

Department of Zoology, Central University of Kashmir, Ganderbal, J&K-India

Scheme for Integrated B. Sc. - M. Sc. Programme in Zoology, under CBCS (2022 Onwards)

SEMESTER - I

Course Type	Course Code	Course Title	Course Credits	Total Credits
MAJOR	ZOO-MAJ-101	Animal Diversity (Non-Chordates)	4	08
	ZOO-MAJ-102	Cell Biology	2	
	ZOO-MAJ-103	Experiential Learning (Based on ZOO-MAJ-101 & 102)	2	
MINOR (Inter-Disciplinary)	BOT-MIN-101	Plant Diversity	4	06
	BOT-MIN-102	Experiential Learning (Based on BOT-MIN-101)	2	
MULTI-DISCIPLINARY <i>(two groups of student opted two different MDC courses)</i>	MDCUG-103-IM	Islam and Muslim civilization I	4	04
	MDCUG-101-AI	Introduction to Indian Constitution	4	
SKILL ENHANCEMENT COURSE	ZOO-SEC-102	Introduction to Sericulture	2	04
	ZOO-SEC-104	Experiential Learning (Based on ZOO-SEC-102)	2	
VALUE ADDED COURSE	ZOO-VAC-101	Communicative English	2	02
Total				24

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SEMESTER - II

Course Type	Course Code	Course Title	Course Credits	Total Credits
MAJOR	ZOO-MAJ-201	Animal Diversity (Chordates)	4	08
	ZOO-MAJ-202	Genetics	2	
	ZOO-MAJ-203	Experiential Learning (Based on ZOO-MAJ-201 & 202)	2	
MINOR (Inter-Disciplinary)	BOT-MIN-201	Plant Anatomy and Physiology	4	06
	BOT-MIN-202	Experiential Learning (Based on BOT-MIN-201)	2	
MULTI-DISCIPLINARY <i>(two groups of student opted two different MDC courses)</i>	MDCUG-201-HRCR	Human rights and constitutional remedies	4	04
	MDCUG -203-IM	Islam and Muslim civilization II	4	
SKILL ENHANCEMENT COURSE	ZOO-SEC-202	Silkworm Rearing Technology	2	04
	ZOO-SEC-204	Experiential Learning (Based on ZOO-SEC-202)	2	
VALUE ADDED COURSE	ZOO-VAC-201	Environmental Studies	2	02
Total				24

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SEMESTER - III

Course Type	Course Code	Course Title	Course Credits	Total Credits
MAJOR	ZOO-MAJ-301	Applied Zoology	4	08
	ZOO-MAJ-302	Organic Evolution	2	
	ZOO-MAJ-303	Experiential Learning (Based on ZOO-MAJ-301 & 302)	2	
MINOR (Inter-Disciplinary)	BOT-MIN-301	Plant Taxonomy, Ecology and Embryology	4	06
	BOT-MIN-302	Experiential Learning (Based on BOT-MIN-301)	2	
MULTI-DISCIPLINARY <i>(two groups of student opted two different MDC courses)</i>	MDCUG-301-TWIC	The Working of Indian Constitution	4	04
	MDCUG-307-IM	Islam and Muslim Civilization III	4	
SKILL ENHANCEMENT COURSE	ZOO-SEC-302	Crop Protection and Silkworm Technology	2	04
	ZOO-SEC-304	Experiential Learning (Based on ZOO-SEC-302)	2	
VALUE ADDED COURSE	KRU-VAC-301	Kashmiri script	2	02
Total				24

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SEMESTER - IV

Course Type	Course Code	Course Title	Course Credits	Total Credits
MAJOR	ZOO-MAJ-401	Comparative Anatomy of Vertebrates	04	12
	ZOO-MAJ-402	Wildlife Conservation and Management	04	
	ZOO-MAJ-403	Experiential Learning based on ZOO-MAJ-401	02	
	ZOO-MAJ-404	Experiential Learning based on ZOO-MAJ-402	02	
MINOR (Inter-Disciplinary)	BOT-MIN-401	Ethnobotany	04	06
	BOT-MIN-402	Experiential Learning based on BOT-MIN-401	02	
DISCIPLINE SPECIFIC ELECTIVE	ZOO-DSE-401	Fish Farming	02	02
ABILITY ENHANCEMENT COURSE	MUR-AEC-I	Learning of Urdu Language	04	04
TOTAL				24

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SEMESTER - V

Course Type	Course Code	Course Title	Course Credits	Total Credits
MAJOR	ZOO-MAJ-501	Animal Ecology	04	12
	ZOO-MAJ-502	Parasitology and Entomology	04	
	ZOO-MAJ-503	Experiential Learning based on ZOO-MAJ-501	02	
	ZOO-MAJ-504	Experiential Learning based on ZOO-MAJ-502	02	
MINOR (Inter-Disciplinary)	BOT-MIN-501	Basics of Plant Biotechnology	04	06
	BOT-MIN-502	Experiential Learning based on BOT-MIN-501	02	
DISCIPLINE SPECIFIC ELECTIVE	ZOO-DSE-501	Agrochemicals and Pest Management	02	02
ABILITY ENHANCEMENT COURSE	UGUR-AEC- LU-V	Learning of Urdu Language	04	04
TOTAL				24

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SEMESTER - VI

Course Type	Course Code	Course Title	Course Credits	Total Credits
MAJOR	ZOO-MAJ-601	Reproductive and Developmental Biology	04	12
	ZOO-MAJ-602	Animal Physiology	04	
	ZOO-MAJ-603	Experiential Learning based on ZOO-MAJ-601	02	
	ZOO-MAJ-604	Experiential Learning based on ZOO-MAJ-602	02	
MINOR (Inter-Disciplinary)	BOT-MIN-601	Basics of Plant Biotechnology	04	06
	BOT-MIN-602	Experiential Learning based on BOT-MIN-601	02	
DISCIPLINE SPECIFIC ELECTIVE	ZOO-DSE-601	Dairy farming	02	02
INTERNSHIP	ZOO-INT-601	Internship	04	04
TOTAL				24

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SEMESTER - VII

Course Type	Course Code	Course Title	Course Credits	Total Credits
MAJOR	ZOO-MAJ-701	Population Ecology and Limnology	04	18
	ZOO-MAJ-702	Cytogenetics	04	
	ZOO-MAJ-703	Applied Toxicology	04	
	ZOO-MAJ-704	Experiential Learning based on ZOO-MAJ-701	02	
	ZOO-MAJ-705	Experiential Learning based on ZOO-MAJ-702	02	
	ZOO-MAJ-706	Experiential Learning based on ZOO-MAJ-703	02	
MINOR (Inter-Disciplinary)	BTCH-MIN-701	Tools and Techniques in Biotechnology	04	06
	BTCH-MIN-702	Experiential Learning based on BTCH-MIN-701	02	
TOTAL				24

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SEMESTER - VIII

Course Type	Course Code	Course Title	Course Credits	Total Credits
MAJOR	ZOO-MAJ-801	Molecular Biology	04	12
	ZOO-MAJ-802	Structure and Function of Endocrine Glands	04	
	ZOO-MAJ-803	Experiential Learning based on ZOO-MAJ-801	02	
	ZOO-MAJ-804	Experiential Learning based on ZOO-MAJ-802	02	
DISCIPLINE SPECIFIC COURSE	ZOO-DSC-801	Fish and Fisheries	04	12
	ZOO-DSC-802	Advances in Wildlife study	04	
	ZOO-DSC-803	Experiential Learning based on ZOO-DSC-801	02	
	ZOO-DSC-804	Experiential Learning based on ZOO-DSC-802	02	
TOTAL				24

Syllabus for Integrated B. Sc. - M. Sc. Programme in Zoology under CBCS (Batch 2022)

Semester - I Major Course

ANIMAL DIVERSITY (NON-CHORDATES)

ZOO-MAJ-101
Credits: 04

Time: 60 Hours
Max. Marks: (50+50)

Unit I: Classification of Invertebrates (15 Hours)

General characters and classification up to class level with distinctive and adaptive features of Protozoa, Porifera, Coelenterata, Platyhelminths, Annelida, Arthropoda, Mollusca and Echinodermata with the suitable examples of each category.

Unit II: Lower Invertebrates (15 Hours)

Protozoa: -Structure and life cycle of *Plasmodium* and *Trypanosoma*. Porifera: -Canal system and Skeletal system. Coelenterata: - Polymorphism, Coral and Coral reefs. Ctenophora: - General organization and Evolutionary significance. Platyhelminths: Morphology and parasitic adaptations of *Fasciola hepatica* & *Taenia solium*.

Unit III: Higher Invertebrates (15 Hours)

Annelida and Arthropoda:-Digestive System, Excretory System of *Pheretima* and Cockroach, Evolutionary significance of Onychophora. Mollusca: -Digestive System and Nervous System of *Pila*, Torsion and detorsion in Gastropods. Echinodermata: -Water vascular system in Asteroidea,

Unit IV: General Account of Invertebrates. (15 Hours)

Sexual reproduction in *Paramecium*. Evolution of Coelom and Metamerism, Filter feeding in Polychaetes, Trochophore larva, Photoreceptors in Arthropods, Respiration in arthropods, Parasitism in Crustaceans. Larval form in Echinodermata,

Reference Books:

1. Barnes, R.D. (1982). Invertebrate Zoology, V Ed. Holt Saunders International Edition.
2. Boolotian & Stiles. 1981. College Zoology (10thEd.)
3. Dorit, Walker & Barnes. 1991. Zoology (Saunders)
4. Marshall & Williams. 1972. Text book of Zoology. Vol. I (Parker & Haswell, 7thEd.)
5. Nigam. 1997. Biology of Non-Chordates (S.Chand)
6. Villee, Walker & Baranes. 1979. General Zoology 5thEd. Saunders
7. Hoar, 2005. General and Comparative Physiology (5thEd. Cambridge)
8. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002).
9. Moore: An introduction to the invertebrates (2006, Cambridge).

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Semester - I **Major Course** **CELL BIOLOGY**

ZOO-MAJ-102
Credits: 02

Time: 30 Hours
Max. Marks: (25+25)

Unit I: Introduction & Cell Membrane (08 Hours)

Introduction and classification of organisms by cell structure, cytosol compartmentalization of eukaryotic cells, Cell fractionation. Cell Membrane and Permeability: Chemical components of biological membranes, Fluid Mosaic Model, membrane as a dynamic entity, Cell recognition and membrane transport.

Unit II: Cell Organelles (08 Hours)

Endoplasmic reticulum: Structure, function. Golgi complex: Structure, biogenesis and functions. Lysosomes: Vacuoles: Structure and functions. Ribosomes: Structures and function. Mitochondria: Structure and function. Chloroplasts: Structure and function, Peroxisomes structure and function, Nucleus: Structure and function.

Unit III: Cell Cytoskeleton and Interactions (07 Hours)

Structure and function of microtubules, Microfilaments, Intermediate filaments. Cell-matrix interactions and cell-cell interactions. Adherence junctions, tight junctions, gap junctions, desmosomes, hemidesmosomes, focal adhesions and plasmodesmata, Role of Collagen and Elastin in EM.

Unit IV Cell Cycle and Signalling (07 Hours)

Cell cycle – Mitosis and Meiosis, regulation of cell cycle. Autocrine, paracrine and endocrine signalling. Types of receptors and action. GPCR signalling, Second Messengers role in signalling and signal transduction - cAMP, IP3, Ca²⁺.

Reference Books:

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons, Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
3. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
4. Becker, W.M., Kleinsmith, L.J., Hardin, J. and Bertoni, G. P. 2009 The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

Syllabus for Integrated B. Sc. - M. Sc. Programme in Zoology under CBCS (Batch 2022)

Semester - I

Major Course

EXPERIENTIAL LEARNING (BASED ON ZOO-MAJ-101 & 102)

ZOO-MAJ-103

Credits: 02

Time: 60 Hours

Max. Marks: (25+25)

1. Study of the salient features of the following Non-chordates: (*Amoeba*, *Entamoeba*, *Euglena*, *Giardia*, *Trypanosoma*, *Paramecium*, *Leucosolenia*, *Sycon*, *Euplectella*, *Spongilla*, *Euspongia*, *Obelia*, *Hydra*, *Aurelia*, *Tubipora*, *Medrepora*, *Milipora*, *Metridium*, *Planaria*, *Fasciola*, *Diphyllobothrium*, *Taenia solium*, *Dracunculus*, *Necator*, *Nereis*, *Pheretima*, *Hirudo*, *Peripatus*, *Palaeomon*, *Buthu*, *Leucifer*, *Limulus*, Scorpion, Tick, Honey bee, Louse, Butterfly, beetle, Chiton, Unio, Sepia, Octopus, Starfish, Holothuria).
2. Study of the *Fasciola hepatica* & *Taenia solium* through permanent slides/specimens.
3. Slide preparation of the Septal nephridia of Earthworm
4. Study of the Digestive system, Reproductive system & Nerve ring of Earthworm through dissection.
5. Preparation of temporary mount of onion root tip to show Mitosis cell division.
6. Preparation of temporary mount of grasshopper testis to show Meiosis cell division.
7. Buccal Smear- Identification of Barr body.
8. Any other practical found feasible by the teacher and approved by the Coordinator/Head and Dean.

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Semester - I Minor Course DIVERSITY OF PLANTS

BOT-MIN-101
Credits: 04

Time: 60 Hours
Max. Marks: (50+50)

Unit I: Viruses, Bacteria & Algae (15 Hours)

Viruses: General account and ultrastructure, replication, viroids, virusoids & prions. Eubacteria: structure, ultrastructural details, Nutrition, reproduction, ecological and economic importance. Archaeobacteria: General account. Algae: General characteristics and classification of algae (Fritsch 1935), Cell structure, Salient features of different algal groups (Chlorophyta, Phaeophyta, Rhodophyta, Xanthophyta, Bacillariophyta, and Protochlorophyta and Charophyta). Algal blooms, Economic importance of algae.

Unit II: Fungi (15 Hours)

Introduction, general criteria of classification of fungi, ultrastructure of fungal cell, mode of nutrition in fungi, Heterothallism, Parasexual life cycle. Role of fungi as food and medicines. Salient features of different fungal groups: (i) Chytridiomycota (ii) Zygomycota (iii) Ascomycota (iv) Basidiomycota (v) Deuteromycota and (vi) Oomycota. Concept of Lichens & economic importance, Mycorrhiza.

Unit III: Bryophytes (15 Hours)

General characters, classification (Proskauer, 1957), structure and reproduction of representative groups. Sporophytic structure and evolution; Evolution of gametophyte and sporophyte, Structure and reproduction in Marchantia & Anthoceros, Ecological and economic importance of Bryophytes.

Unit IV: Pteridophytes & Gymnosperms (15 Hours)

General characters, classification (Christenhusz), structure and reproduction of representative groups. Stelar evolution in Pteridophytes. Telome concept, Apogamy and Apospory, heterospory and seed habit. Economic importance of Pteridophytes.

General characters, classification (Christenhusz), distribution in India, Salient features of Pinaceae (Pinus) Cycadales (Cycas) and Gnetales (All three families). Economic importance of Gymnosperms. Paleobotany w.r.t India.

Reference Books:

1. Willey, J M., Sherwood, L.M. and Woolverton, C.J. (2017). Prescott's Microbiology, 10th Edition, McGraw-Hill, USA.
2. Alexopoulos, C.J., Mims, C.W. and Blackwell, M. (2007). Introductory Mycology. Fourth Edition Wiley India Pvt. Limited.
3. Fritsch F.E., The Structure & Reproduction of Algae, Cambridge University Press Cambridge, U.K. Vol. I, Vol. II.
4. Vanderpoorten, A. and Goffinet, B. (2009). Introduction to bryophytes. Cambridge University Press, Cambridge. ISBN 978-0-521-70073-3.
5. Christenhusz, M. J., & Chase, M. W. (2014). Trends and concepts in fern classification. Annals of botany, 113(4), 571-594.

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Semester - I
Minor Course

EXPERIENTIAL LEARNING (BASED ON BOT-MIN-101)

BOT-MIN-102
Credits: 02

Time: 60 Hours
Max. Marks: (25+25)

1. Demonstration of TMV & Bacteriophage model.
2. Demonstration of Gram staining method.
3. Identification of fungi by lactophenol cotton blue method: *Mucor*, *Rhizopus*, *Aspergillus*, *Penicillium*.
4. Specimen study of *Agaricus* & *Morchella*.
5. Lichens: crustose, foliose and fruticose specimens.
6. Type study of algae and Cyanobacteria-*Volvox*, *Oedogonium*, and *Batrachospermum*.
7. *Marchantia*- morphology of thallus, W.M. rhizoids and scales, V.S. thallus through Gemma cup, W.M. gemmae (all temporary slides), V.S. antheridiophore, archegoniophore, L.S. sporophyte (all permanent slides).
8. Study of morphological, anatomical and reproductive structures of other bryophytes viz: *Polytrichum* and *Funaria*.
9. Study of morphological, anatomical and reproductive structures of the representative Pteridophytes viz: *Azolla*, *Selaginella*, *Dryopteris*, *Equisetum*.
10. *Cycas* – seedling, coralloid root and coralloid root T. S., T. S. of leaflet and Rachis, micro and mega sporophyll, male cone V. S., micro sporophyll T. S. , entire and V. S. of ovule.
11. *Pinus* - Branch of indefinite growth, spur shoot, T. S of old stem and needle R . L .S and T. L. S. of stem, male and female cone, V .S. of male and female cone.
12. Any other practical found feasible by the teacher and approved by the Coordinator/Head and Dean.

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Semester - I

Value Added Course

COMMUNICATIVE ENGLISH

ENG-VAC-101

Credits: 02

Time: 30 Hours

Max. Marks: (25+25)

Unit I:

(07 Hours)

Spoken English: Practice in the correct pronunciation of English vowels and consonants, syllables and accent, International Phonetic Alphabet (IPA)

Unit II: Grammar (08 Hours)

1. Verbs: -
 - Subject-verb concord
 - Non-finite verb forms (infinitives and participles)
2. Sentence Structure: -
 - Connectors
 - Types of sentences
 - Affirmative/interrogative sentences,
 - Negation, Exclamations
 - Types of phrases and clauses
 - finite and non-finite subordinate clauses
 - noun clauses and phrases
 - adjective clauses and phrases
 - adverb clauses and phrases
 - Modes of reporting

Unit III:

(08 Hours)

English in Everyday Situations: Greetings/Introducing Oneself, Making requests/seeking Permission, Asking for and giving information/complementing/apologizing Role play: Identifying and acting out different situations

Unit IV:

(07 Hours)

Written Communication and Composition: Paragraph writing, letter writing, Report Writing, Making Presentations

Reference Books:

1. Effective English Communication by Mohan, Krishna, Raman and Meenakshi, New Delhi: Tata McGraw Hill, 2000.
2. Communicative English by Anuradha and Meenal, Nirmal Publishing House, 2016.
3. A Communicative Grammar of English by Leech, Geoffrey and Jan Svartvik, Routledge 2003.
4. *Advanced English Grammar*, by Martin Hewing, Cambridge University Press, New Delhi, 2010,
5. Write Rightly by Geetha Rajeevan, CUP

Online Resources

BBC Learning English

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Semester - I

Skill Enhancement Course

INTRODUCTION TO SERICULTURE

ZOO-SEC-102

Credits: 02

Time: 30 Hours

Max. Marks: (25+25)

Unit I: Introduction and Scope

(07 Hours)

Origin and history of sericulture, scope and advantages of sericulture in India. Distribution of mulberry and non-mulberry sericulture industry in India. Silk route. Silk production in the world. Silk types, composition, properties and uses.

Unit II: Structure and Life Cycle

(08 Hours)

Classification of silkworm, Morphology of various stages (egg, larva, pupa and moth) of mulberry and non-mulberry silkworms, Sex differences in larvae, pupa and adults of *Bombyx mori*, Structure of silk gland.

Unit III: Mulberry Cultivation

(08 Hours)

Popular mulberry varieties of temperate region, Optimum conditions for mulberry growth, Mulberry planting system, Methods of mulberry propagation (seedling, vegetative & micro- propagation methods), pruning types and objectives, Concept of irrigation, Methods and frequency of irrigation.

Unit IV: Silkworm Breeding

(07 Hours)

Races of *Bombyx mori* and classifications, Commercial races of Indis, Breeding of silkworms technique, Criteria and methods for selection, individual and batch selection. Inbreeding, Advantages and disadvantages, Heterosis; Advantage of hybrids, single and polyhybrids, interspecific hybrids in non-mulberry silkworms. Basic seed maintenance.

Suggested Books

1. Charsley, S.R. (1982). Culture and Sericulture. Academic Press Inc., New York, U.S.A
2. Dokuhon, Z.S. (1998). Illustrated Textbook on Sericulture. Oxford & IBH publishing Co., Pvt. Ltd. Calcutta.
3. Ganga, G., and J. Sulochana Chetty. (1991) An introduction to sericulture. Oxford & IBH Publishing Company.
4. Hasao Aruga (1994). Principles of Sericulture (Translated from Japanese) Oxford & IBH publishing Co., Pvt. Ltd. New Delhi.
5. Madan Mohan Rao, M. (1999) Comprehensive Sericulture Manual. PS Publications, Hyderabad.

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Semester - I

Skill Enhancement Course

EXPERIENTIAL LEARNING (BASED ON ZOO-SEC-102)

ZOO-SEC-104

Credits: 02

Time: 60 Hours

Max. Marks: (25+25)

1. Morphology of silkworm egg, larva, pupa and moth.
2. Comparative study of Mulberry and non-mulberry silkworms at egg, larva, pupa and moth stage.
3. Structure of silk glands through whole mounts.
4. Larval mouth parts, spinneret and gonad.
5. Identification of different stages in development and mounting of embryo.
6. Selection of cocoons for breeding.
7. Identification of different races of silkworm.
8. Visit to different sericulture farms for field study.
9. Any other practical found feasible by the teacher and approved by the Coordinator/Head and Dean.

Semester - II

Major Course

ANIMAL DIVERSITY (CHORDATES)

ZOO-MAJ-201

Credits: 04

Time: 60 Hours

Max. Marks: (50+50)

Unit I: General Characters and Classification (15 Hours)

General characters and classification up to subclass level with distinctive and Adaptive features of Protochordates (Urochordates and Cephalochordates); Cyclostomata, Pisces, Amphibia, Reptilia, Aves and Mammalia. along with the suitable examples of each category.

Unit II: Protochordates and Anamniotes (15 Hours)

Protochordata: Digestive System and Circulatory system of Herdmania. Retrogressive Metamorphosis. Pisces:-Digestive System, Respiratory System (Gills Structure), Urinogenital system of Scoliodon Migration and Osmoregulation in fishes. Amphibia: - Digestive System, Respiratory System, Urinogenital system of frog. Neoteny in amphibians.

Unit III: General Organization of Reptiles (15 Hours)

Origin of Amniotes, Affinities and general organization of Sphenodon; General organization of tortoise; Venomous and Non-venomous snakes of India, Poisonous apparatus and biting mechanism in snakes, Snake Venom and its composition, General organization and classification of Crocodilia, Extinct Reptiles (Dinosaurs).

Unit IV: General Organization of Aves and Mammals (15 Hours)

Aves: Digestive System, Respiratory System, Urinogenital system of Pigeon. General characters of Archaeopteryx and its evolutionary significance, General organization of flightless birds and their distribution, Flight adaptations in bird. Mammals: - Aquatic mammals and adaptations, Volant mammals and adaptations.

Reference Books:

1. Dorit, Walker & Barnes: Zoology. Brooks Cole; 1 edition (February 15,1991)
2. Cambell and Reece: Biology (7th ed. 2005, Pearson)
3. Nigam: Biology of Chordates (1997, S. Chand)
4. Kotpal Series of Chordates (Rastogi Publications)
5. Parker & Haswell. 2005. Text book of Zoology Vol. II(Macmillan)
6. Tortora and Anagnostakos, 1986. Principles of Anatomy and Physiology (6thEd.)
7. Schmidt, N. 2005. Animal Physiology (5thEd.)
8. Hoar, 2005. General and comparative Physiology (7thEd.) India print.

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Semester - II Major Course GENETICS

ZOO-MAJ-202
Credits: 02

Time: 30 Hours
Max. Marks: (25+25)

Unit I: Mendelian Genetics (07 Hours)

Mendel's selection of experimental plants, Phenomenon of dominance, Variation in dominance (Incomplete dominance and Codominance), Law of Segregation, Law of independent assortment, Mendel's monohybrid and dihybrid cross, Back cross and test cross. Lethal alleles, Epistasis; dominant and recessive epistasis, Complementary and Supplementary gene Interactions, Pleiotropy.

Unit II: Linkage and Sex linked Inheritance (08 Hours)

Linkage, Chromosomal theory of Heredity, complete and incomplete linkage, linkage groups and significance of linkage, Cytological basis of crossing over, molecular mechanism of crossing over; Two factors and three factor crosses; tetrad analysis, Interference and Coincidence; Sex linked inheritance in human beings.

Unit III: Multiple Alleles and Cytoplasmic Inheritance (07 Hours)

Multiple alleles, Coat Color in Rabbit, Blood groups in humans and Bombay phenotype, Rh factor and Eye Color in *Drosophila*, Evidences for Cytoplasmic inheritance, Maternal inheritance in *Limnaea*, Extra-Nuclear inheritance in *Paramecium* (Kappa particles).

Unit IV: Gene Mutation and Genetic Disorders (08 Hours)

Mutations; kinds of mutations, Point Mutations, Multiple mutations, Spontaneous mutations, Induced mutations, Radiations and temperature as mutagen, Chemical mutagens, Detection of mutations; Genetic disorders- Huntington disease, Duchene muscular dystrophy, Hemophilia, Thalassemia, and Cystic fibrosis.

Reference Books:

1. Gardner, E. J., Simmons, M. J., Snustad, D.P. (2008). Principles of Genetics. VIII. Ed. Wiley India.
2. Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V. Ed. John Wiley and sons
3. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of genetics. X Ed. Benjamin Cummings.
4. Russell, P.J. (2009). Genetics a molecular approach. III Ed. Benjamin Cummings.

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Semester - II

Major Course

EXPERIENTIAL LEARNING (BASED ON ZOO-MAJ-201 & 202)

ZOO-MAJ-203

Credits: 02

Time: 60 Hours

Max. Marks: (25+25)

1. Study of salient features of the following Museum Specimens: (*Herdmania*, *Amphioxus*, *Lamprey*, *Scoliodon*, *Torpedo*, *Trygon*, *Chimaera*, *Labeo*, *Cattla*, *Cyprinus*, *Schizothorax*, *Tor*, *Lung fish*, *Uraeotyphlus*, *Ambystoma*, *Alytes*, *Hyla*, *Salamander*, *Tortoise*, *Turtle*, *Cobra*, *Hydrophis*, *Viper*, *Crocodile*, *Sparrow*, *Bulbul*, *Crow*, *Parrot*, *Kiwi*, *Duck*, *Platypus*, *Rat*, *Deer*).
2. Identification of Poisonous and Non-Poisonous snakes.
3. Dissection of Fish to show Gills, Digestive system and Reproductive system.
4. Field survey for Photography and Identification of the local fauna; (Amphibian, Reptiles & Birds).
5. Preparation of temporary mount of Polytene chromosome from salivary glands of *Drosophila* larva.
6. Idiogram preparation and determination of karyotype asymmetry in *Homo sapiens*.
7. Identification of ABO Blood groups.
8. Extraction of DNA from tissues.
9. Pedigree analysis of Haemophilia.
10. Any other practical found feasible by the teacher and approved by the Coordinator/Head and Dean.

Semester - II
Minor Course
PLANT ANATOMY & PHYSIOLOGY

BOT-MIN-201
Credits: 04

Time: 60 Hours
Max. Marks: (50+50)

Unit I: Plant Anatomy & Development (15 Hours)

Introduction of Plant anatomy, techniques & its applications, Meristems–Different types, Characteristics of Procambium & Cambium. Simple tissues, conductive tissues–Xylem & Phloem. Structure–tyloses–Heartwood and sapwood–growth rings. Periderm, rhytidome, and the nature of bark. An introduction of plant developmental biology, techniques & applications, plant growth kinetics and patterns of growth. Seed germination. Tropisms; Photomorphogenesis. Organisation of root apical meristem & shoot apical meristems (theories).

Unit II: Plant Water Relations (15 Hours)

Physical properties of water, Importance of water to plant life. Diffusion, imbibition and osmosis; concept & components of water potential. Absorption and transport of water, Ascent of sap, Translocation of organic solutes, Mechanism of phloem transport, Source-sink relationship. Transpiration, types of transpiration, opening and closing of stomata, Mechanism of transpiration.

Unit III: Mineral Nutrition (15 Hours)

Mineral Nutrition: Essential elements (macro and micronutrients) and their role in plant metabolism, deficiency symptoms. Mineral ion uptake (active and passive transport). Nitrogen metabolism-biological nitrogen fixation in Rhizobium. Relationship between nitrogen fixation & photosynthesis.

Unit IV: Photosynthesis (15 Hours)

Photosynthesis: Absorption & action spectra, enhancement effect; Photosynthetic pigments, photosynthetic light reactions, photophosphorylation and its types, carbon assimilation pathways: C3, C4, and CAM. Photorespiration. Physiological effects of phytohormones-Auxins, Gibberellins, Cytokinins, ABA, Ethylene, Brassinosteroids, Salicylic acid, Jasmonates. Physiology of flowering - photoperiodism, role of phytochrome in flowering, Vernalization. Seed dormancy and seed germination.

Reference Books:

1. Beck, C.B. (2010). An Introduction to Plant Structure and Development, II edition
2. Ueli Grossiklaus (2019) Plant development & Evolution. 1st edition. Academic Press.
3. Alessandro Minelli (2018) Plant Evolutionary Developmental Biology. Cambridge University Press.
4. B.P Pandey (2012). Plant Anatomy. S. Chand publishers.
5. Ramsay Jodie L (2009) An Overview of Plant Anatomy & Diversity: A Botany Lab Manual. Kendall/Hunt Publishing Co, U.S.; 2nd edition.
6. Rajesh Tandon, K. R. Shivanna, Monika Koul (2020) Reproductive Ecology of Flowering Plants
7. : Patterns & Processess. Springer.
8. Taiz, L. and Zeiger, E. (2010) Plant Physiology. 6th Edition. Sinauer Associates, USA.

Semester - II
Minor Course

EXPERIENTIAL LEARNING (BASED ON BOT-MIN-201)

BOT-MIN-202

Credits: 02

Time: 60 Hours

Max. Marks: (25+25)

1. Measurement of plant growth in plants.
2. Study of cytological zonation in the shoot apical meristem in double stained permanent slides of any suitable plant.
3. Study of quiescent centre cells through photographs.
4. Study of C. S. of typical dicot and monocot leaves.
5. Study of epidermal peels of leaves of appropriate to study various stomatal types.
6. Study of anatomy of dicot and monocot roots
7. Study of anatomy of dicot and monocot stem.
8. Determination of water potential of potato tuber tissues by gravimetric method.
9. Determination of osmotic potential of onion epidermal peels by plasmolytic method.
10. Determination of stomatal frequency and stomatal index of a given leaf material.
11. To study the effect of time and enzyme concentration on the rate of reaction (e.g. action of diastase on starch) by spot plate method.
12. Study of enzyme kinetics with respect to the effect of pH.
13. Extraction and separation of chloroplast pigments in the plant material by partitioning solvent method.
14. Separation of chloroplast pigments by paper & thin layer chromatography.
15. Any other practical found feasible by the teacher and approved by the Coordinator/Head and Dean.

Syllabus for Integrated B. Sc. - M. Sc. Programme in Zoology under CBCS (Batch 2022)

Semester - II Value Added Course ENVIRONMENTAL STUDIES

ZOO-VAC-201
Credits: 02

Time: 30 Hours
Max. Marks: (25+25)

Unit I: Introduction to Environment (07 Hours)

Environment: concept and importance; Components of environment: Physical, Biological and Social; Ecosystem: Concept, Structure and Function. Ecosystem services: Ecological, economic, social, aesthetic and informational, Environmental Movements (Chipko & Appiko Movement).

Unit II: Natural Resources (08 Hours)

Land resources: global land use patterns, concept land degradation and desertification; Consequences of over-exploitation of Forest resources; Consequences of over-utilization of Water resources, concept of water harvesting and watershed management, water conflicts; Renewable and non-renewable energy sources

Unit III: Biodiversity and Conservation (07 Hours)

Biodiversity: definition, levels (genetic, species and ecosystem) and values. Threats to biodiversity: habitat loss, poaching of wildlife, biological invasions. Concept of endemism and hot-spots of biodiversity. Conservation of biodiversity: In-situ and Ex-situ concepts.

Unit IV: Environmental Issues (08 Hours)

Causes, effects and control measures of: Air, Water, Soil, Noise and Solid waste pollution. Concept of natural disasters and Global environmental issues: Increase in greenhouse gases, Climate change, Acid rain and Stratospheric ozone layer depletion. Salient features of: Environment Protection Act, 1986.

Reference Books:

1. Panigrahi, A.K. and Alaka Sahu, 2014 - A text book of Environmental studies. Giribala Publications, Berhampur.
2. Carson, R. 2002 - Silent spring. Houghton Mifflin Harcourt
3. Gleeson, B. and Low, N. (eds) 1999 - Global ethics and environment. London
4. Odum, EP, Odum, HT and Andrews, J. 1971- Fundamentals of Ecology, Philadelphia, Saunders.
5. Singh, JS, Singh, SP and Gupta SR. 2014 - Ecology, Environmental Science and conservation. S. Chand Publications, New Delhi.
6. Smith, R.L. (2008); Ecology and Field biology, USA

Semester - II
Skill Enhancement Course
SILKWORM REARING TECHNOLOGY

ZOO-SEC-202
Credits: 02

Time: 30 Hours
Max. Marks: (25+25)

Unit I: Silkworm Rearing (07 Hours)

Silkworm Rearing House, Characteristics of rearing house, selection of site, provision for various activities in rearing, Disinfection methods and appliances, Selection of silkworm breeds for rearing, Estimation of mulberry leaf yield and assessment of leaf quality, Appliances used for worms rearing, feeding, bed cleaning & spinning larvae.

Unit II: Chawki Rearing (08 Hours)

Chawki rearing of young age worms in India, Paraffin paper rearing, Box rearing, New net method, co-operative rearing, self, floor & shoot rearing, brushing of larvae, characteristics of chawki worms, leaf quality for chawki rearing, transportation of chawki worms, significance of chawki rearing.

Unit III: Non-Mulberry Silkworm Rearing (07 Hours)

Tasar Silkworm Rearing, Oak Tasar Silkworm Rearing, Eri Silkworm Rearing, Muga Silkworm Rearing,

Unit IV: Grainage Technology & Marketing of Cocoons (08 Hours)

Breeding stations, Selection of a seed cocoon rearer, Grainages procedure, Diapausing and Non-diapausing egg, Incubation methods, Transport of eggs. physical characters of cocoons considered for commercial, Defective cocoons, Transportation and marketing of cocoons.

Reference Books:

1. Omura, S. (1973) Silkworm Rearing Techniques in Tropics. Overseas Technical Cooperation Agency, Tokyo, Japan.
2. Rajan, R.K. and Himantharaj, H.T. (2005) Silkworm Rearing Technology. Central Silk Board, Bangalore.
3. Tazima, Y. (1972) Handbook of Silkworm Rearing. Fuji Pub.Co. Ltd., Tokyo, Japan.
4. Hiratsuka. (1999) Silkworm Breeding Oxford & IBH publishing Co, Pvt. Ltd. New Delhi. Calcutta.
5. Narasimhanna. M.N. (1998). Manual on Silkworm egg Production. CSB., Govt. of India, Bangalore.

Syllabus for Integrated B. Sc. - M. Sc. Programme in Zoology under CBCS (Batch 2022)

Semester - II

Skill Enhancement Course

EXPERIENTIAL LEARNING (BASED ON ZOO-SEC-202)

ZOO-CC-204

Credits: 02

Time: 60 Hours

Max. Marks: (25+25)

1. Plan of model rearing house.
2. Study of Rearing equipment; rearing stands, Trays, chop sticks, ant wells, chopping knives
Chopping board, Feeding stand foam pads, basin stand, feather, paraffin paper, hygrometer and mountages etc.
3. Methods of disinfection of the rearing rooms and appliances, spraying and fumigation.
4. Methods of brushing, rearing young age worms, feeding, cleaning and spacing schedule for chawki silkworm rearing.
5. Leaf preservation for silk worm rearing.
6. Late stage rearing, feeding, cleaning, and spacing; temperature, humidity, requirements.
7. Different-types of mountages, methods of mounting
8. Harvesting and cocoon assessment
9. Data recording during silkworms rearing.
10. Individual rearing and mass rearing.
11. Visit to different sericulture farms for studying silkworm rearing techniques.
12. Any other practical found feasible by the teacher and approved by the Coordinator/Head and Dean.

Syllabus for Integrated B. Sc. - M. Sc. Programme in Zoology under CBCS (Batch 2022)

Semester - III Major Course APPLIED ZOOLOGY

ZOO-MAJ-301
Credits: 04

Time: 60 Hours
Max. Marks: (50+50)

Unit I: Parasite & Parasitism

(15 Hours)

Parasites and Hosts, Zoonosis, Host Parasite relationship, Life cycle, pathogenecity and control of parasites such as, *Fasciola hepatica*, *Taenia solium*, *Schistosoma haematobium*, *Ascaris lumbricoides* and *Enterobius vermicularis*

Unit II: Economic Entomology and Vermiculture

(15 Hours)

Beneficial Insect's products (Honey, Silk and Lac). Insects as pollinators; Insects as biological control agents (Predators and Parasitoids) of pests. Harmful Insects: Occurrence, life cycle and control of the pest attacking Apple (*Quadraspidiotus perniciosus*), Paddy (*Scirpophaga incertulas*) and Vegetable (*Pieris brassicae*) Vermiculture technique.

Unit III: Aquaculture

(15 Hours)

General account of Trout culture and carp culture, Induced breeding in fish. Fish diseases and management (bacterial, Viral and Fungal). Ornamental fish culture, Prawn Culture- Freshwater prawn culture, Aquatic weeds, their control and importance

Unit IV: Farm Animals

(15 Hours)

Indigenous and exotic breeds of Ruminants (Cows); Loose and conventional housing system, feeding and rationing; Commercial importance of dairy and poultry farming; Broiler farming; Varietal improvement techniques; Diseases of Ruminants (Cows) and Poultry and their management.

Reference Books:

1. Prost, P.J. (1962). Apiculture. Oxford and IBH, New Delhi
2. Hafez, E.S.E. (1962). Reproduction in Farm Animals, Lea and Fabiger Publishers
3. Srivastava, C. B. L. (1999). Fishery Science and Indian Fisheries. Kitab Mahal Publ.
4. Sardar Singh, Beekeeping in India. Indian Council of Agricultural Research. New Delhi.

Syllabus for Integrated B. Sc. - M. Sc. Programme in Zoology under CBCS (Batch 2022)

Semester - III Major Course ORGANIC EVOLUTION

ZOO-MAJ-302
Credits: 02

Time: 30 Hours
Max. Marks: (25+25)

Unit I: Origin of Life and Evolutionary Theories (08 Hours)

Ancient and Medieval theories; Theory of special creation, Cosmozoic theory, theory of Abiogenesis, Theory of Biogenesis, Chemosynthetic origin of life; Evolutionary theories; Lamarckism, Darwinism, Neo-Darwinism, Evidences of evolution.

Unit II: Evolutionary Patterns and Isolation (08 Hours)

Concept of organic evolution, Sequential and Divergent evolution, Anagenesis and Cladogenesis, Monophyletic, Polyphyletic and Paraphyletic evolution. Microevolution, Macroevolution and Megaevolution. Reproductive Isolating mechanisms (Pre-mating & Post-mating).

Unit III: Population Genetics and Natural Selection (07 Hours)

Hardy-Weinberg equilibrium, Factor effecting gene frequencies, Genetic drift, Founder effect and Bottleneck effect, Molecular clock concept, Natural selection, Types of Natural selection, Industrial melanism.

Unit IV: Evolution of Man and Horse (07 Hours)

Evolutionary trends in man; Bipedal locomotion, Upright posture, Evidences from molecular biology in favour of Hominid evolution from apes, Common ancestors of Apes and Man in Oligocene and Miocene, Evolution of man in Pleistocene period, Phylogeny of horse.

Reference Books:

1. Ridley, M. 2004. Evolution. III. Edition. Blackwell Publishing co.
2. Barton, N. H., Briggs, D.E.G., Eisen, J. A., Goldstein, D.B. and Patel, N. H. 2007 Evolution. Cold Spring, Harbour Laboratory Press
3. Genetics and Analysis of Quantitative traits by Lynch. M and B. Walsh (1997). Senauer Associates, Sunderland.
4. Evolutionary Genetics by Maynard Smith J (1989), Oxford University press.
5. Genes in Population by Spiess. E (1989) 2nd Edition. Wiley-Liss, New York

Semester - III

Major Course

EXPERIENTIAL LEARNING (BASED ON ZOO-MAJ- 301 & 302)

ZOO-MAJ-303

Credits: 02

Time: 60 Hours

Max. Marks: (25+25)

1. Study of placoid, cycloid and ctenoid scales through permanent slides.
2. Study of morphological characters of *Taenia solium*, *Fasciola hepatica*, *Ascaris*, *Enterobius* with the help of permanent slides/ specimens.
3. Mounting of placoid scales and Cycloid scales.
4. Study of morphological characters of *Bombyx mori*.
5. Collection of insect pollinators.
6. Collection and identification of Apple, Paddy and Cabbage pests
7. Mounting of sting apparatus of Honey Bee.
8. Fish farm visit for studying induced breeding.
9. Experimental transmission of microbial (bacterial & fungal) pathogens of fish to understand pathogenecity pattern.
10. Histopathology of microbial and parasitic infected fish.
11. Study of connecting links between two phyla/class through specimens/charts.
12. Study human ancestors through chart/ photograph.
13. Study of horse phylogeny through chart/ photographs.
14. Any other practical found feasible by the teacher and approved by the Coordinator/Head and Dean.

Semester - III

Minor Course

PLANT TAXONOMY, ECOLOGY & EMBRYOLOGY

BOT-MIN-301

Credits: 04

Time: 60 Hours

Max. Marks: (50+50)

Unit I: Taxonomy

(15 Hours)

Definition of Plant Taxonomy, Concept of Biosystematics, Experimental taxonomy, Integrative taxonomy. Principles of plant taxonomy; Basic components of plant taxonomy. Phases of Plant Taxonomy. Taxonomic categories: Taxonomic hierarchy (structure and properties); Concept of phenetics & cladistics w.r.t plants. Plant identification: methods of identification; Role of information technology in plant identification. Plant nomenclature: International Code of Nomenclature for algae, fungi, and plants (ICN): principles of ICN; Angiosperm Phylogeny Group (Concept Version & latest trend).

Unit II: Basic Components, Data & Tools

(15 Hours)

Taxonomic tools and institutions: Herbarium (procedures of collection, processing and preservation of plant specimens, roles of herbaria); Cybertaxonomy (concept and scope), e- floras and e-herbaria. Botanic gardens (concept and roles): Botanical Survey of India. Plant Molecular Taxonomy: definition & applications, molecular data sources, Concept of Plant DNA barcoding & Plant DNA fingerprinting, their applications.

Unit III: Plant Ecology Basics

(15 Hours)

Concept of niche & habitat, resource partitioning, character displacement, food web complexity, primary productivity–global patterns & methods of measurement. Population characteristics (primary & secondary), population growth curves, life history strategies (r and k selection). Species interactions–types of interactions, Characteristics of communities–analytical & synthetic characters, Levels of species diversity and its measurement, Ecotones & edge effect. Ecological Succession–types, Biogeographical zones of India, Theory of island biogeography.

Unit IV: Embryology

(15 Hours)

Florigen concept and photoperiodism, Pollination mechanisms and vectors. Male Gametophyte: Structure of anther, microsporogenesis, tapetum; sperm dimorphism; pollen germination, Female Gametophyte: Ovule types; megasporogenesis; organization of embryo sac; Self-incompatibility and fertilization. Seed Development and fruit growth: Endosperm development; embryogenesis; Polyembryony & Apomixis. Dormancy; Importance and types of dormancy; Double fertilization; *in vitro* fertilization.

Reference Books:

1. Simpson, M.G. (2006). Plant Systematics. Elsevier, Amsterdam.
2. Gurcharan Singh (2021). Plant Systematics Theory and Practice 4th Edition. Oxford & IBH/CBS.
3. O.P Sharma (2017). Plant Taxonomy. 2nd Edition. McGraw Hill Education; 2nd edition (1 July 2017).
4. B.P Pandey (2012). Plant Anatomy. S. Chand publishers.
5. Odum, E.P. (2011). Fundamental of Ecology. 5th Edition. Saunders. ISBN 9780030584145
6. Chapman, J.L. and Reiss, M.J. (2003). Ecology: Principles and Applications. Second Edition. Cambridge University Press, UK. ISBN 0 521 58802 2. 335 pages.

Semester - III

Minor Course

EXPERIENTIAL LEARNING (BASED ON BOT-MIN-301)

BOT-MIN-302

Credits: 02

Time: 60 Hours

Max. Marks: (25+25)

1. Preparation of herbarium specimens of different types of leaves & inflorescences.
2. Taxonomic description of representative dicot & monocot plant families: Ranunculaceae, Brassicaceae, Fabaceae, Rosaceae, Asteraceae, Solanaceae, Poaceae, Liliaceae.
3. Study of various placentation types.
4. Collection, processing and preservation of 10 herbarium specimens to be submitted by each student at the time of examination. This exercise will carry 10 marks.
5. Demonstration of plant identification mobile apps.
6. Determination of minimum size and number of quadrats for phytosociological studies.
7. Computation of Frequency, Density, Abundance and Cover of constituent species of different communities.
8. Estimation of IVI of the species in different communities.
9. Measurement of Biodiversity: Species Richness and Evenness, Various Indices.
10. Study of microsporogenesis and gametogenesis in appropriate materials.
11. Study of T.S. of Anther.
12. Study of pollen germination and average pollen tube length in vitro.
13. Study of different types of ovules via permanent slides.
14. Study of embryo sac (Polygonum).
15. Isolation of monocot and dicot embryos from suitable material.
16. Any other practical found feasible by the teacher and approved by the Coordinator/Head and Dean.

Semester - III
Value Added Course

KASHMIRI SCRIPT

KRU-VAC-301

Credits: 02

Time 30 Hours

Max Marks:(25+25)

	کاشمر رسم الخط	
8:00 Hours	کاشمر رسم الخط	پونٹ I:
	ریوایت	
	تعارف	
7:00 Hours	کاشمر اعلا	پونٹ II:
	مصوتہ (Vowels)	
	مصمتہ (Consonants)	
8:00 Hours	کاشمر منتر جملہ سازی	پونٹ III:
	سادہ مرکب تہہ پیچیدہ جملہ	
7:00 Hours	مخاورہ تہہ ضرب النثل	پونٹ IV:

امدادی کتابچہ:

کاشمر زبان ہنز بناؤ تھہ۔ انہار: کاشمر ڈپارٹمنٹ، یونیورسٹی آف کشمیر حضرت بل سرینگر
کشمیری زبان اور شاعری: جلد اول (عبدالاحد آزاد): اکیڈمی آف آرٹ کلچر اینڈ لٹریچر سرینگر
کاشمر ادب توارنخ (ناجی منور، شفیع شوق): کاشمر ڈپارٹمنٹ، یونیورسٹی آف کشمیر حضرت بل سرینگر
کاشمر ادب توارنخ (اوتار کشن رہبر)
کاشمر گرایمر (شفیع شوق)
وتیتا (آفاق عزیز)

Semester - III
Value Added Course

सत्र I
प्रमुख पाठ्यक्रम
हिन्दी

HIN-VAC-301 / हिन्-वीएसी-301
क्रेडिट्स : 02

समय: 30 घण्टे
पूर्णांक : (25+25)

इकाई : 1

समय: 8:00 घण्टे

स्वर – परिचय एवं परिभाषा, मात्राएं एवं उच्चारण स्थान, व्यंजन – परिभाषा एवं परिचय, विदेशी व्यंजन , संयुक्त व्यंजन , महाप्राण एवं अल्पप्राण ध्वनियां, पंचमाक्षर एवं अनुनासिक ध्वनियां

इकाई : 2

समय: 8:00 घण्टे

शब्द लेखन , शब्द (मात्रा सहित), वाक्य लेखन , वाक्यों के प्रकार , सरल वाक्य, मिश्रित वाक्य, संयुक्त वाक्य, शुद्ध - अशुद्ध वाक्य , विराम चिह्न, लिंग की परिभाषा (स्त्रीलिंग-पुल्लिंग), एकवचन – बहुवचन , संज्ञा, सर्वनाम, विशेषण (परिभाषा एवं प्रकार)

इकाई : 3

समय: 7:00 घण्टे

पर्यायवाची शब्द, विलोम शब्द, अपठित अनुच्छेद (गद्यांश), सार लेखन , टिप्पणी लेखन , अनुच्छेद लेखन , पल्लवन – संक्षेपण, हिन्दी पठन एवं श्रुति लेखन

इकाई : 4

समय: 7:00 घण्टे

विभिन्न विधाएँ :

निबन्ध लेखन (परिभाषा एवं प्रकार) , पत्र लेखन (सरकारी , अर्धसरकारी / निजी) , कहानी लेखन (परिभाषा एवं प्रकार) , हिन्दी विज्ञापन लेखन

अनुशंसित पुस्तकें :

1. सरल हिन्दी व्याकरण और रचना (वासुदेव नन्दन प्रसाद), प्रकाशक – भारती भवन
2. आधुनिक हिन्दी व्याकरण और रचना (डॉ. वासुदेव नन्दन प्रसाद), प्रकाशक – भारती
3. हिन्दी व्याकरण भाषा और उसके अनुप्रयोग (मीनाक्षी अग्रवाल) , ऑक्सफोर्ड प्रेस, नई दिल्ली

Semester - III

Skill Enhancement Course

SILK TECHNOLOGY & CROP PROTECTION

ZOO-SEC-302

Credits: 02

Time: 30 Hours

Max. Marks: (25+25)

Unit I: Silk Technology & By-Products

(07 Hours)

Silk stifling methods, Storage and sorting of cocoons, Cocoon cooking, Reeling operation and appliances, Re-reeling, raw silk testing methods. By-products of moriculture, rearing, grainage operation and reeling.

Unit II: Mulberry Diseases & Management

(08 Hours)

Fungal, Bacterial, viral, nematode and deficiency diseases of mulberry, Preparation of the spray solution, fungicides and their toxicity, precautions to be taken while spraying the fungicides.

Unit III: Non-Mulberry Diseases & Management

(07 Hours)

Diseases of non-mulberry silkworm host plants, diseases of tasar silkworm host plants, oak tasar silkworm host plants, muga silkworm host plants, Eri silkworm host plants, Application of fungicides, Integrated disease management (IDM).

Unit IV: Silkworm Diseases & Management

(08 Hours)

Common diseases of mulberry silkworm (Protozoan, Bacterial, Viral & Fungal). Diseases of non-mulberry silkworms. Management of silkworm diseases.

Reference Books:

1. Diseases and Pests of mulberry and their control. Sen Gupta, Govindaiah and Pradeep Kumar CSR & TI Mysore (1991).
2. Govindan, R. and T.K. Narayanaswamy, Devaiah (1998). Principles and silkworm pathology- text book.
3. Hand book of pests and disease control of mulberry and silkworm; United Nation Publication, Bangkok, Thailand (1990).
4. Lu Yup Lian (1995). Silkworm diseases: oxford and IBH Publication. Co. Pvt. Ltd.

Semester - III

Skill Enhancement Course

EXPERIENTIAL LEARNING (BASED ON ZOO-SEC-302)

ZOO-SEC-304

Credits: 02

Time: 60 Hours

Max. Marks: (25+25)

1. Identification and preservation of different diseased mulberry leaf/plant parts based on external symptoms.
2. Collection and identification of the pests from mulberry tree and silkworm rearing house.
3. Observation on morphological and anatomical symptoms of Pebrine in silkworm.
4. Observation of the spores of Pebrine (*Nosema bombycis*) infecting silkworm and preparation of temporary mounts of pebrine spores of *Nosema bombycis*.
5. Study of bacterial flacherie and fungal muscardine in silkworm from sample/slides.
6. Identification of silkworm pests.
7. Methods of application of insecticide/bed disinfectant/fungicide/formalin solution and management of silkworm diseases.
8. Visit to different sericulture farms for field study.
9. Any other practical found feasible by the teacher and approved by the Coordinator/Head and Dean.

Semester - IV

Major Course

COMPARATIVE ANATOMY OF VERTEBRATES

ZOO-MAJ-401

Credits: 04

Time: 60 Hours

Max. Marks: (50+50)

Unit I: Integumentary and Skeletal Systems

(15 Hours)

Integumentary system and function of integument, Derivatives of the Integument, Epidermal derivatives: glands; Epidermal Scales, Horns, Feathers & Hair. Skull embryonic components and Morphogenesis, Jaw suspensions in Vertebrates, Types of Vertebrae in Vertebrates.

Unit II: Digestive and Respiratory systems

(15 Hours)

Digestive system: - Alimentary canal and associated glands in Vertebrates. Structure of stomach in ruminants, Respiratory system: - skin, gills (external and internal gills) lungs and Air sacs; Accessory respiratory organs of Vertebrates, Swim or air bladder.

Unit III: Circulatory and Urinogenital systems

(15 Hours)

Circulatory system: - General plan of circulation, evolution of heart and Modification of aortic arches. Blood, Function of blood, lymphatic system; Urinogenital system: - Vertebrate kidney: Pronephros, Mesonephros and Metanephros. Gonads and their ducts in Pisces, Amphibia, Reptilia, Aves & Mammals.

Unit IV: Nervous system & Sense organs

(15 Hours)

Nervous system: - Central Nervous system in Vertebrates (Elasmobranchs, Teleosts, Amphibia, Reptilia, Aves and Mammalia, Sense organs: - Classification of receptors, Brief account of visual receptors in Elasmobranchs, Amphibia, Reptilia, Aves and Mammalia. Cutaneous receptors and Chemoreceptors.

Reference Books:

1. Kardong, K. V. 2005. Vertebrate's Comparative Anatomy, Function and Evolution. IV Edition. McGraw-Hill Higher Education.
2. Kent, G.C. and Carr, R.K. 2000. Comparative Anatomy of the Vertebrates. IX Edition the McGraw-Hill Company.
3. Weichert, C.K. and William Presch. 1970. Elements of Chordate Anatomy. Tata McGraw Hills
4. Hilderbrand, M. and Gaslow, G.E. Analysis of Vertebrate Structure. John Wiley and sons

Semester - IV

Major Course

WILDLIFE CONSERVATION AND MANAGEMENT

ZOO-MAJ-402

Credits: 04

Time: 60 Hours

Max. Marks: (50+50)

Unit I: Wildlife Importance and Conservation (15 Hours)

Definition of Wildlife, Importance of its study, Values of Wild life- positive and negative; Causes of depletion, Conservation of wild life (In-Situ & Ex-Situ), Wildlife conservation ethics, World conservation strategies. Important National Parks, Wildlife sanctuaries and biosphere reserves of India with their characteristic wildlife, Protected areas of Jammu and Kashmir.

Unit II: Habitat Evaluation and Wildlife Conflicts (15 Hours)

Habitat analysis, evaluation and management of wild life: Physical parameters: Topography, Geology, Soil water; Biological parameters: food, cover, forage, browse and cover estimation; Impact of climate change on wildlife, Human-wildlife conflict and its management. Poaching and illegal trading.

Unit III: Habitat Management (15 Hours)

Fire as management tool in grassland management. Habitat management techniques – control and regulation of grazing, Weed eradication, water hole management. Wetland; Characteristics, Method of wetland evaluation, physical, chemical and biological assessment of wetland. Management of invasive wetland species in India, Treaties for wetland conservation, RAMSAR and Bonn Convention.

Unit IV: Wild life Protection Act and Projects (15 Hours)

Wildlife Protection Act (1972) and its detailed structure, Recent amendments in WPA 1972 and their role in Wildlife protection and Conservation. Wildlife conservation projects Project Tiger, Project Lion, Project Hangul, Role of organizations like; IUCN, CITES, TRAFFIC, WWF, BNHS in wildlife conservation.

Reference Books:

1. Krausman, P.R. and Cain, W.J. 2013. Wildlife management and conservation, Contemporary Principles and Practices.
2. Frysell, J.M. and Sinclair, A.R.E. 2014. Wildlife Ecology, Conservation and Management.
3. Morrison, M. L. and Mathewson, H.A. 2015. Wildlife Habitat Conservation: Concepts, Challenges and Solutions (Wildlife Management and Conservation).

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Semester - IV

Major Course

EXPERIENTIAL LEARNING (BASED ON ZOO-MAJ-401)

ZOO-MAJ-403

Time: 60 Hours

Credits: 02

Max. Marks: (25+25)

1. Study of salient features of the available vertebrate specimens.
2. Study of exoskeleton of fish through temporary mounts.
3. Identification of Poisonous and Non-poisonous snakes.
4. Disarticulated skeleton of Fowl.
5. Identification of different types of feathers in birds.
6. Study of digestive system of mammals through models.
7. Identification of Vertebrae of the Vertebrates through models/photographs.
8. Fish blood slide preparation.
9. Dissection of fish for exposing gills and swim bladder.
10. Slide preparation for T.S. of liver/gut/Skin.
11. Any other practical found feasible by the teacher and approved by the Coordinator/Head and Dean.

Semester - IV

Major Course

EXPERIENTIAL LEARNING (BASED ON ZOO-MAJ-402)

ZOO-MAJ-404

Time: 60 Hours

Credits: 02

Max. Marks: (25+25)

1. Collection of pellet for analysis of food habits of ungulates.
2. Collection of scat for analysis of food habits of carnivores.
3. Pug mark identification and characterization of common large mammals.
4. Examination of hair cuticle scale pattern of different mammalian species.
5. Preparation of ethograms: time activity budget.
6. Comparative studies of dentition and skull of different species.
7. Visit to any Wildlife Sanctuary of Jammu and Kashmir, followed by report submission.
8. Any other practical found feasible by the teacher and approved by the Coordinator/Head and Dean.

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Semester – IV
Major Course
Discipline Specific Elective
FISH FARMING

ZOO-DSE-401
Credits: 02

Time: 30 Hours
Max. Marks: (25+25)

Unit I: Scope and Importance (08 Hours)

Classification and characters of Cultivable fishes (trout & carps), Scope of Aquaculture, Economic value of fish: as food, food for cattle, fish oil, fish manure and guano, Fish Silage, Fish Glue and isinglass, Fish leather and soap. Role of fishes in Biological Control and harmful fishes.

Unit II: Culture Techniques (07 Hours)

Extensive, Semi-intensive and Intensive Culture, Integrated fish culture with duck farming and Poultry farming, Composite fish culture. General account of Oyster culture, Pen and cage culture, Raft culture.

Unit III: Fish Pond Management (07 Hours)

Types of pond for culture, Layout of fish farm, Prestocking management of ponds and Poststocking management of ponds, Resource of fish seed and their packing and transport methods.

Unit IV: Fish Feed and Health (08 Hours)

Feed management, principle of feed preparation, types and different forms of feed, feed ingredients and feed formulation for different cultivable species. Nutritional diseases (Avitaminosis, Mineral deficiency, Starvation), Health management strategies: monitoring/inspection of fish diseases, Sanitation and disinfection, Vaccines.

Reference Books:

1. Barnabe Gilbert, 1990. Aquaculture-Vol. II. Ellis Horwood: 1097 pp
2. Dilip Kumar, K. 1992. Fish culture in undrainable ponds. F.A.O. Tech. paper:325 P.240
3. Pillay, T.V.R. 1990. Aquaculture, Principles and Practices. Fishing News Books Ltd. p.575
4. Arumugam, N. 2008. Aquaculture, Saras publication p.480
5. Biswas, K.P. Prevention and control of fish and Prawn diseases. Sinderman, C. J. Principle diseases of marine fish and shell

Semester – IV
Major Course
Discipline Specific Elective
POULTRY FARMING

ZOO-DSE-402
Credits: 02

Time: 30 Hours
Max. Marks: (25+25)

Unit I: Introduction to Poultry Farming (07 Hours)

Definition of poultry, Importance of poultry farming, Birds included in poultry. Present status and future prospectus of poultry Industry. Principles of Poultry housing. Poultry houses. Systems of poultry farming.

Unit II: Classification of Poultry (08 Hours)

Classification of poultry (Chicken) on the basis of their utility: Morphological characters, Egg type; (White leg horn, Keystone), Meat type; (Brahma, Cornish) Dual purpose; (Rhode Island Red, Vanraja), Fancy variety; (Silky, frizzled) Indigenous/ Desi; (Kashmiri faverolla, Kadaknath), Classification of Chicken as per international standards.

Unit III: Feed and Livestock Health Management (07 Hours)

Poultry feed Management-Principles of feeding, Nutrients requirements for different stages of layers and broilers. Feed additives definition. Poultry diseases: Viral, bacterial, fungal and parasitic: symptoms, control and management. Chicken vaccination: types, principles and procedure.

Unit IV: Farm Management and Poultry Entrepreneurship (08 Hours)

Space and light management during growing and laying period. Management principles of incubation. Artificial insemination. Poultry litter management: methods of disposal, environmental advantages due to use of poultry litter for different purposes. Egg marketing- types-organized and unorganized marketing. Major problems in egg marketing. Technical support sponsored by the Government for the marketing of meat and eggs.

Reference Books:

1. Panda, A. K. Rural Poultry production.
2. Singh, R. K. Handbook of Hatchery technology.
3. Ibne Ali & Singh, D. K. Handbook of poultry husbandry.
4. Anand, B. Handbook of poultry disease diagnosis & treatment.
5. Viyas, M. K. Glimpse of Indian Poultry Industry.
6. Wilson, Keith. A handbook of poultry practice. (ISBN 8177540697)
7. Mamdal, A. B., Yadav, A. S., Johari, T. S. & Pathak, N. N. Nutrition & Disease management of Poultry (ISBN 81-8189-075-2)

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Semester - V

Major Course

ANIMAL ECOLOGY

ZOO-MAJ-501

Credits:04

Time: 60 Hours

Max. Marks: (50+50)

Unit I: Introduction to Ecology

(15 Hours)

Relevance of studying ecology, History of ecology, Autecology and synecology, levels of organization, Laws of limiting factors: Liebig's law; Law of tolerance; Factor compensation; Light as physical factor; Temperature as physical factor; Concept of temperature regulation in homeotherms and poikilotherms.

Unit II: Population and Biodiversity

(15 Hours)

Population characteristics, Population Size and density, Age structure, Natality, Mortality, life tables, Survivorship curves, Population dynamics and dispersion, Exponential and Logistic growth, equation and pattern. r and k strategies. Population regulation-density dependent and density independent factors. Gause's Principle, Lotka- Volterra Equation, Biodiversity, types, significance and conservation, Diversity indices.

Unit III: Community Ecology and Succession

(15 Hours)

Community characteristics, Classification of Communities, composition of community, Dominance, diversity, species richness, abundance, Horizontal and Vertical stratification, Habitat and Niche, Ecotone and Edge effect, Ecotypes, Ecological succession; Causes, types and process of succession. Theories pertaining to climax community.

Unit IV: Ecosystem Structure and Function

(15 Hours)

Kinds of Ecosystem, Components of Ecosystem, Productivity of Ecosystem, Food chain, detritus and grazing food chains, Food web, Energy flow, Linear and Y-shaped model. Ecological pyramids and ecological efficiencies. Biogeochemical Cycles (H₂O & N₂).

Reference Books:

1. Colinviaux, P.A. (1993). Ecology. II Edn. Wiley, John and Sons. Inc.
2. Krebs, C. J. (2001). Ecology. VI edn. Benjamin Cummings.
3. Odum, E.P. (2008). Fundamentals of Ecology. Indian Edition. Brooks/Cole
4. Robert Leo Smith, Ecology and field biology Harper and Row publisher.
5. Rucklefs, R.E. (2000). Ecology. V. edn. Chiron Press.

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Semester - V

Major Course

PARASITOLOGY AND ENTOMOLOGY

ZOO-MAJ-502

Credits: 04

Time: 60 Hours

Max. Marks:(50+50)

Unit I: Parasitic Associations

(15 Hours)

Parasitism, and types of parasites, Types of Vectors and Hosts, Evolution of parasitism; Distribution of parasitism in animal kingdom. Concept of Susceptibility, Gastro-intestinal tract as a habitat of Protozoan and helminths parasites, Reticulo-endothelial system as a habitat of Protozoan parasite of man, Parasitic adaptations in helminths.

Unit II: Life Cycle and Pathogenicity of Parasites

(15 Hours)

Morphology, life cycle, pathogenicity, prevention and control of *Giardia intestinalis*, *Leishmania donovani*, *Balantidium coli*, *Trichomonas vaginalis*, *Schistosoma haematobium*, *Taenia saginata* and *Trichinella spiralis*.

Unit III: Classification and Morphology of Insects

(15 Hours)

Classification of insects- Important orders of Apterygota: (Thysanura, Collembola), Exopterygota: (Odonata, Isoptera, Orthoptera, Dictyoptera, Dermaptera, Mallophaga, Hemiptera), and Endopterygota: (Lepidoptera, Diptera, Coleoptera, Hymenoptera). Sound producing organs in insects with reference to Stridulation in *Gryllus*, Grasshopper, Light producing organs and mechanism of light production in firefly.

Unit IV: Endocrine Glands and Ecto-hormones in Insects

(15 Hours)

Endocrine glands in insects; Neurosecretory cell, Corpora allata, Corpora Cardiaca and Prothoracic gland; Chemical defence in insects; Adaptive radiation in insects (Mimicry & Adaptive colouration), Types of Pheromones and Allomones in insects and their significance.

Reference Books:

1. Arora, D.R. and Arora, B. (2001). Medical Parasitology II Ed. CBS publ.
2. Noble. E.R. and Noble, G.A. 1982. Parasitology: The biology of animal Parasites V Ed. Lea & Febiger.
3. Chatterjee, K.D. 2009. Parasitology: Parasitology and Helminthology XIII Ed., CBS pulb. & Distributor.
4. Gillot, J. E. Entomology.
5. Smith, J.D. Introduction to parasitology

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Semester - V

Major Course

EXPERIENTIAL LEARNING (BASED ON ZOO-MAJ-501)

ZOO-MAJ-503

Time: 60 Hours

Credits: 02

Max. Marks: (25+25)

1. Study of life tables and plotting of survivorship curves of different types from the hypothetical/ real data provided.
2. Determination of population density in a natural/hypothetical community by Quadrant method and calculation of Shannon-Weiner diversity index for the same community.
3. Physico-chemical analysis of lotic water (Measurement of temperature, turbidity/ penetration of light, determination of pH, DO, FCO₂, Carbonates, Bicarbonates, Ammonia and total phosphorous).
4. Collection, preservation and qualitative and quantitative estimation of Zooplanktons.
5. Collection and identification of Phytoplanktons.
6. Demonstration of LC₅₀ or LD₅₀ estimation pesticides.
7. Any other practical found feasible by the teacher and approved by the Coordinator/Head and Dean.

Semester - V

Major Course

EXPERIENTIAL LEARNING (BASED ON ZOO-MAJ-502)

ZOO-MAJ-504

Time: 60 Hours

Credits: 02

Max. Marks: (25+25)

1. Study of the morphological characters of Silverfish, Grasshopper, Cockroach, Termite, Honeybee, Dragonfly, Damselfly, Butterfly, Moth, Beetle, Housefly, Bug and Wasp.
2. Collection and Identification of common fish parasites.
3. Collection and Identification of parasites of poultry.
4. Study of morphological characters of stages of human/animal parasites with the help of permanent slides.
5. Insects collection, identification and preparation of insectarium.
6. Visit to Sericulture Research Institute.
7. Any other practical found feasible by the teacher and approved by the Coordinator/Head and Dean.

Semester – V

Major Course

Discipline Specific Elective

AGRO-CHEMICALS AND PEST MANAGEMENT

ZOO-DSE-501

Credits: 02

Time: 30 Hours

Max. Marks: (25+25)

Unit I: Introduction of Pest

(07 Hours)

Definition and Categories of pests, assessment of pest population, Pest resurgence, Pest outbreak and causes of pest outbreak, Concept of injury level.

Unit II: Chemical Insecticides

(08 Hours)

Chemical insecticides: Classification of insecticides, Organo- chlorine insecticides their mode of action and hazards, Carbamates, their mode of action, Organophosphates insecticides-their brief classification, mode of action and hazards.

Unit III: Biological and Microbial Control

(08 Hours)

Biological control: definition, principles and successful examples of pest control through biological control agents (predators and Parasitoids). Microbial control, advantages and disadvantages, Role of Viruses, Bacteria and fungi in Pest Management.

Unit IV: Integrated Pest management

(07 Hours)

Integrated Pest management- Concept and strategies, Methods of Cultural control, Mechanical control, Genetic manipulation of pest population (Sterile insect release & Hybrid sterility). Role of insect hormonal in insect pest management.

Reference Books:

1. Pradhan, S. (1969). Insect pests of crops. National Book Trust, India Book House.
2. Atwal, A. S. (1993). Agricultural Pest of India and South East Asia. Kalyani Publ. NewDelhi.
3. Pedigo, L.P. (2002). Entomology and Pest Management, Prentice Hall Publication.
4. Robert, F. Norris, Edward P. Caswell-Chen and Marcos Kogan, Concepts of Integrated Pest management, Prentice Hall of India.

Semester – V

Major Course

Discipline Specific Elective

INSECTICIDES TOXICOLOGY

ZOO-DSE-502

Credits: 02

Time: 30 Hours

Max. Marks: (25+25)

Unit I: Introduction to Insecticide Toxicology (07 Hours)

Definition and scope of insecticide toxicology; history of chemical control; pesticides use and pesticides industry in India. Pest resistance to insecticides; mechanisms, types and management of insecticides resistance.

Unit II: Insecticides (08 Hours)

Classification of insecticides based on mode of entry, Structure and mode of action of organochlorines, organophosphates, carbamates, pyrethroids, oxadiazines and phenyl pyrozoles.

Unit III: Toxicity Evaluation (08 Hours)

Principles of toxicology; evaluation of insecticide toxicity; joint action of insecticides- synergism, potentiation and antagonism; factors affecting toxicity of insecticides; insecticide compatibility, selectivity and phytotoxicity.

Unit IV: Control of Toxicity (07 Hours)

Insecticide residues, their significance and environmental implications. Insecticide Act, registration and quality control of insecticides; safe use of insecticides; diagnosis and treatment of insecticide poisoning.

Reference Books:

1. Chattopadhyay SB. 1985. *Principles and Procedures of Plant Protection*. Oxford & IBH, New Delhi.
2. Gupta HCL.1999. *Insecticides: Toxicology and Uses*. Agrotech Publ., Udaipur.
3. Ishaaya I & Degheele (Eds.). 1998. *Insecticides with Novel Modes of Action*. Narosa Publ. House, New Delhi.
4. Matsumura F. 1985. *Toxicology of Insecticides*. Plenum Press, New York.
5. Perry AS, Yamamoto I, Ishaaya I & Perry R. 1998. *Insecticides in Agriculture and Environment*. Narosa Publ. House, New Delhi.
6. Prakash A & Rao J. 1997. *Botanical Pesticides in Agriculture*. Lewis Publ., New York.

Semester - VI

Major Course

REPRODUCTIVE AND DEVELOPMENTAL BIOLOGY

ZOO-MAJ-601

Credits: 04

Time: 60 Hours

Max. Marks: (50+50)

Unit I: Asexual Reproduction and Regeneration (15 Hours)

Asexual reproduction and its evolutionary significance in Metazoans, Mode of Asexual reproduction, Fragmentation, Fission, Strobilation, Budding, Gemmule and Statoblast formation, Parthenogenesis, types and Significance, Arrhenotoky, Thelytoky, Regeneration, Types, Modes of regeneration in invertebrates, Mechanism of Limb regeneration in Amphibians.

Unit II: Reproductive Organs and their Functions (15 Hours)

Structure of testis and ovary in human. Reproductive glands in male and female, Mechanism and site of Spermatogenesis, Oogenesis process, Mechanism of Vitellogenesis, Polarity and Symmetry of egg, Gonadal Hormones, Regulation of gonadotropin secretion in male and female.

Unit III: Reproductive Cycles and Early Events (15 Hours)

Reproductive cycles; Estrous cycle, Vaginal and Uterine changes during Estrous cycle.; Menstrual Cycle and regulation of reproductive cycle. Mechanism of Ovulation and its regulation, Follicular atresia, Corpus luteum formation and regression; Fertilization; Changes in gametes, Implantation of embryo in humans.

Unit IV: Embryonic Development (15 Hours)

Types of eggs, Cleavage, planes and pattern, Morphogenetic movements during Gastrulation, Fate map of frog. Metamorphosis: changes, hormonal regulation in amphibians, Extra embryonic membranes in birds; Fate map of Mammalian blastula, Placenta, structure, types and functions. Embryonic Induction, Lens and Neural induction in Vertebrates.

Reference Books:

1. Gilbert, S.F. (2010). Developmental Biology, IX Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts(USA)
2. Balinsky, B.I. and Fabian, B.C. (1981). An Introduction to Embryology, V Edition, International Thompson Computer Press.
3. Kalthoff (2008). Analysis of Biological Development, II Edition. McGraw-Hill Pub.
4. Lewis Wolpert (2002). Principles of Development. II Edition, Oxford Univ. Press.

Semester - VI
Major Course
ANIMAL PHYSIOLOGY

ZOO-MAJ-602
Credit:04

Time: 60 Hours
Max. Marks: (50+50)

Unit I: Physiology of Nutrition and Respiration (15 Hours)

Digestion and absorption of macronutrients, digestive enzymes and their role, Gastrointestinal hormones and regulation, Cellulose digestion in Ruminant, Stimulation of hunger and thirst, Pulmonary ventilation, Respiratory centres: organization and function, Surfactant, Gaseous exchange through respiratory membrane and tissues, Mechanism of O₂ and CO₂ transport, Diving adaptations in Vertebrates; Altitudinal adaptations to low oxygen pressure (Mountain Sickness).

Unit II: Physiology of Circulation and Excretion (15 Hours)

Blood, Haemopoiesis, Haemostasis, Haemoglobin: Structure and function, Blood Coagulation, Anti-Coagulants, Blood buffers, Lymph: composition and functions, Origin and conduction of Cardiac impulse, Cardiac cycle, Excretion, Urine formation, Glomerular filtration, Tubular reabsorption and secretion, Counter current mechanism, Juxtaglomerular apparatus, Hormonal regulation, Acid-base balance and homeostasis.

Unit III: Physiology of Muscles (15 Hours)

Comparative molecular structure and function of skeletal, smooth and cardiac muscles, Ultrastructure of skeletal muscle fibers, Muscle proteins, Sequence of events in contraction and relaxation of skeletal muscle, Sliding filament theory of muscle contraction, Energetics of muscle contraction, Muscle twitch, summation, tetanus and fatigue, Isotonic and isometric contraction,

Unit IV: Physiology of Nerves (15 Hours)

Nervous system, Axonal transmission, Motor neuron and other types of neurons, Genesis of membrane potential and action potential, Sodium-potassium pump, Synaptic transmission, Types of synapses and synaptic knobs, Excitatory and inhibitory post-synaptic potential, Chemical transmission, neurotransmitters (acetylcholine, or catecholamines, serotonin and GABA), Autonomic nervous system (Sympathetic and parasympathetic)

Reference Books:

1. Guyton, A.G. 1986. Text book of Medical Physiology, 7th Edn
2. West, J.B. 1985. Best and Taylor's Physiological basis of Medical practice (Williams & Wilkins).
3. Hoar, W.S. 1983. General and comparative animal physiology, 3rd edn. (prentice Hall)
4. Eckert, R. and D. Randall. 1983. Animal Physiology. 2nd edn. W.H. Freeman & Co.

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Semester - VI

Major Course

EXPERIENTIAL LEARNING (BASED ON ZOO-MAJ-601)

ZOO-MAJ-603

Time: 60 Hours

Credits: 02

Max. Marks: (25+25)

1. Study of spermatogenesis and identification of its various stages with the help of already available permanent slides/ ICT tools/ models/ charts/ photographs etc.
2. Study of Reproductive organ in fishes/rats,
3. Structure of egg in birds.
4. Demonstration of oogenesis in earthworm/ fish/ rat ovary with the help of already available permanent slides/ ICT tools/ charts/ photographs etc.
5. Histology of male and female reproductive organs and accessory reproductive glands with the help of already available permanent slides/ ICT tools/ charts/ photographs etc.
6. Study of whole mounts and sections of developmental stages of frog through permanent slides: Cleavage stages, blastula, gastrula.
7. Study of different sections of placenta (photomicrograph/ slides).
8. Any other practical found feasible by the teacher and approved by the Coordinator/Head and Dean

Semester - VI

Major Course

EXPERIENTIAL LEARNING (BASED ON ZOO-MAJ-602)

ZOO-MAJ-604

Time: 60 Hours

Credits: 02

Max. Marks: (25+25)

1. Adrenalin and insulin induced changes in blood glucose levels in rat/mice.
2. Preparation of Slide of Haemin crystal.
3. Finding of BT and CT of blood.
4. Counting of mammalian RBCs and WBCs.
5. Determination of Sedimentation rate of Erythrocytes.
6. Estimation of Hemoglobin
7. Study of the digestion of starch by salivary amylase at different pH and Temperature.
8. Any other practical found feasible by the teacher and approved by the Coordinator/Head and Dean.

Semester – VI
Major Course
Discipline Specific Elective
DAIRY FARMING

ZOO-DSE-601
Credits: 02

Time: 30 Hours
Max. Marks: (25+25)

Unit I: Dairy Development (08 Hours)

Livestock in India- related to dairy farming; Introductory animal husbandry- common animal husbandry terms; Dairy development in India, NDDB, NDRI, Dairy Cooperatives. Important cows and buffalo breeds.

Unit II: Management of Dairy Farm (07 Hours)

General management practices of Dairy farming- (Grooming, Castration, Dehorning, Trimming, Shoeing), Calf management and management of pregnant and lactating Cow and Buffaloes.

Unit III: Milk Marketing (07 Hours)

Dairy processing; Composition of milk; factors affecting the quality of milk; milk collection; Pasteurization; grading and packaging; transportation and distribution.

Unit IV: Fodder and Diseases of Farm Animals (08 Hours)

Importance of grassland and fodder in dairy farming. Livestock waste utilization and recycling. Diseases of cattle- Foot and mouth diseases, Anthrax, Haemorrhagic septicaemia and Babesiosis, Diseases of lactating cow (Mastitis & Milk fever).

Reference Books:

1. Thomas, C. K. and Sastry, N. S. R. 1991. Dairy Bovine Production.
2. Watson, J.A.S. and Mills, W.J. 2005. Farm animals and their management.
3. Taylor, R.E. and Field, T.G. 1977. Scientific Farm animal production.
4. Reddy, D.V. Fodder production and grassland management for Veterinarians. 5 Merkel, J. Managing livestock wastes.
5. Banerjee, G.C. A text book of Animal Husbandry.
6. Jagdish Prasad, Animal Husbandry & dairy science.

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Semester – VI

Major Course

Discipline Specific Elective

ANIMAL BIOTECHNOLOGY

ZOO-DSE-602

Credits: 02

Time: 30 Hours

Max. Marks: (25+25)

Unit I: Introduction to Animal Biotechnology

(08 Hours)

Concept and scope of biotechnology, Characteristics of Cloning vectors: Plasmids, Cosmids, Phagemids, Lambda Bacteriophage, BAC, YAC and Expression vectors. Restriction enzymes: Nomenclature, Construction of genomic and cDNA libraries and screening by colony and plaque hybridization, Animal ethics and biosafety.

Unit II: Molecular Techniques

(07 Hours)

Southern, Northern and Western blotting, DNA sequencing: Sanger method Polymerase Chain Reaction, DNA Finger Printing, Transformation techniques: Calcium chloride method and electroporation.

Unit III: Genetically Modified Organisms

(07 Hours)

Production of cloned and transgenic animals: Nuclear Transplantation, Retroviral Method, DNA microinjection, Applications of transgenic animals: Production of pharmaceuticals, production of donor organs, knock-out mice.

Unit IV: Culture Techniques and Applications

(08 Hours)

Animal cell culture, Expressing cloned genes in mammalian cells, Molecular diagnosis of genetic diseases (Thalassemia, Haemophilia and Sickle cell anemia), Recombinant DNA in medicines: Recombinant insulin and human growth hormone and Gene therapy.

Reference Books:

1. BD Singh, (2014) Biotechnology: Expanding Horizons, Kalyani Publishers
2. U. Satyanarayan and U Chakrapani, (2014) Biotechnology, Books & Allied Ltd.
3. Watson, J.D., Myers, R.M., Caudy, A. and Witkowski, J.K. (2007). Recombinant DNA- Genes and Genomes- A Short Course. III Edition, Freeman and Co., N.Y. USA.
4. Brown, T.A. (2015). Gene Cloning and DNA Analysis. 7th Edition, Academic Press, California, USA.

Semester – VII

Major Course

POPULATION ECOLOGY AND LIMNOLOGY

ZOO-MAJ-701

Credits: 04

Time: 60 Hours

Max. Marks: (50+50)

Unit I: Population Ecology-I (15 Hours)

Trade-offs in life history of organism; Regulation of reproductive effort by trade-offs between fecundity & survival and number & size of offspring; Role of intraspecific competition in population regulation; Role of Predation in population regulation; Energy partitioning: r and k selection, Grime's triangle, Concept of Meta-population; Meta-population dynamics: Colonization and Extinction; Rescue effect; Sources and sink concept in meta-population.

Unit II: Population Ecology-II (15 Hours)

Species diversity and Ecosystem function; Diversity indices- Simpson's diversity index, Shannon diversity index, Pielou's diversity index (with calculations on any hypothetical data); Quantifying species richness-Species accumulation curve (Collector's curve); Species-area curve, Disturbance and species diversity, Equilibrium theory of Island Biogeography, Positive and negative interactions; Ecological niche and Niche overlap; Resource partitioning and character displacement.

Unit III: Inland water and its Physico-Chemical Properties (15 Hours)

Introduction to Limnology; Lentic and Lotic waters; Lakes: types and thermal classification; River: Classification and features; Light as a physical factor: penetration of Light and its relation with aquatic organisms; Impact of temperature on aquatic living organism, thermal stratification; Forms and role of Nitrogen and Phosphorus in aquatic ecosystem; Dissolved gases: dissolved oxygen (Orthograde and Clinograde concepts) and carbon dioxide.

Unit IV: Biological Properties of Inland Water (15 Hours)

Plankton: Classification of plankton; Zooplankton: types of zooplankton, Seasonal cycles, top -down control of zooplankton, Diel migration and Cyclomorphosis; Phytoplankton: types of phytoplankton, seasonal cycle in phytoplankton, role of chlorophyll-a and nutrient ratio (N:P) in phytoplankton biomass estimation; Benthic plants: types and importance; Zoobenthos: types, factors affecting their distribution in lakes and significance.

Reference Books:

1. Phillipson, J. 1966. Ecological Energetic, Edward Arnold Ltd. London.
2. Odum, E.P. 1971. Fundamentals of Ecology, W.B. Saunders, USA.
3. Kormondy, E.T. 1971. Concept of Ecology. Prentice Hall of India, New Delhi.
4. Cole, A.A. 1974. Text book of Limnology. The G.V. Mosby Company Saint Louis.
5. Arvind Kumar. 2005. Fundamentals of Limnology.

Semester – VII
Major Course
CYTOGENETICS

ZOO-MAJ- 702
Credit: 04

Time: 60 Hours
Max. Marks: (50+50)

Unit I: Structure and Organization of Chromosome (15 Hours)

Chromosome structure in pro-and eukaryotes, nucleosome model, telomere structure. Specialized chromosome types, Lampbrush and Polytene chromosomes. Accessory chromosomes, occurrence, behaviour, transmission and origin. Ring chromosomes Formation, Detection, Behaviour at meiosis. Karyotype symmetry; chromosome numbers; symbols & terminologies, Chromosome Banding Techniques its Significance and applications.

Unit II: Numerical Variations in Chromosomes (15 Hours)

Polyploidy-induction and types. Autopolyploids meiotic behaviour, Segregation. Effect of autopolyploidy. Allopolyploids – classification, meiotic behaviour, Role of allopolyploidy in evolution of wheat, potato, tobacco and cotton. Aneuploidy: types of aneuploids; induction of trisomics, monosomics and nullisomes-their role in chromosome mapping. Numerical disorders: Patau's syndrome, Edward's syndrome, Down's syndrome, Turner's syndrome and Klinefelter's syndrome.

Unit III: Structural Variations in Chromosomes (15 Hours)

Types of structural chromosome alterations- deletion, duplication, meiotic behaviour and utility. Identification, meiotic behaviour and induction of inversions. Identification, meiotic behaviour and induction of translocations. Significance of structure alterations of chromosomes in evolution. Cri du Chat, Williams syndrome, Fragile X syndrome, Prader– Willi syndrome and Burkitt's lymphoma

Unit IV: Molecular Cytogenetic (15 Hours)

Chromosomal DNA content and C-value paradox. Gene amplification; mechanism and significance, Genome evolution. Repetitive DNA sequences, techniques for detecting repetitive DNA. FISH and GISH techniques: principles and applications, concept of chromosome painting. Flow Cytometry. Alien addition and substitution- Their role in gene transfer. Human genome project.

Reference Books:

1. Burnham, C.R. (1962): Discussions in Cytogenetics Burgess Publ. Co. Minneapolis.
2. Garber, G.B. (1972): Cytogenetics. McGraw Hill. Pub. Co. Ltd.
3. Hexter, W. and Yost: The science of Genetics. Prentice Hall Inc.
4. Srb. A.M. Owen, R.D. and Edgar, R.S. General genetics, W.H. Freeman and Co., San Fransisco.
5. Sinnett, E.W., Dunn, L.C. and Debzhanski, Th (1958): Principles of genetics. Kugakusha. Co. Inc.
6. Ltd. Japan.
7. P.K. Gupta, Rastogi Publ. Merrut. 1994. Cytogenetics, Genetics and Evolution

Semester – VI
Major Course
APPLIED TOXICOLOGY

ZOO-MAJ-703
Credits: 04

Time: 60 Hours
Max. Marks: (50+50)

Unit I: Introduction of Toxicology and Xenobiotics (15 Hours)

Toxicology, History and Scope. Toxicity, classification of Toxicants. Toxic agents, mode of action of toxic agents in living organisms. Xenobiotics and mechanism of their transfer, Absorption and excretion of xenobiotics. Accumulation and elimination of xenobiotics by bio-transformation.

Unit II: Heavy metal toxicity (15 Hours)

General Principle of metal toxicity, dispersion and sources. Toxic metals and their toxicity (Arsenic, Aluminum, Cadmium, Lead, Mercury). Types of pesticide and their formulation. Organochlorine insecticide, mechanism of their toxic action. Organophosphate insecticides, mechanism of toxic action.

Unit III: Environmental Toxicology (15 Hours)

Definition Environmental toxicology, classification of Environmental toxicology. Food additives, classification of food additives. Toxic agents in Processed food, colouring agents. Radiation and radioactivity, discovery of radioactivity, types of radiation, effect of radiation on life, preventive measures from radiation. Pollution definition and types. Environmental Carcinogens, different carcinogens.

Unit IV: Application of Toxicology and Environment Policy (15 Hours)

Poison, classification of poison. Animal Poisoning- Honey bee poisoning, Scorpion poisoning, snake poisoning and their treatment. Toxicity Tests, types of Toxicity Tests, Acute toxicity test and chronic toxicity test. Calculation of LC50 or LD50. Environment Policy, Environmental challenges, causes and impacts.

Reference Books:

1. Principles of ecotoxicology- 3rd edition 2006, C H Walker, S P Hopkin, R N Sibly and D B Peakall (Eds.), Taylor and Francis, New York, NY.
2. Introduction to Environmental toxicology -3rd edition 2003, W.G. Landis and M.H. Yu. Lewis publishers.
3. Text Book of Modern Toxicology 2000 edition, Ernst Hodgson and Patricia Levi, McGraw – Hill Int. ed.
4. Principles of toxicology 2010 edition, Anju Agarwal and Krishna Gopal, IBDC Publishers India.
5. Essentials of Toxicology 2011 edition, Vijay Kumar Matham, New India Publishing Agency, New Delhi, India.
6. Principles of Biochemical Toxicology- Jatimbrell; Taylor and Francis Ltd, London.
7. Basic Environmental Toxicology – Lorris G. Cockerham, Barbara S Shane; CRC Press, London.
8. Handbook of Toxicology – Thomas J Haley, Willan O Berndt; Hemisphere Publishing cooperation.

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Semester - VII

Major Course

EXPERIENTIAL LEARNING (BASED ON ZOO-MAJ-701)

ZOO-MAJ-704

Credits: 02

Time: 60 Hours

Max. Marks: (25+25)

1. Determination of physico-chemical characteristics of Lentic water bodies.
2. Determination of physico-chemical characteristics of Lotic water bodies.
3. Qualitative and quantitative estimation of phytoplankton from freshwater aquatic system.
4. Qualitative and quantitative estimation of zooplankton from freshwater aquatic system.
5. Collection and identification of macrophytes from local water bodies (lakes and pond streams and canals)
6. Estimation of primary productivity in freshwater bodies.
7. Estimation of biomass of Macrophytes.
8. Any other practical found feasible by the teacher and approved by the Coordinator/Head and Dean.

Semester - VII

Major Course

EXPERIENTIAL LEARNING (BASED ON ZOO-MAJ-702)

ZOO-MAJ-705

Credits: 02

Time: 60 Hours

Max. Marks: (25+25)

1. Lymphocyte culture
2. Demonstration of karyotype asymmetry in Homo sapiens.
3. Idiogram preparation
4. Structure of salivary gland chromosomes of Drosophila/Chironomus larva.
5. Demonstration of fluorescence in-situ hybridization.
6. Commet Assay
7. Barr body
8. Any other practical found feasible by the teacher and approved by the Coordinator/Head and Dean.

Semester - VII

Major Course

EXPERIENTIAL LEARNING (BASED ON ZOO-MAJ-703)

ZOO-MAJ-706

Credits: 02

Time: 60 Hours

Max. Marks: (25+25)

1. Effect of toxicant on fish or any other target animal.
2. Estimation of SGOT and SGPT as a marker enzyme for hepatotoxicity.
3. Estimation of serum creatinine activity as a marker enzyme for Renal toxicity.
4. Demonstration of micronuclei test
5. Estimation of Hemoglobin and RBC in toxicant exposed experimental animals.
6. Identify, enlist and sort out the different household hazard waste.
7. Identify and enlist the different types of contaminants and their sources that pollute ground water.
8. Industrial visit
9. Any other practical found feasible by the teacher and approved by the Coordinator/Head and Dean.

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Semester - VIII

Major Course

MOLECULAR BIOLOGY

Code: ZOO-MAJ-801

Credits: 04

Time: 60 Hours

Max. Marks: (100)

Unit I: DNA Structure and Replication

(15 Hours)

DNA as genetic material, Structure of DNA, Types of DNA, Replication of DNA in prokaryotes and eukaryotes: Semiconservative nature of DNA replication, Bi-directional replication, DNA polymerases, Rolling circle replication, Fidelity of replication. Telomere replication.

Unit II: DNA Recombination and Repair

(15 Hours)

Recombination; Homologous recombination (Holliday model, Meselson-Radding modification). DNA damage and repair: Physical and chemical DNA damaging agents, Causes and types of DNA damage. Mechanisms of DNA repair, SOS response system of DNA repair in *E. coli*.

Unit III: RNA Synthesis and Processing

(15 Hours)

Transcription in prokaryotes and Eukaryotes: RNA polymerases, mechanism of transcription initiation, elongation and termination. RNA structure and types, Post-transcriptional modifications of mRNA (5' Cap, Poly A tails & Splicing). Regulation of transcription in Eukaryotes (Acetylation, Methylation, Phosphorylation and other modifications).

Unit IV: Gene Expression

(15 Hours)

Regulation of gene expression in prokaryotes: Operon concept (inducible and repressible system), Genetic code and its characteristics, Prokaryotic and eukaryotic translation: Mechanism of initiation, elongation and termination of polypeptides, Inhibitors of translation. Post-translational modifications of proteins.

Reference Books:

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
3. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
4. Becker, W.M., Kleinsmith, L.J., Hardin, J. and Bertoni, G. P. 2009 The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco

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Semester - VIII
Major Course

STRUCTURE & FUNCTIONS OF ENDOCRINE GLANDS

Code: ZOO-MAJ-802

Credits: 04

Time: 60 Hours

Max. Marks: (100)

Unit I: Endocrine Glands, Structure and Functions (15 Hours)

Hypothalamus: Structure and Function, Hormones of Adenohypophysis and Neurohypophysis. Thyroid Gland: Structure and its hormones, their function and Disorders, Regulation of thyroid secretions; Parathyroid Gland and its hormones, Role PTH and Calcitonin in maintaining Ca^{2+} level of Blood; Adrenal Gland: Structure and hormones of Adrenal Cortex and Medulla, their Functions and Disorders.

Unit II: Hormones and their Biosynthesis (15 Hours)

Characteristics of hormones, Classification of hormones, Chemical Nature of hormones; Mechanism of Hormone Action: the cAMP mechanism and hormone receptors; Biosynthesis of Thyroid Hormones, Biosynthesis of Sex Steroid Hormones and Corticosteroids, Biosynthesis of Adrenal Medullary Hormones, Synthesis of Insulin Hormone and its role in maintaining blood glucose level.

Unit III: Hormonal Control of Metabolism and Reproduction (15 Hours)

Pancreas (Islets of Langerhans); Location and Structure, Pancreatic hormones, and its Regulation; Gastro-Intestinal hormones and Endocrine Regulation of Digestion; Role of hormones in the differentiation of Male and Female Gonads; Hormonal Regulation of Gametogenesis, Hormonal Regulation of Reproductive Cycles, Placental Hormones.

Unit IV: Hormonal Regulation and Behaviour (15 Hours)

Role of hormones in animal migration, Hormonal regulation of Biological Rhythms; Role of hormones in Parental Care of animals, Hormonal regulation of mating behaviour; Regulation of Water and Electrolytes by Mineralocorticoids, Renin-Angiotensin System.

Reference Books:

1. Bantley, P.J. (1976): Comparative vertebrate Endocrinology, Cambridge Univ. Press, U.K.
2. Norris, O Davia: Vertebrate Endocrinology
3. Williams Text book of Endocrinology (1998). W.B. Saunders Company.
4. Hadley MaE and Levine, J.E. (2006): Endocrinology by Addison-Wesley
5. Barrington, E.E.W.: An introduction to Compar. Endocrinology, Willey Eastern Pvt. Ltd. USA.

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Semester - VIII

Major Course

EXPERIENTIAL LEARNING (Based on ZOO-MAJ-801)

Code: ZOO-MAJ-803

Time: 60 Hours

Credits: 02

Max. Marks: (50)

1. Isolation and estimation of DNA (Diphenylamine reagent or any other method).
2. Quantitative estimation of RNA using the Orcinol reaction.
3. Agarose gel Electrophoresis of DNA.
4. DNA amplification by PCR.
5. Gel Documentation.
6. Preparation of liquid culture medium (LB) and raising a culture of *E. coli*.
7. Preparation of solid culture medium (LB) and growth of *E. coli* by spreading and streaking.
8. Any other practical found feasible by the teacher, approved by the Coordinator/Head.

Semester - VIII

Major Course

EXPERIENTIAL LEARNING (Based on ZOO-MAJ-802)

Code: ZOO-MAJ-804

Time: 60 Hours

Credits: 02

Max. Marks: (50)

1. Study of endocrine glands through laboratory model /chart.
2. Histological study of different endocrine glands using permanent slides.
3. To study the effect of testosterone on the chick comb.
4. To study the effect of Thyroxine on metamorphosis.
5. Extraction of the pituitary gland from fish.
6. Any other practical found feasible by the teacher, approved by the Coordinator/Head.

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Semester - VIII

Discipline Specific Course

FISH AND FISHERIES

Code: ZOO-DSC-801

Credits: 04

Time: 60 Hours

Max Marks: (100)

Unit I: Diversity and External Biology of Fishes

(15 Hours)

Definition and scope of fish biology; Importance of fish in ecosystems and fisheries; Fish diversity with special reference to J&K, Distinctive features: Body shape, fins; Scales: Type and function of Scales in fishes; Lateral line system; Weberian Ossicle, Structure, Origin, Working and Function; Coloration & Pigmentation: Chromatophores, Pigments and Biological Significance of Coloration in Fishes

Unit II: Functional Biology of Fishes

(15 Hours)

Alimentary Canal and its modifications, Feeding habits and Feeding Adaptations; Structure of gills and mechanism of respiration; Accessory respiratory organs in Fish; Structure of heart and blood circulation; Structure of kidney in fish; Osmoregulation in fishes: Brackish Water and Marine Water Fishes.

Unit III: Reproductive Biology and Growth

(15 Hours)

Reproductive Organs and Accessory Sex Organs, Seasonal Breeding, Maturation and Spawning; Gonadosomatic Index (GSI) and its application; Hormonal Regulation of Fish Reproduction; Growth determination in fishes: length–weight relationship and age estimation.

Unit IV: Ornamental Fisheries

(15 Hours)

Definition, scope and importance of Ornamental Fisheries; Characteristics features of Ornamental fishes; Biology of some selected indigenous Indian Ornamental Fishes (Gold fish, guppy, angelfish); Aquarium plants and their management; Types of aquaria: Freshwater and marine aquaria; Tank, Aerators, filters, heaters, lighting; Preparation of feed for tropical and temperate ornamental fish.

Reference Books:

1. Textbook of Fish Biology & Indian Fisheries Rahul P Parihar
2. A Text Book of Fish Biology and Fisheries by S S Khanna and H R Singh,
3. Fish Biology by, C B L Srivastava.
4. Fauna of British India, including Ceylon & Burma – by Francis Day.
5. 7. A Complete manual on ornamental fisheries by Srinivasan Muthuirulappan
6. Ornamental fish culture and aquarium management by A D Kholakia
7. Home aquarium and ornamental fish culture by C S Tharadevi and N Arumugam
8. Fish & Fisheries in India – By Jhingran V.G. – Hindustan Pub. Corporation – New Delhi.

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Semester - VIII

Discipline Specific Course

ADVANCES IN WILDLIFE STUDY

Code: ZOO-DSC-802

Credits: 04

Time: 60 Hours

Max Marks: (100)

Unit I: Wildlife Status and Adaptations

(15 Hours)

Bird species identification through morphological studies, Morphological adaptations in bill and claws. Camouflage and mimicry in birds. Endangered mammals and Birds of India. Distribution of major mammalian taxa like cervids, bovids, carnivores, and primates in India. Wildlife status in J&K. Threatened Birds of J & K. Concept of IUCN threat categories.

Unit II: Geographical Distribution of Wildlife

(15 Hours)

Biogeography and Biogeographic regions of India. Distribution of Wildlife in different biogeographical regions of India: - The Himalayan Mountain system, The Peninsular Indian sub-region, The Indian Desert, The Tropical rain forest region. Zoogeographical regions of the world and their characteristic wildlife. Concept of Ecotourism and sustainable development

Unit III: Wildlife Census Techniques

(15 Hours)

Sampling design and data collection, Methods of wildlife population estimation: Sample counts, Drive counts, Line transect method and concept of distance sampling, Point counts, Pugmark census, Pellet group count, and Mark-recapture. Bird ringing

Unit IV: Modern Techniques in Wildlife Studies

(15 Hours)

Bio-telemetry system and its applications in wildlife, VHF, and satellite telemetry. Bio-loggers and hydrophones and their applications. Non-invasive techniques in Wildlife studies. Habitat Suitability Index. Remote Sensing and GIS: active and passive remote sensing. Types of platforms and scanning systems. Working principle, advantages, limitation and application of GPS.

Reference Books:

1. Krausman, P.R. and Cain, W.J. 2013. Wildlife management and conservation, Contemporary Principles and Practices.
2. Frysell, J.M. and Sinclair, A.R.E. 2014. Wildlife Ecology, Conservation and Management.
3. Morrison, M. L. and Mathewson, H.A. 2015. Wildlife Habitat Conservation: Concepts, Challenges and Solutions (Wildlife Management and Conservation.
4. Rajesh Gopal, Fundamentals of Wildlife Management: Natraj Publishers.
5. Vivek Menon Indian Mammals: A Field Guide; Hachette India publishers.
6. Richard Grimmet, Birds of the Indian Subcontinent oxford publishers

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Semester - VIII

Discipline Specific Course

EXPERIENTIAL LEARNING (Based on ZOO-DSC-801)

Code: ZOO-DSC-803

Time: 60 Hours

Credits: 02

Max. Marks: (50)

1. Identification of Fishes with Suitable Examples from each group.
2. Study of different types of Scales from Permanent Slides/Freshly Prepared slides from Fish Specimens.
3. Study of Structure of Weberian Ossicle in Fish.
4. Study the internal anatomy of fish,
 - Alimentary Canal
 - Structure of gills and Swim bladder
 - Reproductive system.
5. Study of the food items in gut and determination of gastro-somatic index for a given fish.
6. Determination of age in fishes using scales.
7. Identification of common ornamental fishes-Gold fish, Koi carp, Danio, Molly, sword tail etc.
8. Introduction to Aquarium accessories and equipment.
9. Any other practical found feasible by the teacher, approved by the Coordinator/Head.

Semester - VIII

Discipline Specific Course

EXPERIENTIAL LEARNING (Based on ZOO-DSC-802)

Code: ZOO-DSC-804

Time: 60 Hours

Credits: 02

Max. Marks: (50)

1. Identification and classification of bird species belonging to different orders.
2. Identification and classification of mammal species of Bovids, Cerevids, Carnivores and Primates.
3. Demonstration of Line transect method for population estimation.
4. Estimation of population through Lincoln-Peterson Index (by using hypothetical/real data).
5. Demonstration on the use of GPS in wildlife.
6. Documentation of some anthropogenic activities affecting wildlife.
7. Documentation of Human-Wildlife Conflict.
8. Any other practical found feasible by the teacher, approved by the Coordinator/Head.