Radioactive Pollution.	09

RECOMMENDED READINGS

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Semester-V	
BSZO 521: Practical - Zoology Lab-V	45 Hrs
<ul style="list-style-type: none"> ➤ Estimation of packed cell volume (P.C.V) with the help of centrifuge. ➤ Preparation of haemin crystals. ➤ Estimation of haemoglobin by photohaemoglobinometer. ➤ Estimation of Water holding capacity of the given soil sample. ➤ Estimation of soil moisture content of the given soil sample. ➤ Osmotic effect on R.B.C. ➤ Determination of blood sugar – fasting, pp, and random by glucometer. ➤ Urine analysis for sugar, protein and pH. ➤ Estimation of population density and frequency of animals in a community. ➤ Demonstration of working of pH meter. ➤ Analysis of pH of given water sample. ➤ Demonstration of working of colorimeter. ➤ Study of Pond ecosystem / Aquarium ecosystem. ➤ Permanent preparation of different zooplanktons – <i>Daphnia</i>, <i>Cyclops</i>, <i>Cypris</i> ➤ Permanent preparation of different ectoparasites – Ticks, Mites, <i>Pediculus</i> . ➤ Demonstration of working of sphygmomanometer (B.P. measurement) with the help of stethoscope. ➤ Dissection of nervous system of grasshopper. 	

RECOMMENDED READINGS

- Principles of animal physiology by Christopher Moyes, Patricia Schulte
- Introduction to Animal physiology by Ian Kay
- Basic Physiology by Shree kumar
- Essentials of Animal Physiology by S C Rastogi
- Animal Physiology, Mechanism and Adaptation by Eckert R
- Animal Physiology, Adaptation and Environment by Schiemdt Nielsen
- Endocrine Physiology by C R Martin
- Environmental Law for the Built Environment by Jack Rostron
- A Forest History of India by Richard P.Tucker.
- Fundamental of Ecology by Odum
- Environment Protection and the Law by Dr. R K Khitoliya
- Environmental Studies by Singh, Thakur & chauhan
- Concepts of Ecology by Edward J. Kormondy
- Ecology, Environment & Pollution by P K Gupta
- Ecology and Environment by P D Sharma
- Modern Concept of Ecology by H D Kumar.
- Biodiversity: Science and Development by Castri, F D & Younes

Semester-VI		
BSZO 611: Biodiversity and Ethology		45 Hrs
इकाई Unit	पाठ्यक्रम सामग्री Course Content	Hours/ Unit
I	Biodiversity – Definition, Types- Genetic, species and ecosystem, Importance, Different values of biodiversity : social, ethical, aesthetic and option values, Diverse Fauna of India (Reptiles, Birds and Mammals), Conservation of Biodiversity.	09
II	Biogeographical Regions of India, Hot spots, IUCN, RDB, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Rare, Endangered, Endemic, Threatened species of Indian Fauna, National Sanctuaries and zoological parks of Rajasthan.	09
III	Wildlife protection Act,1972,, Project Tiger , Project Gir Lion, Crocodile breeding project, Wildlife in Rajasthan with special references to Reptiles Birds and mammals, State bird – Ardeotis nigriceps (Godawan) and state animal Gazelle gazelle (Chinkara)	09
IV	Animal Behaviour – Introduction, Types- Innate, Learned. Methods of Studying Animal Behaviour – Studies in laboratory - Neuro anatomical Technique, Neuro physiological Technique, Neuro chemical Technique. Studies in Wild.	09
V	Animal Behaviour - Role of Pheromones in behavior, Role of hormone in behavior, Communication, Biological rhythms.	09

RECOMMENDED READINGS

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Semester-VI		
BSZO 612: Applied Zoology		45 Hrs
इकाई Unit	पाठ्यक्रम सामग्री Course Content	Hours/ Unit
I	Poultry Keeping: Types of Poultry Breeds, Poultry Farm and its management, Handling and Marketing of Eggs. Diseases – Disease causing Pathogens, Symptoms, and Control measures.	09
II	Sericulture: Species of Silk Moth, Silkworms and their Host Plants, Mulberry Silk Worm culture, Life cycle. Natural enemies and diseases of silkworm and their control.	09
III	Apiculture: Indian species of Honey bees, Life history of Apis cerana indica, Artificial Bee hives, Natural enemies and Diseases of Honey bee and their control, Bee products and their uses. Wild beehive management.	09
IV	Pest Management: Biology and control of pests: Paddy Pests (Diodespia, Spodoptera), Cotton Pests (Dysdercus, Pectinophora), Sugarcane pests (Scirpophaga, Pyrilla), Stored grain pests (Tribolium, Rhyzopertha), Chemical, Biological and Mechanical pest control methods, Integrated Pest Management (I.P.M.).	09
V	Aquaculture: Introduction to Aquaculture, General principles of Aquaculture, Fish farm and its management, Composite fish culture, By products of fishing industry. Prawn culture.	09

RECOMMENDED READINGS

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Semester-VI	
BSZO 621: Practical - Zoology Lab-VI	45 Hrs
<ul style="list-style-type: none"> ➤ Study of E.C.G. of different age group persons and its analysis. ➤ Blood smear and identification of different types of blood cells. ➤ Estimation of bleeding time of your own blood. ➤ Estimation of clotting time of your own blood. ➤ Differential leucocytes count (D.L.C.) ➤ Study of different types of bee castes and their identification. ➤ Study of artificial bee hive. ➤ Study of different types of insect traps. ➤ Bioassay study on Pesticides. ➤ Study of different byproducts of fishing industry. ➤ Study of different types of fishing nets. ➤ Study of different types of edible fishes. ➤ Different types of spraying and dusting equipments. ➤ Permanent preparation of store grain pest – Tribolium, Rhyzopertha, Callosobruchus ➤ Honey bee- preparation of mouthparts, sting pollen basket. ➤ Permanent preparation of different types of mouth parts- House Fly, Cockroach, Mosquito, Butterfly. ➤ Dissection of Nervous system of Cockroach ➤ Local fauna report / Collection/ Chart preparation 	

RECOMMENDED READINGS

- Diversity Management: Theoretical Perspectives and Practical Approaches by Dr. Sheying Chen
- Biology of Biodiversity by M Kato
- Biodiversity by E O Wilson
- Diversity of life by E O Wilson
- Threatened Animals of India by B K Tikadar
- Principal of Animal Behavior by Lee Alan Dugatkin
- Animal Behavior by Reena Mathur
- Animal Behavior Desk Reference by Edward M Barrows
- Animal Behavior by John Alcock
- Animal Behavior by Menning
- Modeling in Behavioral Ecology by Lendren
- Fish and Fisheries- Shukla, Pandey
- A Text Book Of Fish Biology And Fisheries (Paperback) by S.S. Khanna & H.R. Singh
- Applied Entomology- P. G. Fenemore, A. Prakash
- Freshwater Aquaculture- Santhanam et al.
- Aquaculture- T. V. R. Pilley
- Sericulture & Silk Industry- D. C. Sarkar
- Bee keeping in India- ICAR
- Economic Zoology- Shukla Upadhyay
- Elements of Entomology- Rajendra Singh
- Insect Pest of crop- S. Pradhan
- Applied zoology- Ansari,Varma, Sharma.