SCHEME AND SYLLABI

3- Year UG Degree (Bachelor of Science in Zoology)
4-Year UG Degree (Bachelor of Science- Honours in Zoology)

(Multidisciplinary)

Approved by
Common Board of Studies
In its meeting held on

28/05/2024

and
Approved by

Faculty of Life Sciences

In its meeting held on

……/……/……

Department of Zoology
Faculty of Life Sciences
Chaudhary Devi Lal University, Sirsa
(Haryana)-India
PIN-125055

Course and Credit Scheme of Bachelor of Science in Zoology - Multidisciplinary

3- Year UG Degree (Bachelor of Science in Zoology)

4- Year UG Degree (Bachelor of Science- Honours in Zoology)

Sr. No.	Course Code	Course Title	Credits				Level
Discipline Specific Courses (DSC)			**L**	**T**	**P**	**Total**	
1	BSC/ZOO/MD/1/DSC/101	Animal Diversity of Non-Chordates	3		1	4	100
2	BSC/ZOO/MD/2/DSC/104	Animal Diversity of Chordates	3		1	4	100
3	BSC/ZOO/MD/3/DSC/201	Biochemistry and Animal Physiology	3		1	4	200
4	BSC/ZOO/MD/4/DSC/203	Agrochemicals and Pest Management	3		1	4	200
5	BSC/ZOO/MD/5/DSC/301	Cell Biology and Genetics	3		1	4	300
6	BSC/ZOO/MD/6/DSC/303	Developmental & Evolutionary Biology	3		1	4	300

Sr. No.	Course Code	Course Title	Credits				Level
Minor (MIC) Courses in Zoology			**L**	**T**	**P**	**Total**	
1	BSC/ZOO/MD/1/MIC/101	Basics of Zoology	2			2	100
2	BSC/ZOO/MD/2/MIC/102	Applied Zoology	2			2	100
3	BSC/ZOO/MD/3/MIC/201	Comparative Anatomy of Vertebrates	3		1	4	200
4	BSC/ZOO/MD/4/MIC/202	Genetic Engineering and Biotechnology	3		1	4	200
5	BSC/ZOO/MD/5/MIC/301	Animal Taxonomy	3		1	4	300
6	BSC/ZOO/MD/6/MIC/302	Human Health and Sex Education	3		1	4	300
7	BSC/ZOO/MD/6/MIC/303	Basics of Endocrinology and Immunology	3		1	4	300
Multidisciplinary Courses (MDC) in Zoology			**L**	**T**	**P**	**Total**	**Level**
1	CDLU/MDC/1/101	Indian biodiversity and Conservation	2		1	3	100
2	CDLU/MDC/2/102	Food Nutrition and Health	2		1	3	100
3	CDLU/MDC/3/201	Insect Vectors, Diseases and Control	2		1	3	200
Skill Enhancement Courses (SEC) in Zoology			**L**	**T**	**P**	**Total**	**Level**
1	CDLU/SEC/1/101	Vermicomposting	2		1	3	100
2	CDLU/SEC/2/102	Apiculture	2		1	3	100
3	CDLU/SEC/3/201	Pisciculture and Fish Diseases	2		1	3	200
4	BSC/ZOO/MD/5/SEC/301	Internship*	4			4	300
5	BSC/ZOO/HWR//8/SEC/401	Research Project/Dissertation*				12	400

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Table:2 Semester wise Course code and Title along with credit details
Bachelor of Science (Zoology) – Multidisciplinary
3- Year UG Degree (Bachelor of Science in Zoology)
4- Year UG Degree (Bachelor of Science- Honours/Honours with research in Zoology)

Course Code	Course Title	Credits				Marks
Semester I						
		L	**T**	**P**	**Total**	
BSC/ZOO/MD/1/DSC/101	Animal Diversity of Non-Chordates	3		1	4	100
…….	BOT/CHE/anyone from Science discipline	3		1	4	100
…….	BOT/CHE/anyone from Science discipline	3		1	4	100
	Minor Courses (MIC)/Skill enhanced Courses (SEC) *(Select one for each from any Science discipline)*					
BSC/ZOO/MD/1/MIC/101	Basics of Zoology	2			2	50
CDLU/SEC/1/101	Vermicomposting	2		1	3	75
CDLU/AEC/1/101	Proficiency in English	2			2	50
CDLU/VAC/1/101	**To be selected from the central pool of Multidisciplinary/Value Added Courses**	2			2	50
CDLU/MDC/1/101		3			3	75
Total					**24**	**600**
Semester II						
BSC/ZOO/MD/2/DSC/104	Animal Diversity of Chordates	3		1	4	100
…….	BOT/CHE/anyone from Science discipline	3		1	4	100
…….	BOT/CHE/anyone from Science discipline	3		1	4	100
	Minor Courses (MIC)/Skill enhanced Courses (SEC) *(Select one for each from any Science discipline)*					
BSC/ZOO/MD/2/MIC/102	Applied Zoology	2			2	50
CDLU/SEC/2/102	Apiculture	2		1	3	75
CDLU/AEC/2/102	Prayojanmoolak Hindi	2			2	50
CDLU/VAC/2/102	**To be selected from the central pool of Multidisciplinary/Value Added Courses**	2			2	50
CDLU/MDC/2/102		3			3	75
Total					**24**	**600**
Semester III						
BSC/ZOO/MD/3/DSC/201	Biochemistry and Animal Physiology	3		1	4	100
…….	BOT/CHE/anyone from Science discipline	3		1	4	100
…….	BOT/CHE/anyone from Science discipline	3		1	4	100
	Minor Courses (MIC)/Skill enhanced Courses (SEC) *(Select the one paper each from MIC and SEC)*					
BSC/ZOO/MD/3/MIC/201	Comparative Anatomy of Vertebrates	3		1	4	100
CDLU/SEC/3/201	Pisciculture and Fish Diseases	2		1	3	75
CDLU/AEC/3/201	(Punjabi Bhasha Ate Viakaran)	2			2	50
CDLU/MDC/3/201	**To be selected from the central pool of Multidisciplinary Courses**	3			3	75
Total					**24**	**600**

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Semester IV						
BSC/ZOO/MD/4/DSC/203	Agrochemicals and Pest Management	3		1	4	100
…….	BOT/CHE/anyone from Science discipline	3		1	4	100
…….	BOT/CHE/anyone from Science discipline	3		1	4	100
	Minor Courses (MIC) *(Select the one paper from MIC)*					
BSC/ZOO/MD/4/MIC/202	Genetic Engineering and Biotechnology	3		1	4	100
CDLU/AEC/4/202	Introduction to Sanskrit	2			2	50
CDLU/VAC/4/201	**To be selected from the Central Pool of Value Added Courses**	2			2	50
Total					**20**	**500**
Semester V						
BSC/ZOO/MD/5/DSC/301	Cell Biology and Genetics	3		1	4	100
…….	BOT/CHE/anyone from Science discipline	3		1	4	100
…….	BOT/CHE/anyone from Science discipline	3		1	4	100
	Minor (MIC)/ Vocational (VOC) Courses *(Select the one paper from MIC)*					
BSC/ZOO/MD/5/MIC/301	Animal Taxonomy	3		1	4	100
BSC/ZOO/MD/5/SEC/301	Internship*			4	4	100
Total					**20**	**500**
Semester VI						
BSC/ZOO/MD/6/DSC/303	Developmental & Evolutionary Biology	3		1	4	100
…….	BOT/CHE/anyone from Science discipline	3		1	4	100
…….	BOT/CHE/anyone from Science discipline	3		1	4	100
	Minor (MIC)/ Vocational (VOC) Courses (*Select the two paper from MIC)*					
BSC/ZOO/MD/6/MIC/302	Human Health and Sex Education	3		1	4	100
BSC/ZOO/MD/6/MIC/303	Basics of Endocrinology and Immunology	3		1	4	100
Total					**20**	**500**

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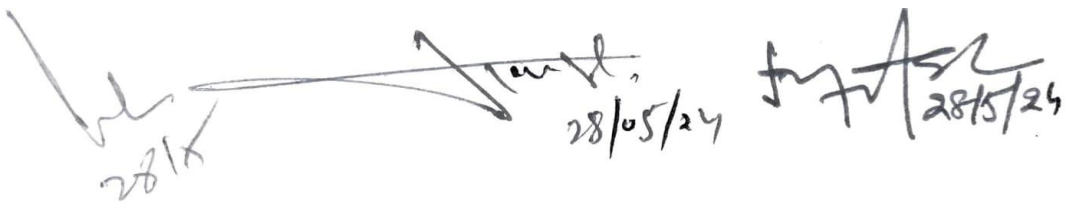
FIRST SEMESTER



BSC/ZOO/MD/1/DSC/101: ANIMAL DIVERSITY OF NON-CHORDATES

DURATION: 3+3 HOURS **MAXIMUM MARKS: 100**

Theory: 75 (External 50 + Internal 25), Practical: 25 (External 25+ Internal 00)

Course Objective: To make students to understand life diversity, structural organization and division of labour in Non-Chordates.

Course Learning Outcomes (CLO): After completing the course, the student shall be able to:

CO1: Identifying the characters and classification of Non-Chordates.

CO2: Describe unique characters and recognize life forms of Non-Chordates.

CO3: Describe type study of different Non-Chordates.

CO4: Prepare permanent stained preparations for different specimens.

UNIT I

Phylum Protozoa: General characters, biodiversity and economic importance of Protozoans. Type study of *Plasmodium*.

Phylum Porifera: General characters, biodiversity and economic importance of Poriferans. Type study of *Sycon*, canal system in sponges, spicules in sponges.

Phylum Coelenterata: General characters, biodiversity and economic importance of cnidarians. Type study of *Obelia*. Polymorphism in Siphonophores. Corals and coral reefs.

Phylum Platyhelminthes and Aschelminthes: General characters, biodiversity and economic importance of flat worms. Type study of Liver Fluke, *Fasciola hepatica*.

UNIT II

Phylum Annelida: General characters, biodiversity and economic importance of annelids. Type study of Earthworm, *Pheretima posthuma* (habitat, habits, metamerism, digestive system, circulatory system, nervous system, reproductive system). Larval forms in Annelids.

Phylum Arthropoda: General characters, biodiversity and economic importance of insects (insect vectors, lac insects, honey bee, insect pest) & crustaceans. Type study of Cockroach, *Periplaneta americana* (habitat, habits, external morphology, digestive system, respiratory system, excretory system, reproductive system).

UNIT III

Phylum Mollusca: General characters, biodiversity and economic importance of Molluscs. Type study of Pila (habitat, habits, external morphology, respiratory, digestive, circulatory system, nervous system and reproductive System). Torsion and detorsion in gastropods.

Phylum Echinodermata: General characters, biodiversity and economic importance of echinoderms. Type study of *Asterias* (Sea Star) (Habitat, habits, external morphology, water vascular system, Circulatory System). Larval forms of Echinoderm.Aristotle's Lantern: Structure & Functions.

Phylum Hemichordate: General characters of Hemichordates with examples. Type study of *Balanoglossus*.

UNIT IV (Practical)

Classification up to orders with ecological note and economic importance of the following animals:

1. Protozoa: Lamination of cultures of Amoeba, Euglena and Paramecium; permanent prepared slides: Amoeba,Euglena, Trypanosoma, Noctiluca, Eimeria, Paramecium (binary fission and conjugation), Opalina, Vorticella,Balantidium, Nyctotherus, radiolarian and formaniferan ooze.
2. Porifera (Parazoa): Sycon, Grantia, Euplectella, Hyalonema, Spongilla, Euspongia.
3. Coelenterata: Porpita, Valella, Physalia, Aurelia, Rhizostoma, Metridium, Millipora, Alcyonium, Tubipora,Zoanthus, Madrepora, Favia, Fungia, and Astrea. Permanent prepared slides: Hydra (W.M.), Hydra with buds,Obelia (colony and medusa), Sertularia, Plumularia, Tubularia, Bougainvillea, Aurelia (sense organs and stagesof life history).
4. Playhelminthes: Dugesia, Fasciola, Taenia, Echinocoecus. Permanent prepared slides: Miracidium,Sporocyst, Redia, Cercaria, Scolex and Proglotttids of Taenia (mature and gravid).
5. Aschelminthes: Ascaris (male and female), Trichinella, Ancylostoma, Meloidogyne.
6. Annelida: Pheretima, Heteronereis, Polynoe, Aphrodite, Chaetopterus, Arenicola, Tubifex and Pontobdella.

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7. Arthropoda: Peripatus, Palaemon (Prawn), Lobster, Cancer (crab), Sacculina, Eupagurus (hermit crab), Lepas, Balanus, Cyclops, Daphnia, Lepisma, Periplaneta (cockroach), Schistocerca (locust), Poecilocerus (ak- hopper), Gryllus (cricket), Mantis (praying mantis), Cicada, Forticula (earwig), Dragon fly, termite queen, bug, moth, beetle, Polistes (wasp), Apis (honey bee), Bombyx (silk moth), Cimex (beg bug), Pediculus (body louse), Millipede, Scolopendra (centipede), Palamnaeus (scorpion), Aranea (spider), Limulus (king crab).
8. Mollusca: Mytilus, Ostrea, Cardium, Pholas, Solen (razor/Fish), Pecten, Holiotis, Patella, Aplysia, Doris, Limax, Loligo, Sepia, Octopus, Nautilus (complete and T.S.), Chiton and Dentalium.
9. Echinodermata: Asterias, Echinus, Cucumaia, Ophiothrix, Antedon and Asterophyton
10. Hemichordata: Balanoglossus.
11. Study of permanent stained preparations: L.S. and T.S. *Sycon;* gemmules, spicules and spongin fibres of *Sycon,* canal system of sponges, T.S. and W.M of *Hydra, Obelia, Sertularia, Plumularia* and *Bougainvillea,* T.S. *Fasciola,* T.S. *Ascaris* (male and female), T.S. Pheretima (pharyngeal and typhlosolar regions), Setae, septal nephridia and spermathecae of Pheretima. Preparation of permanent slides of trachea and mouthparts of House fly or Cockroach. Study of permanent stained slides of statocyst of Palaemon, Glochidium larva of Anodonta, radula and osphradium of Pila, T.S. Star fish (arm), T.S. *Balanoglossus* (through various regions).

Learning Resources

1. Jordan, E.L. and P.S. Verma, 2009. Invertebrate Zoology, S. Chand and Co. Ltd. New Delhi.
2. Ayyar, E.K. and T. Ananthakrishnan, 1992. Manual of Zoology Vol.1 Invertebrates Part I and II, S.Viswanathan Printers and Publishers Pvt. Ltd.Madras.
3. Kotpal, R.L., 2021. Zoology Invertebrates. Rastogi Publications, Meerut.
4. Nair, N.C., N. Arumugam, N. Soundarapandian, T. Murugan and S. Leelavathy, 2010. A textbook of Invertebrates. Saras Publication, Nagercoil.
5. Rastogi V.B., 2021. Invertebrate Zoology. KedarNath Ram Nath, Meerut.
6. Lal S.S., 2019. Practical Zoology Invertebrates. Rastogi Publications, Meerut.
7. Anderson D.T.,1999. Invertebrate Zoology, Oxford University Press.
8. Edward E. Ruppert, Robert D. Barnes (1994). Invertebrate Zoology; Saunders College Pub.

Note for the Paper Setter: The question paper will consist of seven questions in all. The first question will be compulsory and will consist of four short questions of 2 marks each covering the whole syllabus. In addition, six more questions of 14 marks each will be set unit-wise comprising of two questions from each of the three units. The candidates are required to attempt one compulsory question and three more questions selecting at least one question from each unit.

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BSC/ZOO/MD/1/MIC/101: BASICS OF ZOOLOGY

DURATION: 2 HOURS **MAXIMUM MARKS: 50**

Theory: 50 (External 35 + Internal 15), Practical: 00 (External 00 + Internal 00)

Course Objective: To make students to understand life diversity and structural organization in Non-Chordates.

Course Learning Outcomes (CLO): After completing the course, the student shall be able to:

CO1: Identifying the characters and classification of Non-Chordates.

CO2: Differentiate Chordates and Non-Chordates.

CO3: Describe unique characters and recognize life functions of Non-Chordates.

CO4: Understand the role of non-chordates in their surroundings.

UNIT I

Zoology: Definition and scope, introduction to Animal Kingdom, animal characters

Non-Chordates and Invertebrates with examples, Invertebrate Phyla, Introduction to basic characters of animal with special reference to the non-chordates.

Biodiversity: Introduction and Scope.

General characters of Protozoa, lifecycle, pathogenicity and prophylaxis of pathogenic protozoa: Entamoeba, Giardia, Trypanosome, Leishmania.

General characters of sponges with economic importance. General characters of Coelenterates, Ecological importance of corals.

UNIT II

General characters of Annelida, Morphology of earthworm and its ecological role, Economic importance of Leech.

General characters of Arthropods, Study of basic characters of insects, Insects as pest: Grasshopper, Economic importance of Honey Bee.

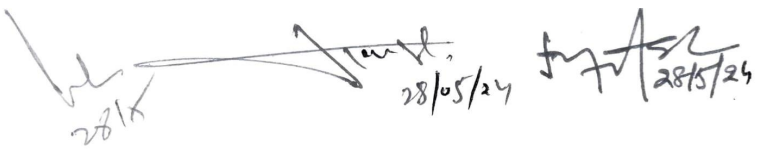
General characters of Mollusca, Study of basic characters of snails, Snails as pest in Paddy fields

General characters of Echinodermata; Study of basic characters of Star fish with reference to its role in ecosystem; Economic importance of Star Fish

Learning Resources

1. Jordan, E.L and P.S. Verma. 2009. Invertebrate Zoology, S. Chand and Co. Ltd. New Delhi.
2. Ayyar, E.K and T. Ananthakrishnan. 1992. Manual of Zoology Vol.1 Invertebrates Part I and II, S.Viswanathan Printers and Publishers Pvt. Ltd. Madras.
3. Kotpal, R.L. 2021. Zoology Invertebrates. Rastogi Publications, Meerut.
4. Rastogi V.B. 2021. Invertebrate Zoology. KedarNath Ram Nath, Meerut
5. Lal S.S. (2019) Practical Zoology Invertebrates. Rastogi Publications, Meerut

Note for the Paper Setter: The question paper will consist of five questions in all. The first question will be compulsory and will consist of seven short questions of 1 marks each covering the whole syllabus. In addition, four more questions of 14 marks each will be set unit-wise comprising of two questions from each of the two units. The candidates are required to attempt one compulsory question and two more questions selecting at least one question from each unit.



CDLU/SEC/1/101: VERMICOMPOSTING

DURATION: 3+3 HOURS **MAXIMUM MARKS: 75**

Theory: 50 (External 35 + Internal 15), Practical: 25 (External 25 + Internal 00)

Course Objective: To make students skilled in Vermicomposting

Course Learning Outcomes (CLO): After completing the course, the student shall be able to:

CO1: Perform Vermiculture for organic farming.

CO2: Get the knowledge of biodiversity of local earthworms.

CO3: Generate income by supplying worms, vermiwash and vermicompost.

CO4: Leads towards organic farming and healthy food.

UNIT I

Vermiculture: Introduction, definition, history, general characters of Annelida, systematic position of earthworm, habits and habitat of earthworm, diversity of earthworms, collection of earthworms, preservation of earthworms.

Vermitechnology: Role of earthworm in maintenance of soil structure and their role as recycling, reduce, reuse, restore (4r's), choosing right species of earthworm.

UNIT II

Earthworm biology and rearing: Key to identify the species of earthworm, life cycle of *Eisenia fetida*, *Lampito mauritii* and their role on ecology, an eco-friendly approach to sustainable agriculture

Vermicomposting (methods and products): Preparation of vermibed, small scale earthworm farming for home garden, large scale commercial composting, properties of vermicompost and vermiwash, application on crop plants economic development and self-employment.

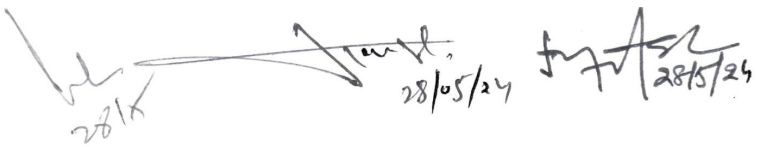
UNIT III (Practical)

1. Key to identify different types of earthworms.
2. Collection of some native earthworms and identification.
3. Study of systematic position, habits, habitat and external feature of earthworm
4. Study of life stages of *Elisenia fetida*, *Eudrilus eugeniae*, *Lampito mauritii*
5. Preparation of vermibeds, maintenance of vermicompost and climatic conditions.
6. Field visit of Vermicomposting unit.
7. Report of field visit.

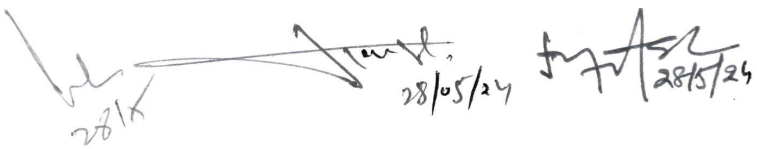
Learning Resources

1. Dash, M. C. (2012). Charles Darwin's Plough Tool for Vermitechnology. I.K. International Publishing House Pvt Ltd. New Delhi, India.
2. Tripathi, G (2003). Vermiresources Technology Discovery Publishing House, New Delhi.
3. Rajnesh Kumar Sharma and Poonam Bhardwaj (2018). Green Farming- Earthworms and Vermitechnology. RAR Publication, New Delhi.

Note for the Paper Setter: The question paper will consist of five questions in all. The first question will be compulsory and will consist of seven short questions of 1 marks each covering the whole syllabus. In addition, four more questions of 14 marks each will be set unit-wise comprising of two questions from each of the two units. The candidates are required to attempt one compulsory question and two more questions selecting at least one question from each unit.



SECOND SEMESTER



BSC/ZOO/MD/2/DSC/104: ANIMAL DIVERSITY OF CHORDATES

DURATION: 3+3 HOURS **MAXIMUM MARKS: 100**

Theory: 75 (External 50 + Internal 25), Practical: 25 (External 25 + Internal 00)

Course objective: To make students to understand life diversity, structural organization andfunctions of the organ systems of Chordates.

Course Learning Outcomes (CLO): After completing the course, the student shall be able to:

CO1: Identifying the characters and classification of Chordates.

CO2: Describe unique characters and recognize life forms of Chordates.

CO3: Explore type study of different Chordates.

CO4: Practical approach to identify all classes of chordates in field.

UNIT I

Chordates: Salient features of chordates; principles of classification; origin and evolutionary tree of chordates. Protochordates: Urochordata: General characters, distribution and affinities. Type study of *Herdmania*. Cephalochordates: General characters, distribution and affinities. Type study of Amphioxus.

Cyclostomata: General characters, bidoversity. Ecological significance of cyclostomes. Type study of *Petromyzon*. Pisces: General characters, biodiversity, scales & fins. Type study of *Labeo*. Migration in Fishes.

UNIT II

Amphibia: General characters and biodiversity. Type study of frog (*Rana*), parental care and neoteny in *Amphibia*. Reptilia: General characters and biodiversity. Type study of *Hemidactylus*. Extinct reptiles; poisonous apparatus in snakes.

UNIT III

Aves: General characters and biodiversity. Type study of Pigeon (*Columba*). Flight/aerial adaptation in birds, Archaeopteryx as missing link. Migration in birds.

Mammals: General characters and biodiversity. Type study of Rat (*Rattus*). Adaptive radiations of mammals, dentition in mammals.

UNIT IV (Practical)

Classification upto orders, habit, habitats, external characters and economic importance (if any):

1. Protochordata: *Molqula, Hetryllus, Pyrosoma, Doliolum, Olikopleura*, and *Amphioxus*.
2. Cyclostomata: *Myxine*, *Petromyzon* and *Ammocoetuslarva*.
3. Chondrichthyes: *Zygaena, Pristis, Narcine (electric ray), Trygon, Rhinobatus, Raja* and *Chimaera*.
4. Osteichthyes: *Acipenser, Lepidosteus, Muraena, Mystus, Catla, Hippocampus, Syngnathus, Exocoetus, Anabas, Diodon, Ostracion, Tetradon, Echinus, Lophius, Solea* and *Polypterus*. Any of the Lung Fishes.
5. Amphibia: *Necturus, Proteus, Amphiuma, Salamandra, Ambystoma, Axolotl larva, Alytes, Bufo* and *Rana*.
6. Reptilia: *Hemidactylus, Calotes, Draco, Varanus, Phrynosoma, Chamaeleon, Typhlops, Python, Eryx, Ptyas, Bungarus, Naja, Hydrus, Viper, Crocodilus, Gavialis, Chelone* (Turtle) and *Testudo* (Tortoise).
7. Aves: *Casuarius, Arden, Anas, Milvus, Pavo, Eudynamis, Tyto, Alcedo* and *Halcyon*
8. Mammalia: *Ornithorhynchus, Echidna, Didelphis, Macropus, Loris, Macaque, Hystrix, Funambulus, Felix, Panthera, Canis, Herpestes, Capra* and *Pteropus*.
9. Study of the skeleton of *Scoliodon, Labeo*, *Rana* (Frog), *Varanus*, Pigeon or Gallus and Orcyctolagus/rat.
10. Study of the following permanent slides: Tornaria larva, T.S. Amphioxus (through different regions), different types of scales.
11. Make permanent stained preparations of the following: Salpa, Spicules, and Pharynx of Herdmania, Amphioxus, Cycloid scales.
12. Field Visit to Protected areas/National Park/Wildlife Sanctuary or Zoo.

Learning Resources

1. R.L.Kotpal. Modern Textbook of Zoology
2. E.L. Jordan and Verma. Chordate Zoology.
3. Barrington, E.J.W. The Biology of Hemichordata and Protochordata. Oliver and Boyd, Edinbourgh.
4. Walters, H.E. and Sayles, L.D. Biology of vertebrates. MacMillan & Co., New York.
5. Kent, C.G. Comparative anatomy of vertebrates.

Note for the Paper Setter: The question paper will consist of seven questions in all. The first question will be compulsory and will consist of four short questions of 2 marks each covering the whole syllabus. In addition, six more questions of 14 marks each will be set unit-wise comprising of two questions from each of the three units. The candidates are required to attempt one compulsory question and three more questions selecting at least one question from each unit.

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BSC/ZOO/MD/2/MIC/102: APPLIED ZOOLOGY

DURATION: 2 HOURS **MAXIMUM MARKS: 50**

Theory: 50 (External 35 + Internal 15), Practical: 00 (External 00 + Internal 00)

Course Objective: Student shall be able to understand the basic concepts of Applied Zoology

Course Learning Outcomes (CLO): After completing the course, the student shall be able to:

CO1 Identify different species of silkworm.

CO2: Use the tools and techniques used in sericulture, piggery poultry and leather Industry.

CO3: Explain the basic concept of Poultry and Pisciculture.

CO4: Understand the basic concepts of industry based applied methods.

UNIT I

Sericulture: Silkworm moth species and their life cycle; Rearing of silkworm, silk reeling, twisting and weaving; Silk composition, kind and uses; Diseases and pests of silkworm.

Prawn Culture: Introduction to Prawns, species; Prawn farming methods, processing and preservation of prawns.

Pearl Culture: Historical background, species; Pearl formation, composition, quality and commercial value, Artificial culturing, synthetic pearl types and their manufacturing, methods of harvesting.

UNIT II

Poultry: Nomenclature and breeds of poultry birds; Egg structure and quality, nutritive values, factors affecting size and egg processing, Poultry products and by products.

Fur and leather industry: Fur producing animals; Fur farming, dressing, processing and dyeing, Fur industry in India; Animals of leather industry, processing of skin, flaying, curing salting and tanning.

Piggery and other utilities of animals: Characteristics of swine and important breeds, Products and by products; Pharmaceuticals from animals; Uses of animals in vaccine production.

Learning Resources

1. Concepts of Insect Control by Ghosh M. R. Wiley Eastern Ltd. New Delhi.
2. Economic Zoology. Shukla Upadhyay, Rastogi Publication, Meerut, India, 1998.
3. Insect Pest Management by Dent, D.
4. Agricultural Entomology by Hill, D.S., Timber Press.
5. General and Applied Entomology by Nayar K. K. and T. N. Ananthkrishnan and B. V. Davis, Tata McGrew Hill Publications. New Delhi.
6. Agricultural Pests: Biology and Control Measures by B. M. Deoray and T. B. Nikam, Nirali Publication, Pune.

Note for the Paper Setter: The question paper will consist of five questions in all. The first question will be compulsory and will consist of seven short questions of 1 marks each covering the whole syllabus. In addition, four more questions of 14 marks each will be set unit-wise comprising of two questions from each of the two units. The candidates are required to attempt one compulsory question and two more questions selecting at least one question from each unit.

28/05/24 28/5/24

CDLU/SEC/2/102: APICULTURE

DURATION: 3+3 HOURS **MAXIMUM MARKS: 75**

Theory: 50 (External 35 + Internal 15), Practical: 25 (External 25 + Internal 00)

Course objective: Students will gain practical knowledge about various methods of bee keeping and extraction of honey thus create scope for entrepreneurship.

Course Learning Outcomes (CLO): After completing the course, the student shall be able to:

CO1: Understand the significance of honey bees and Apiculture

CO2: Acquire knowledge about different species and castes of the honey bees.

CO3: Learn to manage beehives, and production of honey bees products.

CO4: Indentify the economic importance of honey bees in self employment.

UNIT I

Apiculture meaning, definition scope and history, Status of Apiculture Industry in India, Classification and Life Cycle of Honey Bee. Identification of Indigenous and exotic Honey bee species

Cultivable species of Honey Bee with reference to India, Social organization of honey bees: the castes- queen, drone and workers, nesting behavior of Honey bees, Bee foraging, Seasonal management, swarming in Honey bees, waggle dance, defense in honey bees, Diseases and Enemies. of Bees, Control and Preventive measures.

UNIT II

Role of Bees in cross pollination in horticulture and agriculture, Methods of Artificial Bee keeping, Equipments used in Bee keeping Industry, Methods of extraction of Honey and other products

Products of Apiculture Industry and their Uses (Honey, Bee Wax, Royal Jelly, Bee Venom, Propolis and Pollen), Bee Keeping Industry: Present and future, Prospects of apiculture as self employment venture. Economics of Apiculture: Expenditure, Net Income, and Additional benefits

UNIT III (Practical)

Practical Exercises on

1. Identification of different bee species
2. Training of Bee keeping in Artificial boxes
3. Demonstration of Modern Bee Keeping Equipment and Methods.
4. Training of methods of Extraction of Honey (Indigenous and Modern)
5. Field visit to Honey Bee farm/Unit
6. Report of field visit

Learning Resources

1. Prost, P. J. (1962). Apiculture. Oxford and IBH, New Delhi.
2. Bisht, D.S. (2004). Agricultural Development in India, Anmol Pub. Pvt. Ltd.
3. Singh S. (1964). Beekeeping in India, Indian council of Agricultural Research, New Delhi
4. Mehrotra, K.N. Bisht, D.S. (1981). Twenty-five years of apiculture research at IARI. I. Apiculture in relation to agriculture.
5. The Social Behaviour of the Bees, 1974 : By Missioner C.D
6. The Social Behaviour of the Bees, A Comparative Study 1974, C.D.Mathener, Harvard University Press, Cambridge, England.
7. Bees and Mankind 1982, J.B.Free, George Allen & Unwin (Pub.), Limited London, UK. 25. Biogeography and Taxonomy of Honeybees 1985, F.Ruttnar, Springer-Verlag, Berlin, Jermany.

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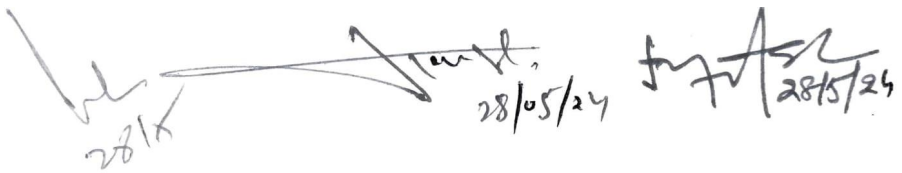
THIRED SEMESTER



BSC/ZOO/MD/3/DSC/201: BIOCHEMISTRY AND ANIMAL PHYSIOLOGY

DURATION: 3+3 HOURS **MAXIMUM MARKS: 100**

Theory: 75 (External 50 + Internal 25), Practical: 25 (External 25 + Internal 00)

Course objective: To make students to understand structure and functions of biomolecules and Physiology of different organ systems.

Course Learning Outcomes (CLO): After completing the course, the student shall be able to:

CO1: Understand and explain the mechanism that works to keep the human body functioning.

CO2: Explain the interaction and interdependence of physiological and biochemical processes.

CO3: Explain the mechanism of action of hormones and related molecules of endocrine system.

CO4: Understand and perform biological and analytical techniques in labs to explain biological activities.

UNIT I

Introduction, classification, structure, function and general properties of proteins, carbohydrates and lipids.

Nomenclature, classification and mechanisms of enzyme action; Enzyme Kinetics, factors affecting enzyme activity, inhibition of enzymes. Transport through bio-membrane (Active and Passive), hydrogen ion concentration and buffers.

Nutrition: Nutritional components: Carbohydrates, fats, lipids, Vitamins and Minerals; Types of nutrition & feeding, Digestion of lipids, proteins, carbohydrates & nucleic acids; symbiotic digestion, lactose intolerance, Physicochemical mechanism of Absorption of nutrients & assimilation; control of secretion of digestive juices.

Muscles: Types of muscles, ultra-structure of skeletal muscle, neuromuscular junction. Bio-chemical and physical events during muscle contraction, single muscle twitch, tetanus, muscle fatigue, muscle tone, oxygen debt., Cori's cycle, single unit smooth muscles, their physical and functional properties.

UNIT II

Circulation: Origin, conduction and regulation of heart beat; cardiac cycle, electrocardiogram, cardiac output, blood pressure; Composition and functions of blood & lymph; Mechanism of coagulation of blood, coagulation factors; anticoagulants, haemopoiesis.

Respiration: Exchange of respiratory gases, transport of gases, lung air volumes, oxygen dissociation curve of haemoglobin, Bohr's effect, Hamburger's phenomenon (Chloride shift), control / regulation of respiration (peripheral reflexes, chemical control and Higher centres), Myoglobin.

Excretion: Patterns of excretory products viz. Amonotelic, ureotlic uricotelic, ornithine cycle (Kreb's – Henseleit cycle) for urea formation in liver; Urine formation, composition of Urine, counter-current mechanism of urine formation, osmoregulation, micturition.

UNIT III

Neural Integration: Nature, origin and propagation of nerve impulse along with medullated & non-medullated nerve fibre, conduction of nerve impulse across synapse, synaptic delay and synaptic fatigue, Neurotransmitter.

Chemical integration of Endocrinology: Structure, chemical nature and mechanism of peptide and steroid hormone action; physiology of hypothalamus, pituitary, thyroid, parathyroid, adrenal, pancreas and gonads, Hormonal disorders.

Reproduction: Spermatogenesis, Capacitation of spermatozoa, oogenesis, ovulation, formation of corpus luteum, oestrous-anoestrous cycle, Menstrual cycle in human, fertilization, implantation and gestation, parturition

UNIT IV (Practical)

1. Qualitative tests for identification of simple sugars, disaccharides and polysaccharides.
2. Study of human salivary amylase activity: Effect of temperature, pH, Concentration.
3. Estimation of abnormal constituents of urine (Albumin, sugar, ketone bodies).
4. Use of Kymograph unit & respirometer.
5. Haematin crystal preparation.
6. Estimation of Hb.
7. DLC of Man/RBC count/WBC count.
8. Study of permanent slides of endocrine glands
9. Blood antigens and antibodies: Blood group testing

Learning Resources

1. Agarwal R A, Srivastava A. K., Kumar K. Animal Physiology and Biochemistry; S Chand Publishing; Twenty Third edition, 1978.
2. Vasantika Kashyap (2021) A Text-Book of Animal Physiology and Biochemistry; Kedar Nath Ram Nath Pub.
3. Arumugam N, Fatima D, Narayanan L.M. (2016) Animal Physiology and Biochemistry; Saras Publication
4. Moyes C, Schulte P (2015). Principles of Animal Physiology, Pearson; 3rd edition
5. Satyanarayana (2021). Biochemistry, Elsevier; 6th edition

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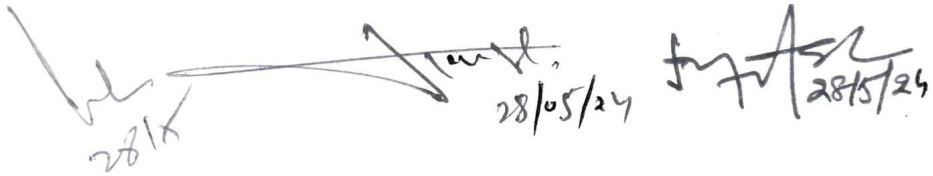

BSC/ZOO/MD/3/MIC/201: COMPARATIVE ANATOMY OF VERTEBRATES

DURATION: 3+3 HOURS **MAXIMUM MARKS: 100**

Theory: 75 (External 50 + Internal 25), Practical: 25 (External 25 + Internal 00)

Course objective: Students will be able to learn about structural and functional organization of invertebrates.

Course Learning Outcomes (CLO): After completing the course, the student shall be able to:

CO1: Compare Integumentary System and Skeletal System of invertebrates.

CO2: Compare Circulatory System and Respiratory System of invertebrates.

CO3: Compare Circulatory System and Urogenital System of invertebrates.

CO4: Nervous System and Sense Organs of invertebrates.

UNIT I

Integumentary System: Structure, functions and derivatives of integument

Skeletal System: Overview of axial and appendicular skeleton, Jaw suspension, Visceral arches

Digestive System: Alimentary canal and associated glands

UNIT II

Respiratory System: Skin, gills, lungs and air sacs; Accessory respiratory organs

Circulatory System: General plan of circulation, evolution of heart and aortic arches

Urogenital System: Succession of kidney, Evolution of urogenital ducts, Types of mammalian uteri.

UNIT III

Nervous System: Comparative account of brain; Autonomic nervous system, Spinal cord, Cranial nerves in mammals

Sense Organs: Classification of receptors: Brief account of visual receptors, chemo-receptors and Mechanoreceptors.

UNIT IV (Practical)

1. Study of placoid, cycloid and ctenoid scales through permanent slides/photographs.
2. Disarticulated skeleton of Frog, *Varanus*, Fowl, Rabbit
3. Carapace and plastron of turtle /tortoise
4. Mammalian skulls: One herbivorous and one carnivorous animal

Learning Resources

1. Kardong, K.V. (2005) Vertebrates' 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 Companies.
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.
5. Walter, H.E. and Sayles, L.P; Biology of Vertebrates, Khosla Publishing House.

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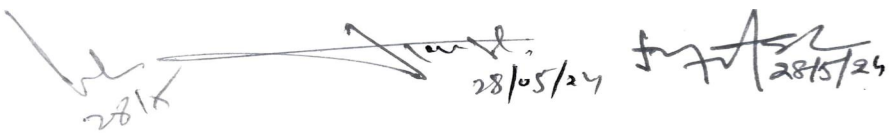

CDLU/SEC/3/201: PISCICULTURE AND FISH DISEASES

DURATION: 3+3 HOURS **MAXIMUM MARKS: 75**

Theory: 50 (External 35 + Internal 15), Practical: 25 (External 25 + Internal 00)

Course objective: To make students to understand basics of aquaculture and control of fish diseases.

Course Learning Outcomes (CLO): After completing the course, the student shall be able to:

CO1: Learn about various methods and significance of fish farming.

CO2: Identification of fish species using classical morphological methods

CO3: Get acquainted about bye products of fish farming industry and fish health

CO4: Trained for analysis of water quality and fish culture in ponds

UNIT I

General introduction -Definition of Fish, Fisheries, Aquaculture and Pisciculture.

Significance of fish farming. Production, Utilization and Demand of Fish in India. General description of Capture and Culture Fisheries.

Culture fisheries and its types. Criteria for the selection of fish species for farming. Important culturable Fishes in India and Identification of commercially important fish species. Basics of induced breeding in fishes.

UNIT II

Pond fish culture: Types, Design and construction of fish farming ponds. Maintenance of fish culture ponds

Ecology of Fish pond ecosystem: Water quality (Physico-chemical and Biological) and Soil quality. Weeds of fish farming ponds and their control

Nutrition of cultured fishes: Natural, supplementary and artificial feed, Nutrient composition and common dietary ingredients. By products of fish farming Industry. Methods of Fish harvesting and marketing. Common fish diseases and their control

UNIT III (Practical)

Practical Exercises on

1. Identification of important fishes
2. Identification of developmental stages of fishes
3. Analysis of physical and chemical properties of water: (Temperature, pH, turbidity, salinity, total solids, Dissolved oxygen, Free carbon-di-oxide, hardness, chlorides)
4. Study of aquatic weeds
5. Study of crafts and gears
6. Visit to fish farm and/or fish market and preparation of report

Learning Resources

1. Encyclopedia of Fish Physiology. 2011. Anthony P. Farrell, E.D. Stevens, J.J. Cech&
2. J.G. Richards (Eds). Academic Press, UK.
3. APHA (1995) Standard Methods of Examination of Water and Wastewater. American Public Health Association, AWWA, WCPF, Washington DC.
4. Das, P, Verma, SR, Dhaje, RJ & Malik DS (2002) Coldwater Fish Genetic Resources and their Conservation. National Conservators publication, 7, 325pp.
5. Datta Munshi, JS & Srivastava, MP (1998) Natural History of Fishes and Systematics of Freshwater Fishes of Infia. Narendra Publishing house, Delhi, 403pp.
6. Jayram, KC (2013) The Freshwater Fishes of the Indian Region (Corrected 2nd Edition) Narendra Publishing house, Delhi, 616pp, XXXIX plates.
7. Lagler, KF, Bardach, JE, Miller, RR & Passino, DRM (1977) Ichthyology, 21nd Edition, New York, Wiley, 506 pp.
8. Nikolsky, GV (1963) The Ecology of Fishes, Academic Press, London.
9. Pillay, TVR (1990) Aquaculture, principles and practices. Fishing New Books. 575pp2. Fish Physiology. (Series) W.S.Hoar and D.J. Randall (Series Eds). Academic Press, UK.
10. The Physiology of Fishes. 2013. Evans, D. H. and Claiborne, J. D., Taylor and Francis

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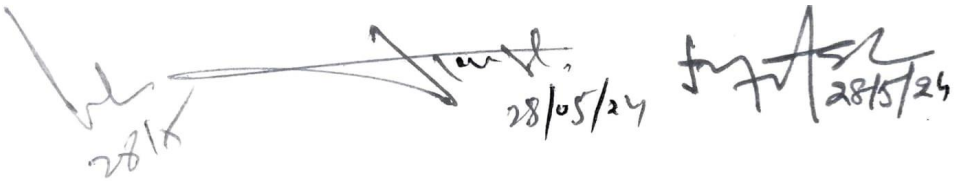
FOURTH SEMESTER



BSC/ZOO/MD/4/DSC/203: AGROCHEMICALS AND PEST MANAGEMENT

DURATION: 3+3 HOURS **MAXIMUM MARKS: 100**

Theory: 75 (External 50 + Internal 25), Practical: 25 (External 25 + Internal 00)

Course objective: To make students to understand basics of agrochemicals, insect pest and their management.

Course Learning Outcomes (CLO): After completing the course, the student shall be able to:

CO1: Understand ecologically and life cycle of important insect pest.

CO2: Explain about various Agrochemicals and pest control approaches.

CO3: Identify various insect and pest species.

CO4: Understand about the vegetable pest.

UNIT I

Study of following important insect pests of crops

Sugarcane: (With their systematic position, habits and nature of damage caused: Sugarcane leaf-hopper (*Pyrilla perpusilla*), Sugarcane Whitefly (*Aleurolobus barodensis*), Sugarcane top borer (*Sciropophaga nivella*), Sugarcane root borer (*Emmalocera depresella*), Gurdaspur borer (*Bissetia steniellus*). Life cycle and control of Pyrilla perpusilla only.

Cotton: (With their systematic position, habits and nature of damage caused: Pink bollworm (*Pestinophora gossypfolla*), Red cotton bug (*Dysdercus cingulatus*), Cotton grey weevil (*Myllocerus undecimpustulatus*), Cotton Jassid (*Amrasca devastans*). Life cycle and control of *Pectinophore gossypiella*.

Wheat: Wheat stem borer (*Sesamia inferens*) with its systematics position, habits, nature of damage caused. Life cycle and control methods.

UNIT II

Study of following important insect pests of crops

Paddy: (With their systematic position, habits and nature of damage caused): Gundhi bug (*Leptocorisa acuta*), Rice grasshopper (*Hieroglyphus banian*), Rice stem borer (*Scirpophaga incertullus*), Rice Hispa (*Diceladispa armigera*). Life cycle and control of *Loptocorisa acuta* only

Study of following important insect pests of vegetables and stored grains

Vegetables: (Their systematics position, habits and nature of damage caused): *Aulacophora faveicollis* – The Red pumpkin beetle, *Dacus cucurbitas* – The pumpkin fruit fly, *Tetranychus tecarius* – The vegetable mite, *Epilachna* – The Hadda beetle. Life cycle and control of *Aulacophora faveicollis*

Stored grains: (Their systematic position, habits and nature of damage caused): Pulse beetle (*Callosobruchus maculatus*), Rice weevil (*Sitophilus oryzae*), Wheat weevil (*Trogoderma granarium*), Rust Red Flour beetles (*Tribolium castaneum*), Lesser grain borer (*Rhizopertha dominica*), Grain & Flour moth (*Sitotroga cerealella*). Life cycle and control of *Trogoderma granarium*)

UNIT III

Important bird and rodent pests of agriculture & their management.

Pest control: Biological control, its history, requirement and precautions and feasibility of biological agents for control.

Chemical control: History, Categories of pesticides, important pesticides from each category to pests against which they can be used, insect repellants and attractants.

Integrated pest management

UNIT IV (Practical)

1. External morphology, identification marks, nature of damage and host of the following pests:-

(i) Sugarcane: Sugarcane leaf-hopper, Sugarcane whitefly, Sugarcane top borer, Sugarcane root borer, Gurdaspur borer (any two).

(ii) Cotton: Red Cotton bug

(iii) Wheat: Wheat stem borer

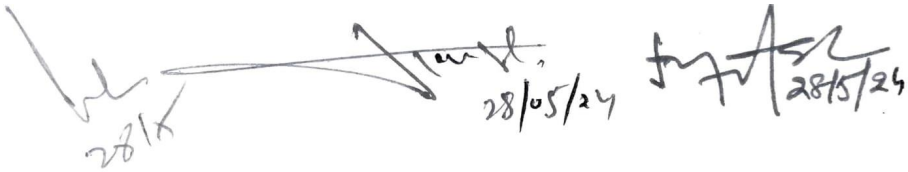
(iv) Paddy: Gundhi bug, Rice grasshopper, Rice stem borer, Rice hispa (any one).

(v) Vegetables: *Aulocophora faveicollis*, *Dacus cucurbitas*, *Tetranychus tecarious*, *Epilachna* (any three).

(vi) Pests of stored grains: Pulse beetle, Rice weevil, Grain & Flour moth, Rust-red flour beetle, lesser grain borer (any three).

2. Stages of life history of silk moth and honey bee.

3. Preparation of permanent/temporary slides for identification of mosquitoes



Learning Resources

1. David Dent, Richard Binks (2020). Insect Pest Management CABI Publishing; 3rd edition
2. Larry P Pedigo, Marlin E. Rice (2014) Entomology and Pest Management. Waveland Pr Inc; 6th edition
3. John R. Ruberson (2019) Handbook of Pest Management, CRC Press; 1st edition
4. Kalatia M.K. (2021) Introduction to principles of pest and disease management; Walnut Publication
5. Smith K M (2013) A Textbook of Agricultural Entomology by Hill, Cambridge University Press

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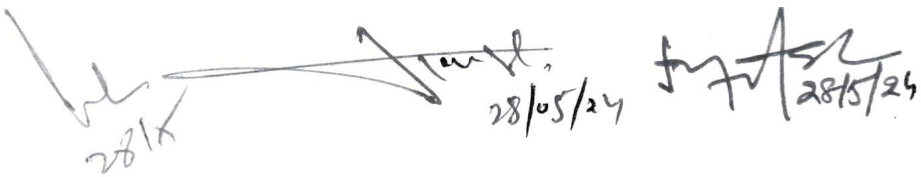

BSC/ZOO/MD/4/MIC/202: GENETIC ENGINEERING AND BIOTECHNOLOGY

DURATION: 3+3 HOURS **MAXIMUM MARKS: 100**

Theory: 75 (External 50 + Internal 25), Practical: 25 (External 25 + Internal 00)

Course objective: This course gives an insight into the direct manipulation of DNA to alter the characteristics of an organism in a particular way.

Course Learning Outcomes (CLO): After completing the course, the student shall be able to:

CO1: Understand the fundamental molecular tools and their applications of DNA modification and cloning.

CO2: Apply the knowledge with problem solving approach to recommend strategies of genetic engineering in Biotechnology and allied industry

CO3: Learn different techniques used in Genetic Engineering.

CO4: Develop future course of their career development in higher education and research with a sound base.

UNIT I

Introduction to Genetic Engineering and Biotechnology. Enzymes as Tools for Genetic Engineering: Restriction Enzymes, Restriction-Modification System, DNA-modifying enzymes, T4 and E. coli DNA Polymerase (Klenow), DNA-methylase, Polynucleotide Kinase, DNA-ligase, Taq DNA polymerase, Reverse Transcriptase, T7 and T3 RNA polymerases. Vehicles for DNA cloning: Plasmid DNA vectors, bacteriophage lambda-derived vectors.

DNA (Gene) cloning, recombinant DNA, cDNA library, genomic library. Isolation of gene from gene library. Screening and identification of recombinant DNA clone from gene library.

UNIT II

Expression of recombinant protein from a DNA clone in bacteria and purification of the protein. Some examples of the useful recombinant proteins: Insulin, Streptokinase, enzymes, antibodies, vaccines.

Polymerase Chain Reaction (PCR) and Site-directed, Restriction enzyme digestion. Transgenic animals, Ligation, Cloning, Transformation, Calculation of transformation efficiency. Mutagenesis. Recent trends in Gene technology. Gene Targeting: Knock-ins and Knock-outs. Targeted Genome Editing: ZFNs, TALENs, CRISPRs etc.

UNIT III

DNA Sequencing and Genome Analysis, Model Genomes. Human Genome Project and Human Genome Sequences. Applications of Genetic Engineering and Biotechnology in agriculture, medicine and its economic and social implications, Ethical precautions.

UNIT IV (Practical)

1. Video-graphic demonstrations on the above mentioned topics.
2. Models and Presentations by students on the topics: Microbial degradation of waste materials, Antibiotics from microorganisms, Transgenic Tomato and Rice, Recombinant Interferon, Growth Hormone, Insulin, Colony Stimulating Factor, Streptokinase, Industrial Enzymes.
3. Restriction enzyme digestion.
4. Separation of molecules using electrophoresis, Cloning.
5. Transformation, Calculation of transformation efficiency.
6. Group discussion or Seminar presentation on one or two related topics.

Learning Resources

1. Primrose, S.B. and Twyman, R. (2006) Principles of Gene manipulation and Genomics (7th edition) Blackwell Publishing.
2. Nicholl, D.S.T. (2008) An introduction to Genetic Engineering (3rd edition) Cambridge University Press.
3. Watson, J.D. (2006) Recombinant DNA (3rd edition) Cold Spring Harbor Laboratory Press.
4. Brown, T.A. (2001) Gene Cloning and DNA Analysis: An Introduction.
5. A PBS Documentary entitled, "Playing God" [History of Genetic Engineering]

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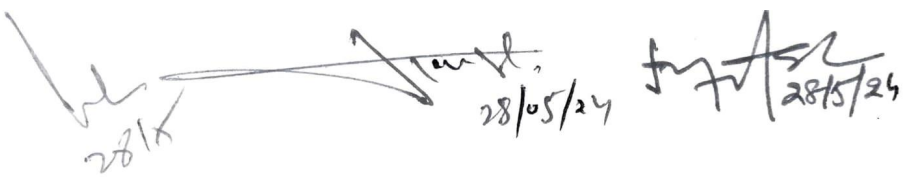
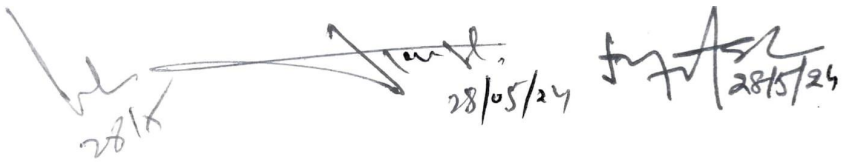


FIFTH SEMESTER



BSC/ZOO/MD/5/DSC/301: CELL BIOLOGY AND GENETICS

DURATION: 3+3 HOURS **MAXIMUM MARKS: 100**

Theory: 75 (External 50 + Internal 25), Practical: 25 (External 25 + Internal 00)

Course objective: To make students to understand cell structures, functions along with the principals of inheritance.

Course Learning Outcomes (CLO): After completing the course, the student shall be able to:

CO1: Understand the nature and basic concept of cell biology and genetics.

CO2: Apply the knowledge of internal structure of cell and their role in many metabolic function of organism

CO3: Explain the concept of gene interactions, Sex linked inheritance and their role in medical sciences

CO4: Conduct the morphometric analysis of chromosomes and demonstrate cell division

UNIT I

General structure of animal cell. Plasma Membrane: Fluid mosaic model, various modes of transport across the membrane, mechanism of active and passive transport, endocytosis and exocytosis. Endoplasmic reticulum (ER): types and functions. Golgi complex: Structure, associated enzymes and role of golgi-complex in animal cell. Ribosomes: Types, biogenesis and role in protein synthesis.

Lysosomes: Structure, enzymes and their role; polymorphism Mitochondria: Structure, Mitochondria as semiautonomous body, biogenesis, functions of mitochondria. Cilia and Flagella: Structure and Functions.

Ultrastructure and functions of Nucleus: Nuclear membrane, nuclear lamina, nucleolus, fine structure of chromosomes, nucleosome concept and role of histones, euchromatin and heterochromatin.

UNIT II

Mendel's Laws of Inheritance, Intra-genic and Inter-genic gene interactions, Linkage and recombination: Cell Cycle, crossing-over and chiasma formation; gene mapping. Sex determination and its mechanism: male and female heterozygous systems, genetic balance system; role of Y-chromosome, male haploidy, cytoplasmic and environmental factors, role of hormones in sex determination. Sex linked inheritance: Haemophilia and colour blindness in man, eye colour in Drosophila, Non-disjunction of sex-chromosome in Drosophila, Sex-linked and sex-influenced inheritance.

UNIT III

Extra chromosomal and cytoplasmic inheritance: Kappa particles in Paramecium, Shell coiling in snails, Milk factor in mice. Multiple allelism: Eye colour in Drosophila; A, B, O blood group in man. Human genetics: Human karyotype, Chromosomal abnormalities involving autosomes and sex chromosomes, monozygotic and dizygotic twins. Inborn errors of metabolism (Alkaptonuria, Phenylketonuria, Albinism, sickle-cell anemia). Applied genetics: Genetic counseling, pre-natal diagnosis, DNA-finger printing, transgenic animals.

UNIT IV (Practical)

1. Cell division: Prepared slides of stages of mitosis and meiosis.
2. Salivary gland and polytene chromosomes of Drosophila/ Chironomus.
3. Temporary squash preparations of onion root tip/grasshopper testis for the study of mitosis
4. Blood antigens and antibodies: Blood group testing
5. Preparation of Human Karyotype and Idiogram
6. Barr Body and Drum stick slide Preparations

Learning Resources

1. Molecular Cell, Biology, J. Darnell, H. Lodish and D. Baltimore Scientific American Book, Inc., USA.
2. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology by P. S. Verma and V.K. Aggarwal
3. Molecular Biology of the Cell, B. Alberts, D. Bray, J. Lewis, M. Raff, K. Roberts and J.D. Watson. Garland Publishing Inc., New York.
4. Cell Biology and Genetics by P.K. Gupta
5. Cell Biology and Genetics by Veer Bala Rastogi.
6. Principles of Genetics by M. Gardner, J. Simmons, D.P. Snustad
7. Genetics by D.P. Snustad, J. Simmons.

Note for the Paper Setter: The question paper will consist of seven questions in all. The first question will be compulsory and will consist of four short questions of 2 marks each covering the whole syllabus. In addition, six more questions of 14 marks each will be set unit-wise comprising of two questions from each of the three units. The candidates are required to attempt one compulsory question and three more questions selecting at least one question from each unit.

28/5/24 28/5/24

BSC/ZOO/MD/5/MIC/301: ANIMAL TAXONOMY

DURATION: 3+3 HOURS **MAXIMUM MARKS: 100**

Theory: 75 (External 50 + Internal 25), Practical: 25 (External 25 + Internal 00)

Course objective: The course provides an insight into the methodology and application of animal taxonomy. The course is directed at those students interested in studies of evolutionary biology, biodiversity, conservation biology, and/or systematics.

Course Learning Outcomes (CLO): After completing the course, the student shall be able to:

CO1: Comprehend the basic concepts of animal taxonomy and zoological nomenclature

CO2: Evaluate the significance of museum specimens

CO3: Analyze the implications of biometrics, numerical taxonomy and cladistics.

CO4: Gain a basic grasp on the rules and philosophy of nomenclature.

UNIT I

Fundamental concepts of Taxonomy: Introduction to taxonomy, application and importance of biosystematics in zoology, cyto-taxonomy, chemo taxonomy, molecular taxonomy. Importance of collections/ museum specimens of the world and India; Documentation of biodiversity. Systematics and taxonomy. Importance and basis of classification. Hierarchy of classification and classification systems.

Zoological Nomenclature: International code of Zoological Nomenclature (ICZN): ICZN, Binomial and trinomial of classification.

UNIT II

Taxonomic Procedures: Taxonomic collections, preservation, curating and process of identifying, description, naming of taxa. Keys: indented and racketed keys, their merits and demerits. Principles and rules of International Code of Zoological Nomenclature (ICZN): ICZN, Binomial and trinomial of classification, type material, author citation, Taxonomic revision, Taxonomic literature. The relevance of systematics in conservation programmes.

UNIT III

Taxonomic characters: Morphological, embryologic, cytogenetical, biochemical numeral components of classification and Linnaean hierarchy.

Molecular phylogenetics: Gene structure, mutation and rates and patterns of nucleotide substitutions. Mitochondrial genome. Molecular "clock" hypothesis.

Species Concept: Concepts of speciation and Subspeciation. Potential mode of speciation

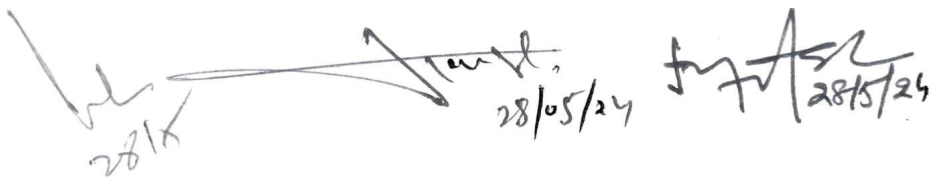
UNIT IV (Practical)

1. General discussion, distinguishing characters and classification of selected animals.
2. Preparation of identification keys for select specimens of non-chordate (e.g., insects) and chordates (e.g., birds)
3. Generation of a character-state matrix by selecting and scoring diagnostic taxonomic characters.
4. Interactive software for exploring phylogeny and analyzing character state to construct dendrogram.
5. Distance-based methods of phylogenetic reconstruction using manual and computer methods.
6. Molecular data analysis by aligning sequences and constructing trees using PAUP

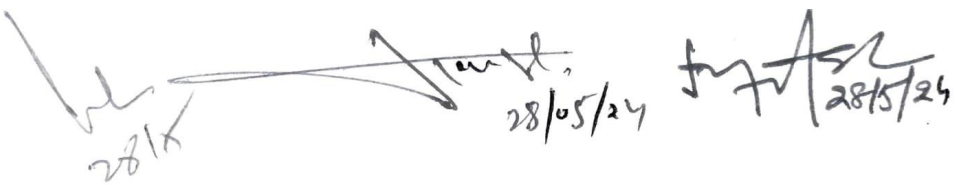
Learning Resources

1. Mayr, E. and Ashlock, P.D. (1991). Principles of Systematic Zoology. (2nd edition) New York: McGraw Hill, Inc.
2. Quicke, D. L. J. (1993). Principles and Techniques of Contemporary Taxonomy. New York: Chapman and Hall

Note for the Paper Setter: The question paper will consist of seven questions in all. The first question will be compulsory and will consist of four short questions of 2 marks each covering the whole syllabus. In addition, six more questions of 14 marks each will be set unit-wise comprising of two questions from each of the three units. The candidates are required to attempt one compulsory question and three more questions selecting at least one question from each unit.



SIXTH SEMESTER



BSC/ZOO/MD/6/DSC/303: DEVELOPMENTAL & EVOLUTIONARY BIOLOGY

DURATION: 3+3 HOURS **MAXIMUM MARKS: 100**

Theory: 75 (External 50 + Internal 25), Practical: 25 (External 25 + Internal 00)

Course objective: To make students to understand basics of developmental & evolutionary biology.

Course Learning Outcomes (CLO): After completing the course, the student shall be able to:

CO1: Understand about principals of embryonic development.

CO2: Explain the process of gametogenesis and fertilization.

CO3: Understand the concept and process of major evolutionary events.

CO4: Explain the evidences of evolution and evolution of different organisms.

UNIT I

Concept and evidences of Evolution: Origin of life, concept and evidences of organic evolution (Concept of Oparin and Haldane; experiment of Miller and Urey). Evolution of Cell: Prokaryotic and Eukaryotic cells. Theories of evolution (Lamarck's, Darwin's concepts and Modern concept/Synthetic theory of evolution).

Concept of micro, macro-and mega-evolution. Concept of species. Evidences of evolution.

Paleontology and evolutionary history: The evolutionary time scale; Eras, periods and epoch; Major events in the evolutionary time scale. Phylogeny of horse. Evolution of man.

UNIT II

Gametogenesis: Spermatogenesis and Oogenesis including structure and differentiation. Capacitation and detailed mechanism of Fertilization, Blockage to polyspermy. Parthenogenesis, different types of eggs.

Cleavage: Patterns, control of cleavage patterns, chemical changes during cleavage. Concept of Totipotency. Embryonic Induction: Origin, structure and significance of primary organizer.

Blastulation and Gastrulation: fate-map construction, process of blastulation and Gastrulation in frog and chick upto the formation of three germinal layers.

UNIT III

Elementary knowledge of extra embryonic membranes. Concepts of competence, determination and differentiation. Regeneration: Morphallaxis and Epimorphosis, Blastema and its significance, mechanisms as exhibited by invertebrates (Hydra and Planaria) and Vertebrates (Limb regeneration in Amphibia). Placentation in mammals.

UNIT IV (Practical)

1. Types of eggs based on quantity and distribution of yolk: sea urchin, insect, frog, Chick.
2. Comparative study of cleavage patterns in Frog and Amphioxus models.
3. How do cells move, change shape and size during morphogenetic movement of Blastulation, Gastrulation in Frog, Amphioxus, Chick?
4. Study of development of chick embryo through incubated chick eggs up to 96 h.
5. Extra embryonic membranes of chick through permanent slides.
6. Some videos to develop understanding on the process of development.
7. Study of adaptive radiations in feet of birds and mouth parts of insects.
8. Understanding embryological evidence of evolution (through charts and videos).
9. Study of types of fossils.
10. Analogy and homology (wings of birds and insects, forelimbs of bat and rabbit).

Learning Resources

1. Dobzhansky, Th. Genetics and Origin of Species. Columbia University Press.
2. Dobzhansky, Th., F.J. Ayala, G.L. Stebbines and J.M. Valentine. Evolution. Surjeet Publication, Delhi.
3. Futuyama, D.J. Evolutinary Biology, Suinuaer Associates, INC Publishers, Dunderland.
4. Haiti, D.L. A Primer of Population Genetics. Sinauer Associates, Inc, Massachusetts.
5. Jha, A.P. Genes and Evolution. John Publication, New Delhi.
6. King, M. Species Evolution-The role of chromosomes change. The Cambridge University Press, Cambridge.
7. Merrel, D.J. Evolution and Genetics. Holt, Rinchart and Winston, Inc.
8. Gilbert: Development Biology Sinauers Ass. Publ. Massachusetts.
9. Wolpert: Analysis of Biological development, Oxford.

Note for the Paper Setter: The question paper will consist of seven questions in all. The first question will be compulsory and will consist of four short questions of 2 marks each covering the whole syllabus. In addition, six more questions of 14 marks each will be set unit-wise comprising of two questions from each of the three units. The candidates are required to attempt one compulsory question and three more questions selecting at least one question from each unit.

28/5/24 28/5/24

BSC/ZOO/MD/6/MIC/302: HUMAN HEALTH AND SEX EDUCATION

DURATION: 3+3 HOURS **MAXIMUM MARKS: 100**

Theory: 75 (External 50 + Internal 25), Practical: 25 (External 25 + Internal 00)

Course objective: The course is designed to address problems associated with health and sex thereby, promoting fitness and well being.

Course Learning Outcomes (CLO): After completing the course, the student shall be able to:

CO1: Understand the importance of good health.

CO2: Understand structure and function of Human reproductive system.

CO3: Understand causes of infertility and assisted reproductive techniques.

CO4: Observe clean sexual habits thereby warding off sexually transmitted diseases.

UNIT I

Health as a state of wellbeing, health awareness, Physical health, balanced diet, food supplements, proper sleep, exercise, pathogens and pollution. Reproductive health, adolescence, senescence. Prevention from mental illness and disabilities, alcoholism, tobacco addiction, de-addiction, lifestyle diseases. Community Health Centres, role of health centres. Spiritual health, yoga and meditation.

Human reproductive system: structural details of male reproductive system, semen, hormonal control. Female reproductive system- structure of ovary, accessory structures, puberty, reproductive cycles and hormonal control, menstrual cycle, gestation period, hysterectomy, menopause.

UNIT II

Events of human reproduction: Gametogenesis- spermatogenesis and oogenesis, ovulation, fertilization, embryonic development, parturition.

Human intervention in reproduction: Contraception and birth control-barrier method, hormonal methods, natural methods, sterilization, termination of pregnancy. Infertility-male and female infertility, causes and treatment for infertility. Advanced Reproductive Technologies- IVF, GIFT, ZIFT, Donor Insemination (DI). Sperm transfer techniques. Surrogacy.

UNIT III

Sexually transmitted diseases: Syphilis, genital warts, chlamydia, chancroid, trichomoniasis, gonorrhea, genital herpes, AIDS, Sex education: Adolescent sexual activity, teenage pregnancy, sexual harassment, sexual awareness and policies (legal aspects), lesbian and gay sex, bisexual, transgender youth, adolescent stress management

UNIT IV (Practical)

1. Study of animal house: set up and maintenance of animal house, breeding techniques, care of normal and experimental animals.
2. Surgical techniques: principles of surgery in endocrinology. Ovariectomy, Hysterectomy, castration and vasectomy in rats.
3. Examination of histological sections from photomicrographs/ permanent slides of rat/human: testis, epididymis and accessory glands of male reproductive systems;
4. Sections of ovary, fallopian tube, uterus (proliferative and secretory stages), cervix and vagina.
5. Human vaginal exfoliate cytology.
6. Sperm count and sperm motility in rat
7. Study of modern contraceptive devices

Learning Resources

1. Kothari P. (1994) Common sexual problems and solutions by, UBS Publishers and Distributors Ltd. 145.
2. Hadley, Mac. E. (2004) Endocrinology. (5th edition) Pearson Education, Singapore.
3. Taylor, D.J., Green, N.P.O., Stout G. W. (2005) Biological Science. (Editor R. Soper) 3rd Edition, Cambridge University Press.
4. The Complete Manual of Fitness and Well-being. The Reader's Digest Association, Inc. Pleasantville, New York / Montreal.
5. Guyton, A.C. and Hall, J.E. Textbook of Medical Physiology.

Note for the Paper Setter: The question paper will consist of seven questions in all. The first question will be compulsory and will consist of four short questions of 2 marks each covering the whole syllabus. In addition, six more questions of 14 marks each will be set unit-wise comprising of two questions from each of the three units. The candidates are required to attempt one compulsory question and three more questions selecting at least one question from each unit.

28/05/24 28/5/24

BSC/ZOO/MD/6/MIC/303: BASICS OF ENDOCRINOLOGY AND IMMUNOLOGY

DURATION: 3+3 HOURS **MAXIMUM MARKS: 100**

Theory: 75 (External 50 + Internal 25), Practical: 25 (External 25 + Internal 00)

Course objective: To make students to understand functioning of immune system and working of endocrine glands.

Course Learning Outcomes (CLO): After completing the course, the student shall be able to:

CO1: Understand the appropriate functioning of immune system.

CO2: Explore different components of immune system.

CO3: Explain the mechanism of action of hormones and related molecules of endocrine system.

CO4: Understand and perform biological and analytical techniques in labs to explain biological activities.

UNIT I

Definition and classification of hormones. Endocrine, paracrine and autocrine modes of hormone delivery, Feedback mechanism.

Structure of pineal gland, Its hormones and their functions in biological rhythms and reproduction; Structure of hypothalamus, Hypothalamic nuclei and their functions, Structure of pituitary gland, Its hormones and their functions; Hypothalmo-Hypophysial portal system.

Structure, Hormones, Functions and Regulation of Thyroid gland; Parathyroid & Adrenal glands; Pancreas; Ovary and Testis; Hormones in homeostasis; Disorders of endocrine glands and Hormonal disorders. Hormone action at Cellular level: Hormone receptors; Transduction and regulation of Hormone action at Molecular level; Genetic control of hormone action.

UNIT II

Definition, overview of immune system, cells and organs of immune system. Primary and secondary lymphoid organs and their functional role. Primary and secondary line of defence. Innate and acquired immunity. Humoral and cell mediated immune response.

Structure, function and classification of immunoglobulins, antigen and immunogen, epitopes, haptens, adjuvant. Antigenic determinants: isotype, allotype and idiotype. Antigen-antibody interactions. B-cell and T-cell mediated immunity, allergy and hypersensitivity, inflammation. Complement System (classical, alternative and lectin pathways).

UNIT III

Cytokines: properties and function. MHC (Major Histocompatibility Complex), graft rejection, autoimmune diseases. Vaccines- historical background, routine vaccines, DNA vaccines, Snake-antidotes. Monoclonal antibodies- production and applications. Immunotoxins.

UNIT IV (Practical)

1. Study of permanent slides of endocrine glands
2. Demonstration of Castration/ ovariectomy in laboratory bred rat.
3. Estimation of plasma level of any hormone using ELISA.
4. Demonstration of lymphoid organs
5. Haematin crystal preparation.
6. Estimation of Hb.
7. ABO blood group determination
8. DLC of Man/RBC count/WBC count.
9. Blood antigens and antibodies: Blood group testing
10. Blood: Erythrocyte Sedimentation Rate (ESR), Haematocrit

Learning Resources

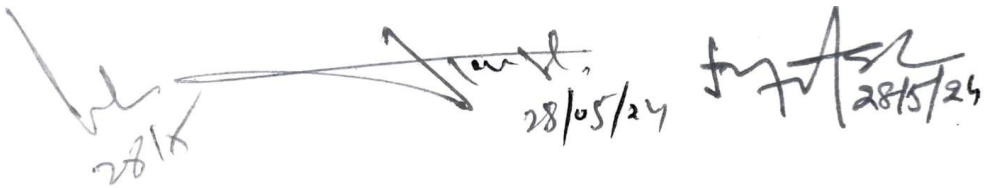
1. Jawetz, M. and Adelberg (2015) Medical Microbiology (27th edition)
2. Chatterjee, K.D (2015) Parasitology (13th edition)
3. Goldsby, R.A.; Kindt, T.J. and Kuby, J. (2006) Immunology (6th edition).
4. Roitt, I.; Brostoff, J. and Male, D. (2012) Immunology (8th edition).
5. Degroot, L.J. and Jameson, J.L. (eds). Endocrinology. W.B. Saunders and Company.

Note for the Paper Setter: The question paper will consist of seven questions in all. The first question will be compulsory and will consist of four short questions of 2 marks each covering the whole syllabus. In addition, six more questions of 14 marks each will be set unit-wise comprising of two questions from each of the three units. The candidates are required to attempt one compulsory question and three more questions selecting at least one question from each unit.

28/05/24 28/5/24

Multidisciplinary Courses (MDC) in Zoology

Semester	Course Code	Course Title	L	T	P	Total	Level
I	CDLU/MDC/1/101	Indian biodiversity and Conservation	2		1	3	100
II	CDLU/MDC/2/102	Food Nutrition and Health	2		1	3	100
III	CDLU/MDC/3/201	Insect Vectors, Diseases and Control	2		1	3	200



CDLU/MDC/1/101: INDIAN BIODIVERSITY AND CONSERVATION

DURATION: 3+3 HOURS **MAXIMUM MARKS: 75**

Theory: 50 (External 35 + Internal 15), Practical: 25 (External 25 + Internal 00)

Course Objective: To make students aware about Indian Biodiversity and conservation strategies being adopted.

Course Learning Outcomes (CLO): After completing the course, the student shall be able to:

CO1: Know about an overview of Indian Biodiversity.

CO2: Understand various strategies of biodiversity conservation.

CO3: Improve their knowledge about Important Protected areas.

CO4: To identify the local biodiversity.

UNIT I

An overview of Indian Biodiversity; Faunal and Floral Indian biodiversity, Definition and concept of Biodiversity; Important Biodiversity area of India, Biodiversity: levels, values and threats and conservation.

Popular Biosphere Reserves and their biodiversity, Popular Tourist spots of Rich Biodiversity, In-situ and Ex-situ conservation of biodiversity.

UNIT II

Protected Areas and their roles in biodiversity conservation, Important National Park and Wildlife sanctuaries, IUCN categories, Threatened categories.

Terrestrial Biodiversity, Aquatic and Coastal biodiversity, Biodiversity hotspots, their characteristic flora and fauna, Biodiversity resources of north-east India.

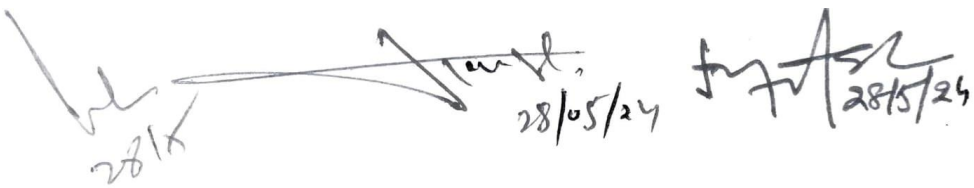
UNIT III (Practical)

1. Study of biodiversity among various organisms (Listing of all the animals found in and around your house and also try to find out their Zoological names).
2. Identification and photography of various species.
3. Visits to a local animal park or zoo to identify and study the captive fauna and preparation of report.
4. Study of adaptive characteristics of various vertebrates in different climate.
5. Study of biodiversity in grassland and pond water by using Shannon -Weiner index.
6. Comparison of two species of birds belonging to same genus (Interspecific difference).

Learning Resources

1. Thammineni Pullaiah and Sandhya Rani (2016) “Biodiversity in India” Volume: Regency Publications
2. Shukla Mahanty and Anjali Srivastava (2016). “Biodiversity and Its Conservation” Disha International Publishing House
3. Ramakrishanan, N “Biodiversity in Indian Scenarios” Daya Publishing House, New Delhi
4. Erach Bharucha (2002) “The Biodiversity of India” Mapin Pub.
5. Asad R. Rahmani and Dhritiman Mukherjee (2016) “Magical Biodiversity of India” Oxford University Press

Note for the Paper Setter: The question paper will consist of five questions in all. The first question will be compulsory and will consist of seven short questions of 1 marks each covering the whole syllabus. In addition, four more questions of 14 marks each will be set unit-wise comprising of two questions from each of the two units. The candidates are required to attempt one compulsory question and two more questions selecting at least one question from each unit.



CDLU/MDC/2/102: FOOD NUTRITION AND HEALTH

DURATION: 3+3 HOURS **MAXIMUM MARKS: 75**

Theory: 50 (External 35 + Internal 15), Practical: 25 (External 25 + Internal 00)

Course Objective: The course covers the basic concepts of balanced diet for people of different ages besides focusing on the consequences of malnutrition and the deficiency diseases and the diseases caused due to poor hygiene.

Course Learning Outcomes (CLO): After completing the course, the student shall be able to:

CO1: Understand the role of food and nutrients in health and disease.

CO2: Provide culturally competent nutrition services for diverse individuals.

CO3: Implement strategies for food access, procurement, preparation, and safety.

CO4: Perform food system management and healthcare for community, and institutional arenas.

UNIT I

Basic concept of food and nutrition. Functions of food Components of food-nutrients (Macro and micronutrients): their biochemical role and dietary sources. Food groups and the concept of a balanced diet. Causes of food spoilage; Food adulteration.

Nutrition through the life cycle- Physiological considerations, nutrient needs and dietary pattern for various groups- adults, pregnant and nursing mothers, infants, preschool and school children, adolescents and elderly.

Nutritional Biochemistry Carbohydrates, Lipids, Proteins - Definition, Classification, Structure and properties Significance of acid value, iodine value and saponification value of lipids; Essential and Non-essential amino acids;

UNIT II

Enzymes- Definition, Classification, Properties; Coenzymes Vitamins- Fat-soluble and Water-soluble vitamins; their Structure and properties Minerals- Iron, calcium, phosphorus, iodine, selenium and zinc: their properties

Introduction to health- Definition and concept of health; Major nutritional deficiency diseases- Protein Energy Malnutrition, Vitamin A deficiency, Iron deficiency anemia, Iodine deficiency disorders, their causes, symptoms, treatment, prevention and government programmes, if any. Life style related diseases- hypertension, diabetes mellitus, and obesity- their causes and prevention through dietary/lifestyle modifications. Social health problems- smoking, alcoholism, drug dependence. Common ailments- cold, cough, fevers, Diarrhea, constipation- their causes and dietary treatment. Food hygiene, Food and Water borne infections

UNIT III (Practical)

1. To detect adulteration in a) Ghee b) Sugars c) Tea leaves and d) Turmeric
2. To determine absorbed oil content in fried foods
3. Estimation of lactose in milk
4. Ascorbic acid estimation in food by titrimetry
5. Estimation of calcium in foods by titrimetry
6. Preparation of temporary mounts of various stored grain pests
7. Identify nutrient rich sources of foods, their seasonal availability and price; study of nutrition labelling on selected foods

Learning Resources

1. Mudambi, SR and Rajagopal, MV. Fundamentals of Foods, Nutrition and Diet Therapy; Fifth Ed; 2007; New Age International Publishers.
2. Srilakshmi B. Nutrition Science; 2002; New Age International (P) Ltd.
3. Srilakshmi B. Food Science; Fourth Ed; 2007; New Age International (P) Ltd.
4. Swaminathan M. Handbook of Foods and Nutrition; Fifth Ed; 1986; BAPPCO.
5. Bamji MS, Rao NP, and Reddy V. Text Book of Human Nutrition; 2009; Oxford & IBH Pub. Co. Pvt Ltd.
6. Wardlaw GM, Hampl JS. Perspectives in Nutrition; Seventh Ed; 2007; McGraw Hill.
7. Lakra P, Singh MD. Textbook of Nutrition and Health; First Ed; 2008; Academic Excellence.
8. Manay MS, Shadaksharaswamy. Food-Facts and Principles; 1998; New Age International (P) Ltd.
9. Jain P et al. Poshan va swasthya ke mool siddhant (Hindi); First Ed; 2007; Acadamic Pratibha.
10. Gibney et al. Public Health Nutrition; 2004; Blackwell Publishing.
11. Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Biochemistry. VI Edition. W.H. Freeman and Co.

Note for the Paper Setter: The question paper will consist of five questions in all. The first question will be compulsory and will consist of seven short questions of 1 marks each covering the whole syllabus. In addition, four more questions of 14 marks each will be set unit-wise comprising of two questions from each of the two units. The candidates are required to attempt one compulsory question and two more questions selecting at least one question from each unit.

28/05/24 28/5/24

CDLU/MDC/3/201: INSECT VECTORS, DISEASES AND CONTROL

DURATION: 3+3 HOURS **MAXIMUM MARKS: 75**

Theory: 50 (External 35 + Internal 15), Practical: 25 (External 25 + Internal 00)

Course objective: The course provides an insight into the common vector-borne diseases, role of vectors in their spread, host- parasite relationship and finally the strategies to manage these vectors.

Course Learning Outcomes (CLO): After completing the course, the student shall be able to:

CO1: Develop awareness about the causative agents and control measures of commonly occurring diseases.

CO2: Develop understanding about the favorable breeding conditions for the vectors.

CO3: Devise strategies to manage the vectors population below threshold levels, public health importance

CO4: Undertake measures or start awareness programmes for maintenance of hygienic conditions

UNIT I

Brief introduction, types and morphological peculiarities of vectors such as mosquitoes, flies, fleas, lice, bugs, ticks and mites. Host-vector relationship. Primary and secondary vector concept. Vector bionomics-larval habitats and host biting preferences, human and animal biting indices. Evolution of vector bionomics and its effect on disease transmission. Vector incrimination. Human practices and the occurrence of pests

Salient features of the vectors belonging to Diptera, Siphonaptera, Siphunculata, Hemiptera, Arachnida, Blattaria, Acarina (families Ixodidae and Argasidae) etc. Role of blood sucking flies in transmission of plague and typhus; of lice (body, head, pubic) in transmission of typhus, relapsing and trench fevers, Vagabond's disease and Phthiriasis; of bugs in transmission of Chaga's disease. Brief account of mites and the associated diseases.

UNIT II

Control of vector flies by screening, fly traps, electrocution, poison baits and outdoor residual sprays; biological control by natural parasites and predators. Chemical control. Efficacy of synthetic pyrethroids, residual spray of insecticides, treated bed nets/curtains and fumigations. Biological control of mosquitoes by the use of viruses, bacteria, fungi, parasites, nematodes and larvivorous fishes. Sterile insect technique, Eradication, Other genetic approaches, Pheromones/allelochemicals, Attract-and kill, Mating disruptors, alarm pheromones and oviposition disruptors

The integrated control/ IPM approach, Damage thresholds estimation, Forecasting, increasing agroecosystem resistance, Pesticide selection, Eradication versus control, up to what limits IPM should be adopted. Decision support

UNIT III (Practical)

1. Study of mouth parts of different insects.
2. Study of permanent slides of the following insect vectors: *Aedes*, *Culex*, *Anopheles*, *Pediculus humanus corporis*, *Pediculus humanus capitis*, *Phithirus pubis*, *Xenopsylla cheopis*, *Musca domestica*, *Cimex lectularius*, *Phlebotomus argentipes* through permanent slides/ videos.
3. State the diseases transmitted by above insect vectors.
4. Project report submission on any one of the insect vectors and the disease transmitted.
5. Group discussion or Seminar presentation on one or two related topics

Learning Resources

1. Imms, A.D. (1977). A General Text Book of Entomology. Chapman & Hall, UK.
2. Chapman, R.F. (1998). The Insects: Structure and Function.IV Edition, Cambridge University Press, UK.
3. Mathews, G. (2011). Integrated Vector Management: Controlling Vectors of Malaria and other Insect Vector borne Diseass.Wiley-Blackwell.
4. Belding, D.L. (1942). Textbook of Clinical Parasitology. Appleton-Century Co., Inc., New York.
5. Roy, D.N. and Brown, A.W.A. (2004). Entomology. Biotech Books, Delhi

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28/05/24 28/5/24