Minutes of the MGU (Nalgonda), Board of Studies committee meeting, Zoology held on 22.03.2022 at 11AM in the Department of Zoology, OU, Hyd.

Members in the Board of Studies committee, Zoology:

Dr. M. Thirumala	Assistant Professor	Chairperson, BOS in Zoology (UCS, MGU, Nalgonda)
Dr.C. Srinivasulu	Associate Professor	Member (UCS, Osmania University, Hyderabad)
Dr.A.V.Rajashekhar	Associate Professor	Member (UCS, Osmania University, Hyderabad)
Dr.S.Padmaja	Associate Professor	Member (UCS, Osmania University, Hyderabad)
Dr. Nageswara Rao Amanchi	Assistant Professor	Member (UCS, Osmania University, Hyderabad)
Dr.Apka Nageswar Rao	Assistant Professor	Member (Nizam College, Osmania University, Hyderabad)
Dr. K. Y. Chitra	Assistant Professor	Member (UCS,Osmania University, Hyderabad)
Dr. Meenakshi	Assistant Professor	Member (UCS,Osmania University, Hyderabad)
Mr. Srinath Patel	Assistant Professor	Member (NG College, Nalgonda)
Mr. J. Swamy	Assistant Professor	Member (GDC (W), Nalgonda)
Dr. Sanjay Dwivedi	Lead, QC	Member (Sanofi healthcare India Private Limited, Medchal-Malkajgiri)
Dr. P. Pavan Kumar	Scientist	Member (Asian Institute of Gastroenterology, Hyderabad)

Agenda:

Adoption of OU B.Sc. Zoology syllabus w.e.f. 2019-20 to MGU (with effect from the A.Y. 2019-20 admitted batch onwards) in the BOS committee meeting conducted on 22.03.2022 at 11 AM Zoology Department, Osmania University, Hyderabad.

The following resolutions were made:

1. With small modifications in OU B.Sc. Zoology schema, i.e. AECC titles (as per TSCHE Proposed CBCS Structure from 2019-20 for Under Graduate Courses) mentioned and approved for MGU, Nalgonda.
2. SEC and GE papers are different in MGU B.Sc. Zoology syllabus from OU B.Sc. Zoology syllabus (supportive documents attached)

The chairperson, BOS thanked all the members for approving the B.Sc. Zoology syllabus w.e.f. 2019-20 A.Y. admitted batch onwards.

1. 2. 3. — 4. 5. 6. —

7. 8. 9. 10. 11. — 12.

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(J. Swamy)

N.G. Govt. College,
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B.Sc. Zoology Syllabus

For Affiliated Colleges

With effect from 2019 - 2020

Mahatma Gandhi University
Nalgonda- 508254
Telangana, India.

B.Sc. ZOOLOGY SYLLABUS UNDER CBCS w.e.f. A.Y. 2019-20 onwards

I. Discipline core course: (4+1=5 credits each) (I, II, III, IV Semester)

Animal Diversity - Invertebrates
Animal Diversity - Vertebrates
Animal Physiology and Animal Behaviour
Cell Biology, Genetics, and Developmental Biology

II. Discipline specific elective: (4+1=5 credits each)(any one paper in V Semester and VI Semester)

Physiological Chemistry and Endocrinology
Immunology and Animal Biotechnology
Laboratory Animals Maintenance and Applications/
Fisheries and Limnology
Ecology, Zoogeography and Evolution

III. Skill enhancement course: (2 credits) 2 papers in III Semester and 2 papers in IV Semester).

SEC-1

Communication skills Or Professional skills (2)

SEC-2

Biofertilisers & Organic farming
Apiculture
Remedial methods for pollution, drinking water & soil fertility standards (2)

SEC-3

Leadership & Management skills
Universal Human Values (2)

SEC-4

Mushroom Culture Technology
Vermiculture
Chemistry of cosmetics & food processing (2)

IV. Generic elective (Open stream) - (4 credits only in V Semester)

Basics of Biotechnology
Fundamentals of food & Nutrition
Basic Mathematics
Information Technologies
Indian constitution & Administration
Politics of Development
Telangana Economy (4)

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24/3/2022

V. Project/optional paper (4 credits only in VI Semester) In case of not opting the project

*Tools and Techniques in Biology (optional paper).

COURSES		PAPERS	TOTAL CREDITS	CREDITS FOR EACH PAPER / SEMESTER					
				B.Sc.					
				SEMESTER I	SEMESTER II	SEMESTER III	SEMESTER IV	SEMESTER V	SEMESTER VI
Core Courses DSC	Optional-1	4	20	Animal Diversity Invertebrates (4+1=5)	Animal Diversity Vertebrates (4+1=5)	Animal physiology & Animal behaviour (4+1=5)	Cell Biology, Genetics & Developmental Biology (4+1=5)	-	-
Elective Courses DSE	Optional-1	2	10	-	-	-	-	Physiological chemistry & Endocrinology/ Laboratory animal maintenance & Applications/ Immunology & Animal Biotechnology (4+1=5)	Fisheries & Limnology/ Ecology, Zoogeography & Evolution (4+1=5)
Language	English(First Language)	6	20	English (4)	English (4)	English (3)	English (3)	English (3)	English (3)
	Second Language	6	20	S.L (4)	S.L (4)	S.L (3)	S.L (3)	S.L (3)	S.L (3)
Ability Enhancement Compulsory Course AECC	Environmental Science / Basic Computer Skills	1	2	Environmental Science / Basic Computer Skills (2)	-	-	-	-	-
	Basic Computer Skills / Environmental Science	1	2	-	Basic Computer Skills / Environmental Science (2)	-	-	-	-
Skill Enhancement Course SEC	SEC1	1	2	-	-	Communication skills OR Professional skills (2)	-	-	-
	SEC2	1	2	-	-	Biofertilisers & Organic farming/ Apiculture/ Remedial methods for pollution, drinking water & soil fertility (2)	-	-	-
	SEC3	1	2	-	-	-	Leadership & Management skills OR Universal Human Values (2)	-	-
	SEC4	1	2	-	-	-	Mushroom Culture Technology/ Vermiculture/ Chemistry of cosmetics & food processing (2)	-	-
Generic Elective GE	Open Stream	1	4	-	-	-	-	Basics of Biotechnology/ Fundamentals of food & Nutrition/ Basic Mathematics/ Information Technologies/ Indian constitution & Administration/Politics of Development/ Telangana Economy (4)	-
Project Work / Optionals		1	4	-	-	-	-	-	Project/Tools & Techniques in Biology (4)
Optional-1 ZOOLOGY (30) & Others (60)				90					
Optional-2				30					
Optional-3				30					
Total Credits in UG				150					
Credits under Non-CGPA	NSS /NCC /sports / Extra curricular		6	Up to 6 (2 in each year)					
	Summer Internship		4	Up to 4 (2 in each, after I & II years)					

22/3/2022

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B.Sc. ZOOLOGY SYLLABUS UNDER CBCS w.e.f A.Y 2019-20 onwards

SEMESTER-I

CORE PAPER - I

ANIMAL DIVERSITY – INVERTEBRATES

Instructions: 4 hrs per week No. of periods: 60 No. of credits: 4

UNIT-1: (15 Periods)

1.1 Protozoa.

1.1.1 General characters and classification of Protozoa up to order levels with examples

1.1.2 Type study - Elphidium

1.1.3 Locomotion and Reproduction in Protozoa.

1.1.4 Epidemiology of Protozoan diseases - Amoebiasis; Giardiasis; Leishmaniasis and Malaria.

1.2 Porifera

1.2.1. General characters and classification of Porifera upto order levels with examples

1.2.2 Type study - Sycon

1.2.3 Canal system in sponges and Spicules.

UNIT - II: (15 Periods)

2.1. Cnidaria

2.1.1 General characters and classification of Cnidaria up to order levels with examples

2.1.2 Type study - Obelia

2.1.3 Polymorphism in Siphonophora

2.1.4 Corals and coral reef formation

2.2 Platyhelminthes

2.2.1 General characters

2.2.2 Classification of Platyhelminthes up toclasseswithexamples

2.2.3 Type study- Schistosoma

2.3 Nemathelminthes

2.3.1 General characters

2.3.2 Classification of Nemathelminthes up to classes with examples

2.3.3 Type study - Dracunculus

2.3.4 Parasitic Adaptations in Helminthes

UNIT - III: (15 Periods)

3.1 Annelida

3.1.1 General characters

3.1.2 Classification of Annelida up to classes with examples

3.1.3 Type study - Hirudinaria granulosa.

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3.1.4 Evolutionary significance of Coelome and Coelomoducts and metamerism

3.2 Arthropoda

3.2.1 General characters

3.2.2 Classification of Arthropoda up to classes with examples

3.2.3 Type study - Prawn

3.2.4 Crustacean larvae

3.2.5 Insect metamorphosis

3.2.6 Peripatus - Structure and affinities

UNIT - IV: (15 Periods)

4.1 Mollusca

4.1.1 General characters

4.1.2 Classification of Mollusca up to classes with examples

4.1.3Typestudy-Pila

4.1.4 Pearl formation

4.1.5 Torsion and detorsion in gastropods

4.2 Echinodermata

4.2.1 General characters

4.2.2 Classification of Echinodermata up to classes with examples

4.2.3Water vascular system in star fish

4.2.4 Echinoderm larvae and their significance

Suggested Readings:

1. L.H. Hyman 'The Invertebrates' Vol I, II and V. - M.C. Graw Hill Company Ltd.

2.Kotpal, R.L. 1988 - 1992 Protozoa, Porifera, Coelenterata, Helminthes,

3.Arthropoda, Mollusca, Echinodermata. Rastogi Publications, Meerut.

4. E.L. Jordan and P.S. Verma 'Invertebrate Zoology' S. Chand and Company.

5. R.D. Barnes 'Invertebrate Zoology' by: W.B. Saunders CO., 1986.

Barrington. E.J.W ., 'Invertebrate structure and Function' by ELBS.

6 P.S. Dhami and J.K. Dhami. Invertebrate Zoology. S. Chand and Co. New Delhi.

7. Parker, T.J. and Haswell 'A text book of Zoology' by, W.A., Mac Millan Co. London.

8. Barnes, R.D. (1982). Invertebrate Zoology, V Edition"

B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20
B.Sc. ZOOLOGY YEAR
ZOOLOGY PRACTICAL SYLLABUS FOR SEMESTER
CORE PAPER - I
ANIMAL DIVERSITY - INVERTEBRATES

Instructions: 3hrs per week **No. of credits: 1**

1. Study of museum slides / specimens / models (Classification of animals up to orders)

i. Protozoa: Amoeba, Paramoecium, Paramoecium Binary fission and Conjugation, Vorticella, Entamoeba histolytica, Plasmodium vivax ii.

ii.Porifera: Sycon, Spongilla, Euspongia, Sycon - T.S & L.S, Spicules, Gemmule

iii. Coelenterata: Obelia - Colony & Medusa, Aurelia, Physalia, Velella, Corallium, Gorgonia, Pennatula

iv. Platyhelminthes: Planaria, Fasciola hepatica, Fasciola larval forms - Miracidium, Redia,
Cercaria, Echinococcus granulosus, Taenia solium, Schistosoma haematobium

v. Nemathelminthes:Ascaris(Male&Female), Drancunculus, Ancylostoma,Wuchereria

vi. Annelida: Nereis, Aphrodite, Chaetopteurs, Hirudinaria, Trochophore larva

vii. Arthropoda: Cancer, Palaemon, Scorpion, Scolopendra, Sacculina, Limulus, Peripatus, Larvae
- Nauplius, Mysis, Zoea, Mouth parts of male & female Anopheles and Culex, Mouthparts of Housefly and Butterfly.

viii. Mollusca: Chiton, Pila, Unio, Pteredo, Murex, Sepia, Loligo, Octopus, Nautilus, Glochidium larva

ix. Echinodermata: Asterias, Ophiothrix, Echinus, Clypeaster, Cucumaria,Antedon,Bipinnaria larva

Dissections:

Prawn: Appendages, Digestive system, Nervous system, Mounting of Statocyst, Insect Mouth Parts

Laboratory Record work shall be submitted at the time of practical examination

An "Animal album" containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose.

Computer aided techniques should be adopted - show virtual dissections

Suggested manuals:

Practical Zoology- Invertebrates S.S. Lal
Practical Zoology - Invertebrates P.S. Verma
Practical Zoology - Invertebrates K.P. Kurl

B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20

B.Sc. ZOOLOGY YEAR

SEMESTER-II CORE PAPER - II ANIMAL DIVERSITY- VERTEBRATES

Instructions: 4 hrs per week No. of periods: 60 No. of credits: 4

UNIT -1: (15 Periods)

1.1 Hemichordata

1.1.1 General characters

1.1.2 Classification of Hemichordata up to classes with examples

1.1.3 Balanoglossus - Structure and affinities

1.2. Urochordata, Cephalochordata and Cyclostomata

1.2.1. Salient features of Urochordata

1.2.2. Retrogressive metamorphosis and its significance in Urochordata

1.2.3. Salient features and affinities of Cephalochordata

1.2.4. General characters of Cyclostomata

1.2.5. Comparison of the Petromyzon and Myxine

1.2.6. General characters and classification of Chordata up to orders with examples.

UNIT - II: (15 Periods)

2.1. Pisces

2.1.1. General characters of Fishes

2.1.2. Classification of fishes up to order level with examples

2.1.3. Scoliodon - Respiratory, Circulatory and Nervous system.

2.1.4. Types of Scales and types of Fins

2.2. Amphibia

2.2.1. General characters ofAmphibians

2.2.2. Classification of Amphibians up to orders with examples.

2.2.3. Hoplobatrachus tigerinus (Rana tigrina)- Respiratory, Circulatory and Nervous system.

2.2.4. Parental care in amphibian; neoteny and paedogenesis.

UNIT -III:(15 Periods)

3.1 Reptilia

3.1.1. General characters of Reptilia

3.1.2. Classification of Reptilia up to orders with examples

3.1.3. Calotes - Respiratory system, Circulatory and Nervous system.

3.1.4. Temporal fosse in reptiles and its evolutionary importance

3.1.5. Distinguished characters of Venomous and Non venomous snakes.

3.2. Aves

3.1.1. General characters of Aves
3.1.2. Classification of Aves up to orders with examples.
3.1.3. Columba livia -, Digestive system, Circulatorysystems,RespiratorysystemandNervous system.
3.1.4. Migration in Birds
3.1.5. Flight adaptation in Birds.

UNIT - IV: (15 Periods)

4.1. Mammalia

4.1.1. General characters of Mammalia
4.1.2. Classification of Mammalia up to orders with examples
4.1.3. Rabbit -Digestive, Respiratory, Circulatory and Nervous system.
4.1.4. Dentition in mammals.
4.1.5. Aquatic adaptations in Mammals.

Suggested Readings:

1. E.L.Jordan and P.S. Verma 'Chordate Zoology' -. S. Chand Publications.
2. Mohan P.Arora. 'Chordata - I, Himalaya Publishing House Pvt.Ltd.
3. Marshal, Parker and Haswell 'Text book of Vertebrates'. ELBS and McMillan, England.
4. Alfred Sherwood Romer. Thomas S. Pearson 'The Vertebrate Body, Sixth edition, CBS college Publishing, Saunders College Publishing
5. GeorgeC.Kent,RobertK.Carr.Comparative Anatomy of the Vertebrates,9th ed. McGraw Hill.
6. Kenneth Kardong Vertebrates: Comparative Anatomy, Function and Evolution, 4th ed, 'McGraw Hill.
7. J.W. Young, The Life of Vertebrates, 3rd ed, Oxford University press.
8. Harvey Pough F, Christine M. Janis, B. Heiser, Vertebrate Life, Pearson, 6th ed, Pearson Education Inc.2002.

Nalgonda.

22/3/2022

B.Sc. ZOOLOGY SYLLABUS UNDER CBCS w.e.f. A.Y.2019-20
ZOOLOGY PRACTICAL SYLLABUS FOR I YEAR
II SEMESTER
CORE PAPER - II
ANIMAL DIVERSITY- VERTEBRATES

Instructions: 3hrs per week No. of credits: 1

Study of museum slides / specimens / models (Classification of animals up to orders)

Hemichordata: Balanoglossus, Tornaria larva

Protochordata: Amphioxus, Amphioxus T.S. through pharynx

Cyclostomata: Petromyzon, Myxine, and Ammocoetus larva

Pisces: Sphyrna Pristis, Torpedo, Channa, Pleuronectes, Hippocampus, Exocoetus, and Echieneis,
Labeo, Catla, Clarius, Auguilla, Protopterus, Scales: Placoid, Cycloid, ans Ctenoid

Amphibia: Ichthyophis, Amblystoma, Siren, Hyla, Rachophous, Bufo, Rana, Axolotal larva

Reptilia: Draco, Chemaeleon, Gecko, Uromastix, Vipera russelli, Naja, Bungarus, Enhydrina, Typhlops, Testudo, Trionyx, Crocodilus, Ptyas.

Aves: Archaeopteryx, Passer, Psittacula, Bubo, Alcedo, Columba, Corvus, Pavo; Collection and study of different types of feathers: Quill, Contour, filoplume, Down

Mammalia: Ornithorhynchus, Tachyglossus, Pteropus, Funambulus, Manis, Loris, Hedgehog

Histology: T.S. of Liver, Pancreas, Kidney, Stomach, Intestine, Lungs Artery, Vein, Bone T.S., Spinal cord.

Osteology:

Rabbit- Axial skeleton system (bones of Skull and Vertebral Column)

Varanus, Pigeon and Rabbit - Appendicular skeleton system (bones of limbs and girdles)

Dissections of Labeo/Tilapia:

1. Digestive system.

2. Brain, Weberian ossicles
3. V, VII, IX, X cranial nerves

Laboratory Record work shall be submitted at the time of practical examination

An "Animal album" containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose.

Computer aided virtual dissections.

Suggested manuals

1. S.S.Lal, Practical Zoology - Vertebrata
2. P.S.Verma, A manual of Practical Zoology - Chordata
3. Freeman& Bracegirdle, An atlas of embryology

AECC

Paper AECC-I (b): ENVIRONMENTAL SCIENCE

Hours per Week: 2 Credits: 2 Exam Hours: 1 ½ Hrs Marks: 40

Objective: to understand the importance of Environment, biodiversity, Environmental pollution.

UNIT - I: ECOSYSTEM, BIODIVERSITY & NATURAL RESOURCES:

1. Definition, Scope & Importance of Environmental Studies.

2. Structure of Ecosystem - Abiotic & Biotic components Producers, Consumers,

Decomposers, Food chains, Food webs, Ecological pyramids)

3. Function of an Ecosystem: Energy flow in the Ecosystem (Single channel energy flow model)

4.Definition of Biodiversity, Genetic, Species & Ecosystem diversity, Hot-spots of Biodiversity, Threats to Biodiversity, Conservation of Biodiversity (In situ &Ex situ)

5. Renewable& Non - renewable resources, Brief account of Forest, Mineral & Energy (Solar Energy & Geothermal Energy) resources

6. Water Conservation, Rain water harvesting & Watershed management.

UNIT - II: ENVIRONMENTAL POLLUTION, GLOBAL ISSUES&LEGISLATION: (15hrs.)

1. Causes, Effects & Control measures of Air Pollution, Water Pollution

2. Solid Waste Management

3. Global Warming & Ozone layer depletion.

4. Ill - effects of Fire- works

5. Disaster management - floods, earthquakes & cyclones

6. Environmental legislation:-

(a) Wild life Protection Act (b) Forest Act (c) Water Act (d) Air Act

7. Human Rights

8. Women and Child welfare

9. Role of Information technology in environment and human health

FIELD STUDY: (5 hrs.)

Pond Ecosystem

Forest Ecosystem

SUGGESTED BOOKS:

1. Environmental Studies - from crisis to cure - by R. Rajagopalan (Third edition) Oxford University Press.

2. Text book of Environmental Studies for undergraduate courses (second edition) by Erach Bharucha

3. A text book of Environmental Studies by Dr.D.K.Asthana and Dr. Meera Asthana

4. Environmental Studies (2019), R Venkateswara Rao, HPH.

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Hyderabad-500

Paper AECC-I (a): BASIC COMPUTER SKILLS

Hours per Week: 2 Credits: 2 Exam Hours: 1 1/2 Marks: 40

Objective: to impart a basic level understanding of working of a computer and its usage.

UNIT I: UNDERSTANDING OF COMPUTER AND WORD PROCESSING:

Knowing computer: What is Computer, Basic Applications of Computer; Components of Computer System, Central Processing Unit (CPU), VDU, Keyboard and Mouse, Other input/output Devices, Computer Memory, Concepts of Hardware and Software; Concept of Computing, Data and Information; Applications of IECT; Connecting keyboard, mouse, monitor and printer to CPU and checking power supply.

Operating Computer using GUI Based Operating System: What is an Operating System; Basics of Popular Operating Systems; The User Interface, Using Mouse; Using right Button of the Mouse and Moving Icons on the screen, Use of Common Icons, Status Bar, Using Menu and Menu-selection, Running an Application, Viewing of File, Folders and Directories, Creating and Renaming of files and folders, Opening and closing of different Windows; Using help; Creating Short cuts, Basics of O.S Setup; Common utilities.

Understanding Word Processing: Word Processing Basics; Opening and Closing of documents; Text creation and Manipulation; Formatting of text; Table handling; Spell check, language setting and thesaurus; Printing of word document.

UNIT II: SPREAD SHEET, PRESENTATION SOFTWARE & INTRODUCTIONTO INTERNET, WWW AND WEB BROWSERS:

Using Spread Sheet: Basics of Spreadsheet; Manipulation of cells; Formulas and Functions; Editing of Spread Sheet, printing of Spread Sheet.

Basics of presentation software: Creating Presentation; Preparation and Presentation of Slides; Slide Show; Taking printouts of presentation / handouts.

Introduction to Internet, WWW and Web Browsers:

Introduction to Internet: Basic of Computer networks; LAN, WAN; Concept of Internet; Applications of Internet; connecting to internet; What is ISP; Knowing the Internet; Basics of internet connectivity related troubleshooting.

World Wide Web: Search Engines; Understanding URL; Domain name; IP Address; using e-governance website.

Web Browsing: Software, Communications and collaboration: Basics of electronic mail; Getting an email account; Sending and receiving emails;

Accessing sent emails; Using Emails; Document collaboration; Instant Messaging; Netiquettes.

SUGGESTED READINGS

Introduction to Computers, Peter Norton, Mc GrawHill , 2012.
Using Information Technology, Brian K Williams, StaceyC.Sawyer, Tata Mc GrawHill.

Web Resources:

1. **https://online.stanford.edu/courses/soe-ycscs101-sp-computer-science-101**
2. **https://www.extension.harvard.edu/open-learning-initiative/intensive-introduction- computer-science.**

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B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20
II YEAR, SEMESTER-III
CORE PAPER - III
ANIMAL PHYSIOLOGY AND ANIMAL BEHAVIOUR

Instructions: 4 hrs per week No. of periods: 60 No. of credits: 4

UNIT - 1: (15 periods)

1.1 Digestion

1.1.1 Enzymes: Definition, classification, inhibition, regulation.
1.1.2 Digestion of carbohydrates, proteins, lipids and cellulose
1.1.3 Absorption, assimilation of digested food
1.1.4 Role of gastrointestinal hormones in digestion

1.2Excretion

1.2.1 Classification of animals on the basis of excretory products: Ammonotelic, Uricotelic and Ureotelic
1.2.2 Structure and function of nephron
1.2.3 Urine formation counter current mechanism

1.3 Osmoregulation

1.3.1 Water and ionic regulation by fresh water
1.3.2 Brackish water and marine water animals

UNIT - II: (15 periods)

2.1 Homeostasis

2.1.1 Concept of homeostasis
2.1.2 Mechanism of homeostasis

2.2 Respiration

2.2.1 Definition of respiration, respiratory mechanism, external, internal and cellular Respiration
2.2.2 Respiratory pigments, transport of oxygen, oxygen dissociation curves, Bohr's effect, transport of carbon dioxide, chloride shift
2.2.3 Regulation of respiration: nervous and chemical mechanism

2.3 Circulation

2.3.1 Types of circulation: open and closed: Structure of mammalian heart
2.3.2 Types of hearts: neurogenic and myogenic
2.3.3 Heart functions, conduction and regulation of heartbeat, regulation of heart rate
2.3.4 Tachycardia, bradycardia: blood clotting mechanism

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UNIT - III: (15 periods)

3.1Muscle contraction

3.1.1 Types of muscles

3.1.2 Ultrastructure of skeletal muscle fibre

3.1.3 Sliding filament theory of muscle contraction mechanism and energetics

3.1.4 Twitch tetanus summation, Treppe fatigue

3.2 Nerves

3.2.1 Structure of neuron

3.2.2 Resting potential, threshold potential, action potential, conduction of nerve impulse

3.2.3 Transmission of nerve impulse

3.2.4 Synapse, synaptic transmission neurotransmitters EPSP, IPSP

3.3 Endocrine systems

3.3.1 Endocrine glands- Structure, secretion, function of Pituitary, Thyroid, Parathyroid, Adrenal glands and pancreas.

3.3.2 Hormone action and concept of secondary messengers

3.3.3 Male and female hormones, hormonal control of menstrual cycle in human beings

UNIT - IV: (15 periods)

4.1Animal behaviour

4.1.1 Types of behaviour and acquired instinctive behaviour

4.1.2 Behaviour taxes, reflexes tropisms

4.2 Learning and memory

4.2.1 Types of learning, trial and error learning imprinting, habituation,

4.2.2 Conditioning: classical conditioning, instrumental conditioning, examples of conditioning, Pavlov's experiment

4.3 Social behaviour and communication:

4.3.1 Colonial existence of bees and termites, pheromones

4.4 Biological rhythms

4.4.1 Biological clocks, circadian rhythms, circumlunar rhythms, circannual rhythms

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Suggested readings

1. Gerard J. Tortora and Sandra Reynolds Garbowski Principles of Anatomy and Physiology, Tenth Ed ., John Wiley & Sons
2. Arthur C. Guyton MD, A Text Book of Medical Physiology, Eleventh ed ., JohnE. Hall, Harcourt Asia Ltd.
3. William F. Ganong, A Review of Medical Physiology, 22 ed, McGraw Hill, 2005
4. Sherwood, Klandrof, Yanc, Animal Physiology, Thompson Brooks/Coole, 2005.
5. Sherwood, Klandrof, Yanc, Human Physiology, Thompson Brooks/Coole, 2005.
6. Knut Scmidt-Nielson, Animal Physiology, 5th ed, Cambridge Low Price Edition.
7. Roger Eckert and Randal, Animal Physiology, 4th ed, Freeman Co, New York.
8. Singh. H.R, Text Book of Animal Physiology and Biochemistry
9. Nagabhushanam, Comparative Animal Physiology Veer Bal Rastogi, Text Book of Animal Physiology.

Asst. Professor of Zoology
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B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20
PRACTICAL SYLLABUS
SEMESTER-III
CORE PAPER -III: ANIMAL PHYSIOLOGY AND ANIMAL BEHAVIOUR

Instructions: 3hrs per week **No. of credits: 1**

1. Qualitative test of identification of carbohydrates, proteins and lipids.
2. Qualitative test of identification of ammonia, urea, uric acid (nitrogenous excretory products).
3. Zonation of gut in cockroaches.
4. Effect of pH and temperature on salivary amylase activity.
5. Study of permanent histological sections of mammalian endocrine glands: pituitary, thyroid, pancreas, adrenal glands.
6. Estimation of haemoglobin by Sahil's method.
7. Estimation of blood clotting time.
8. Estimation of total protein by Biuret's method.
9. Estimation of unit metabolism of fish.
10. Laboratory record work shall be submitted at the time of practical examinations. Computer - aided techniques shall be adopted as per UGC guidelines.

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B.Sc. II Year: Semester-III
Skill Enhancement Course
SEC-2 (Credits - 2)
Biofertilizers and Organic Farming (30 Hrs)

UNIT - I:- (15h)

1. Manures and Bio fertilizers Types of fertilizers, manures. Manure composition.
2. Manures for crop productivity.
3. Differences between fertilizers and bio fertilizers: pH changes and water contamination
4. Bacterial Bio fertilizers: General account on the microbes used as bio fertilizer
5. Algal Bio fertilizers: Associative effect of different microorganisms. Azolla and Anabaena-Azolla association, nitrogen fixation, factors affecting growth, Azolla in rice cultivation

UNIT - II: (15h)

Fungal Bio fertilizers: Mycorrhizal association, types of mycorrhizal association, occurrence and distribution, phosphorus nutrition, growth and yield. Colonization of VAM - isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.

Organic Farming: Green manuring and organic fertilizers, recycling of bio-degradable municipal, agricultural and industrial wastes, Bio compost making- types, method of vermin composting, Pancha kavya. Biological pest control (ncem)

Suggested Readings

I. Dubey R.C. 2005. A Text book of Biotechnology. S.Chand & Co. New Delhi.
Kumaresan V. 2005.
2. Biotechnology. Saras Publications. New Delhi,
3. John Jothi Prakash E. 2004. Outlines of Plant Biotechnology. Emkay Publication. New Delhi
4. Sathe T.V. 2004. Vermiculture and Organic Farming. Daya Publishers, New Delhi.
5 Subha Rao N.S. 2000. Soil Microbiology, Oxford & IBH Publishers. New Delhi,
6. Vayas S.C. Vayas S. and Modi H.A. 1998.Bio-fertilizers and organic 1 arming Akta Prakashan. Nadiad.

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22/3/2022

B.Sc. II Year
Semester III
Skill Enhancement Course- II (SEC -II) (2 Credits)
REMEDIAL METHODS FOR POLLUTION, DRINKING WATER AND SOIL FERTILITY STANDARDS

UNIT I: Remedial Methods for Pollution Prevention and control of air pollution 15 h (1 hr/week)

Ozone hole-causes and harm due to ozone depletion. The effect of CFC's in Ozone depletion and their replacements. Global Warming and Greenhouse Effect Precautions to control global warming. Deleterious effect of pollutants - Endangered Monuments- acid rain. Precautions to protectmonuments.Sourcesof Radiation pollution – Chernobyl accident and its Consequences. Radiation effect by the usage of cell phones and protection tips. Deleterious effects of cell phone towers and health hazards.

Sources of water pollution-(i). Pollution due to pesticides and inorganic chemicals, (ii). Thermal pollution (iii). Ground water pollution (IV). Eutrophication.

Methods for control of water pollution and water recycling. Dumping of plastics in rivers & oceans and their effect on aquatic life. Determination of (i) Dissolved Oxygen and (ii) Chemical Oxygen Demand in polluted water - Illustration through charts (or) demonstration of experiments. Sources of soil pollution (i). Plastic bags, (ii). Industrial and (iii). Agricultural sources. Control of soil pollution. Environmental laws in India. Environmental benefits of planting trees.

UNIT II: Drinking Water and Soil Fertility Standards and Analysis 15 h (1 hr/week)

Water Quality and Common Treatments for Private Drinking Water Systems: Drinking Water Standards-Primary Drinking Water Standards: Inorganics, Organics and Volatile Organic Chemicals. Secondary Drinking Water Standards-Inorganics and Physical Problems. Water Testing, Mineral Analysis, Microbiological Tests, Pesticide and Other Organic Chemical Tests. Principle involved in Water Treatment Techniques. (i) Reverse osmosis (ii) Disinfection methods such as chlorination, ultraviolet light, ozonation etc (iii) Chemicaloxidationand(iv) Ion exchange (water softeners).Visit to nearby drinking water plants and interaction at sites.

Introduction to Soil Chemistry- Basic Concepts. Effect of pH on nutrient availability. Macronutrients and their effect on plants -Carbon, Hydrogen,Oxygen,Nitrogen and Phosphorus other macronutrients-Calcium, Magnesium and Sulphur. Micronutrients and their effect on plants. Boron (B4 07 2-), Copper (Cu2+), Iron (Fe2+, Fe3+) Manganese(Mn2+) Molybdenum(MoO4 2-) Zinc (Zu2+) Cobalt (Co2+) Chlorine (Cl-) and Others. Determination of soil nitrogen by Kjeldahl method- Illustration through charts (Or) demonstration of experiment. Visit to nearby agricultural forms and interaction with farmers. Discussion with farmers on the use of Soil Analysis Kits.

References

1. A Text book for 'Remedial methods for pollution, drinking water and soil fertility standards', First Edition, Authors: Dr Mudvath Ravi, GopuSrinivas, PuttaVenkatReddy, Vuradi Ravi Kumar, Battini Ushaiah, ISBN No. 978-93-5311-183-0.
2. Remedial methods for pollution, drinking water and soil fertility standards, Author: Dr G. Vanjatha.
3. Remedial methods for pollution, drinking water and soil fertility standards, Telugu version, Authors: Dr N. Yogi Babu, Dr. G. Vanajatha, M. Srilatha.
4. Environmental Pollution, download.nos.org/333courseE/10.pdf
5. CFC Replacements, butane.chem.uiuc.edu/pshapley/Environmental/L21/3.html
6. Effects of Acid Rain on Buildings www.air-quality.org.uk/12.php
7. Acid Rain Effects -Buildings - Chemistry chemistry.elmhurst.edu/vchembook/196buildings.html
8. How to protect national heritage - ways to protectmonuments www.youthkiawaaz.com/2011/03/how-to-protect-national-heritage/.
9. Chernobyl nuclear power plant accident - NRC www.nrc.gov/reading-rm/doccollections/fact-sheets/chernobyl-bg.pdf
10. Side-effects of harmful radiation from mobile phones and towers pib.nic.in/newsite/printrelease.aspx?relid=116304
11. Cell Phone Radiation Protection- HighlyEffectiveTipshttps: www.electricsense.com/775/how-to-protect-yourself-from-cell-phone-radiation/
12. Chemical Waste That Impact on Aquatic Life or Water Quality blog.idrenvironmental.com/chemical-waste-that-impact-on-aquatic-life-or-waterquality
13. Trees and Your Environment - Clean Air gardeningwww.cleanairgardening.com/plantingtrees
14. Water quality and common treatments for private drinking water . extension.uga.edu/publications/detail.html?number=b939
15. Soil chemistry https://casfs.ucsc.edu/about/publications/Teaching-OrganicFarming/PDFdownloads/2.2-soil-chemistry.pdf
16. SoilAnalysis-Determination of Available Nitrogen ... - Amrita Virtual Lab vlab.amrita.edu/?sub=2&brch=294&sim=1551&cnt=1
17. Determination of dissolved oxygen (DO) www.cutm.ac.in/pdf/env%20engg%20lab%20manual.pdf
18. Determination of chemical oxygen demand of wastewater www.pharmaguideline.com> quality control > test

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22/3/2022

B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20

B.Sc. ZOOLOGY II YEAR
SEMESTER- III
PAPER-III [SEC] APICULTURE

Instructions: 2hr per week
No. of period: 30
No. of credits: 2

UNIT-I: (15 Periods)

1.1 History, classification and present status of apiculture industry in India
1.2 Biology of honey bees and bee economy
1.3 Social organization of bee colony
1.4 Selection of bee species for apiculture
1.5 Bee rearing method: artificial Bee rearing (Apiary), Bee hives

UNIT-II: (15 Periods)

2.1 Products of apiculture industry and its use – honey; Bees wax; propalic
2.2 Methods of extraction of honey – indigenous and modern
2.3 Bee keeping equipment
2.4 Colony inspection and maintenance of the equipment
2.5 Bee diseases and enemies; control and preventive method

Suggested Reading:

1. Textbook of Applied Zoology, Telugu Academy.
2. Apiculture by Prost P.J. Oxford aro IBH, New Delhi
3. Apiculture by Bisht, ICAR publication

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B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20

B.Sc. ZOOLOGY II YEAR
SEMESTER - IV
CORE PAPER – IV:
CELL BIOLOGY, GENETICS & DEVELOPMENTAL BIOLOGY

Instructions: 4hr per week
No. of period: 60
No. of credits: 4

UNIT – I:

1. Cell Biology **(15 Periods)**

1.1. Ultrastructure of animal cell
1.2. Structure and functions of plasma membrane proteins.
1.3. Structure and functions of cell organelles –Endoplasmic reticulum, Golgi body, Ribosomes, Lysosomes, centrosomes, Mitochondria and Nucleus
1.4. Chromosomes – Structure, types, giant chromosomes
1.5. Cell Division - Mitosis, Meiosis; Cell cycle and its regulation.

UNIT – II:

2. Molecular Biology **(15 Periods)**

2.1 DNA (Deoxyribo Nucleic Acid) – Structure and RNA (Ribo Nucleic Acid) - Structure, types
2.2 DNA Replication
2.3 Protein Synthesis – Transcription and Translation
2.4 Gene Expression – Genetic Code; operon concept
2.5 Molecular Biology Techniques- Polymerase Chain Reaction, Electrophoresis

UNIT – III:

3. Genetics **(15 Periods)**

3.1 Mendals laws of Inheritance and Non-Medelian Inheritance
3.2 Linkage and Crossing over
3.3 Sex determination and sex-linked inheritance
3.4 Chromosomal Mutations- Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy; Gene mutations- Induced versus Spontaneous mutations.
3.5 Inborn errors of metabolism.

UNIT – IV:

4. Developmental Biology and Embryology **(15 Periods)**

4.1 Gametogenesis (Spermatogenesis and Oogenesis) Fertilization; Types of eggs; Types of cleavages
4.2 Development of Frog up to formation of primary germ layers
4.3 Formation of Foetal membrane in chick embryo and their functions
4.4 Types and functions of Placenta in mammals
4.5 Regeneration in Turbellaria and Lizards

Suggested readings:

1. **Lodish, Berk, Zipursky, Matsudaria, Baltimore, Darnell** *'Molecular Cell Biology'* W.H. Free man and company New York..
2. **Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008).** *Principles of Genetics*. VIII Edition. Wiley India.
3. **Snustad, D.P., Simmons, M.J. (2009).** *Principles of Genetics*. V Edition. John Wiley and Sons Inc.

4. **Klug, W.S., Cummings, M.R., Spencer, C.A. (2012).** *Concepts of Genetics*. X Edition. Benjamin Cummings.
5. **Russell, P. J. (2009).** *Genetics- A Molecular Approach*. III Edition. Benjamin Cummings.
6. **Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B.** *Introduction to Genetic Analysis*. IX Edition. W. H. Freeman and Co.
7. **Gupta P.K.**, 'Genetics'
8. Developmental Biology by **Berryl**
9. Developmental Biology **S. Gilbert**
10. Developmental Biology - patterns, problems and principles by **W. Saunders Jr.**

B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20

B.Sc. ZOOLOGY II YEAR PRACTICAL SYLLABUS
SEMESTER - IV
CORE PAPER – IV
CELL BIOLOGY, GENETICS & DEVELOPMENTAL BIOLOGY

Instructions: 3hr per week
No. of credits: 1

I. Cytology

1. Preparation and Identification of slides of Mitotic divisions with onion root tips
2. Preparation and Identification of different stages of Meiosis in Grasshopper Testes
3. Identification and study of the following slides
   i). Different stages of Mitosis and Meiosis
   ii) Lamp brush and Polytene chromosomes

II. Genetics

1. Problems on Genetics - Mendelian inheritance, Linkage and crossing over, Sex linked inheritance

III. Embryology

1. Study of T.S. of Testis and Ovary of a mammal
2. Study of different stages of cleavages (2, 4, 8, 16 cell stages); Morula, Blastula
3. Study of chick embryos of 18 hours, 24 hours, 33 hours and 48 hours of incubation

Laboratory Record work shall be submitted at the time of practical examination

An **"Album"** containing photographs, cut outs, with appropriate write-up about Genetics and Evolution.

Computer aided techniques should be adopted as per UGC guide lines.

Suggested manuals

1. Manual of laboratory experiments in cell biology Edward, G.
2. **Freeman & Bracegirdle,** An atlas of embryology

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22/3/2022

B.Sc. II Year: Semester-IV
Skill Enhancement Course
SEC-4 (Credits 2)
Mushroom Culture Technology

Lectures: 30

UNIT-I (15 Hrs)

1. Introduction& history. Medicinal value of edible mushrooms; Poisonous mushrooms. Types of edible mushrooms available in India? Volvariella volvacea, Pleurotus citrinopileatus. Agaricus bisporus.
2. Cultivation Technology: Infrastructure; substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer. Tray, small polythene bag.
3. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves.
4. Factors affecting the mushroom bed preparation - Low cost technology. Composting technology in mushroom production.

UNIT-II (15Hrs)

5. Storage: Short-term storage (Refrigeration - up to 24 hours) Long term Storage (canning. pickles, papads), drying, storage in salt solutions
6. Nutritional value of Mushrooms: Proteins - amino acids, mineral elements nutrition Carbohydrates, Crude fibre content - Vitamins.
7. Food Preparation: Types of foods prepared from mushroom Research Centres - National level and Regional level. Cost benefit ratio - Marketing in India and abroad, Export Value.

Suggested Readings

1. Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. and Jayarajan. R (1991) Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
2. Swaminathan, M. (1990) Food and Nutrition. Bappco, The Bangalore Printing and Publishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.
3. Tewari. Pankaj Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi.
4. Nita Bahl (1984-1988) Hand book of Mushrooms, II Edition, Vol. I & Vol. II.

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B.Sc. II Year Semester IV
Skill Enhancement Course- IV
(SEC - IV) (2 Credits)
Chemistry of Cosmetics and Food Processing

Unit-I: Chemistry of Cosmetics and Perfumes

A general study including preparation and uses of the following: Hair dye, hair spray. Shampoo, sunscreen lotions, lipsticks, talcum powder, nail enamel, creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours. Essential oils and their importance in cosmetic industries with reference to eugenol, geraniol. Sandal wood oil, eucalyptus, 2-phenyl ethyl alcohol. Demonstration experiments or illustration of experimental procedures through charts for the preparation of talcum powder, shampoo and vanishing cream. Analysis of deodorants and antiperspirant - Aluminium, Zinc. Boric acid, Chloride and Sulphide.

Unit-II: Food Processing and Food Adulteration

Food processing: Introduction, methods for food processing, additives and preservatives. Food processing- impact on nutrition, analysis of calcium in milk by complexometric titration, spectrophotometry analysis of iron in foods, Spectrophotometric identification and determination of caffeine and benzoic acid in soft drinks. Field Work -Visit to Food Industries. Food adulteration: Adulterants in some common food items and their identification: Pulses, chilli powder, turmeric powder, milk, honey. Spices, food grains and wheat flour, coffee powder, tea leaves, vegetable oil, ghee, ice creams, tomato sauce. Field Work-Collection of adulterated food samples, demonstration of a minimum of five experiments for testing adulterants in food items.

References

1. E. Stocchi: Industrial Chemistry, Vol -I, Ellis Horwood Ltd. UK.
2. P.C. Jain, M. Jain: Engineering Chemistry. Dhanpat Rai & Sons, Delhi
3. Sharma. B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut (1996).
4. Rameen Devi, Food Processing and Impact on Nutrition, Sc J Agric Vet Sci... AugSep 2015; 2(4A):304-311.
5. W.A. Poucher. Perfumes. Cosmetics and Soaps (1993).
6. Srilakshuni. Food Science. Edition: 3rd (2004).
7. Lillian Hoagland Meyer, Food chemistry (2008).
8. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. Ranganna, Tata McGraw-Hill Education, 1986 - Food.
9. Fundamental concepts of applied chemistry J.C Ghosh, S. Chand and Co. Ltd, New Delhi.
10. Applied Chemistry K .Bhagavathi Sundhar, MJP publishers.

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24/3/2022

B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20

B.Sc. ZOOLOGY II YEAR
SEMESTER- IV
PAPER-IV(SEC-3): VERMICULTURE

Instructions: 2hr per week
No. of period: 30
No. of credits: 2

UNIT-I: **(15 Periods)**

1.1 Scope of vermi technology- Vermiculture and vermi composting – difference between vermiculture and vermi composting –
1.2 Earthworm diversity – Ecological groups of earthworms, biology of composting earthworms – Eoisena foeitida, Eudrilus lugeniae.
1.3 Soil – Physical, chemical and biological features
1.4 Organic waste sources – problems in traditional composting, vermi compositing
1.5 Types small and large scale pit method, heap method.

UNIT-II: **(15 Periods)**

2.1. Vermiculture techniques – vermi culture process – site selection - Selection and collection of species mono and poly culture
2.2. Essential parameters for vermi culture – bedding. Methods of harvesting worms general manual methods, self harvesting method, mechanical method
2.3. Nutritive value of vermi compost, storing and packing of compost
2.4. Applications of vermi composting in agricultural and horticultural practices
2.5. Economic of vermi culture, nationalized bank, NABARD support for vermi culture.

References:

1. Earthworm ecology by LEE
2. Biology of earthworm by Steven son
3. Vermi composting tech – soil health to human health by Ranganathan L.S.

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V - SEMESTER
BS 503, GENERIC ELECTIVE (GE)
FUNDAMENTALS OF FOOD AND NUTRITION

NO. OF HOURS: 60 CREDITS: 4

CREDIT I: FUNDAMENTALS OF FOOD 15 Hours

1.1 Definition of food, Types of foods- Nano foods, Convenience foods,

1.2 Texturized Foods, space Foods, Novel foods, Organic foods

CREDIT II: FUNDAMENTALS OF NUTRITION 15 Hours

2.1 Definition of Nutrition

2.2 Digestion, absorption & assimilation of nutrients in the human gut

2.3 Benefits of intestinal microflora- Pre & probiotics.

CREDIT III. FOOD SAFETY AND QUALITY CONTROL 15 Hours

3.1 Selecting and purchasing food

3.2 Understanding food labels

3.3 Storing raw foods and cooked foods

3.4 Definition of food adulteration and common adulterants present in food

CREDIT IV. HYGIENE AND SANITATION 15 Hours

4.1 Definition of hygiene and sanitation

4.2 Personal hygiene of food Handler

4.3 Techniques of washing hands

4.4 Pest control and garbage disposal

REFERENCE BOOKS:

1. Sri Lakshmi. B, Nutrition Science, New age international Pvt. Ltd. publishers.
2. SrilakshmiB ., Food Science, New Age International Pvt. Ltd publishers
3. Biochemistry- U Satyanarayana, U chakrapani, Books and Allied (Pvt . Ltd.)
4. The pink book -food smart by FSSAI
5. Catering Management - An Integrated Approach - MohiniSethi, Surjeet Malhan, 3rd edition, New Age International Publishers.

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22/3/2022

BA III Year -Semester-V

GE paper

Course-II: Indian Constitution and Administration

The Constitution of India defines the basic objectives and functioning of the government.

It has provisions for bringing about social change and defining the relationship between individual citizen and the state. It lays out certain ideals that form the basis of the kind of country that we as a citizen aspire to live in. An in–depth analysis of various basic areas of the constitution is the main objective of this inter disciplinary course. This helps the students to strengthen their understanding of Indian constitution and functioning of government.

Module 1: Indian Constitution

a).Nature of the Constitution Salient features - Preamble

b).Fundamental Rights, Directive Principles - Fundamental Duties

c).Amendments of the Constitution: Procedure for Amendment- Emergency Provisions

Module II: Centre - State Relations and Local Self Government

a).Distinctive features of Indian Federation

b) Legislative, Administrative and Financial relations between the Union and the States

C) Decentralization Experiments in India - 73rd and 74th Amendments

Module III: State Government

a). Governor, Chief Minister and Council of Ministers

b).Secretariat and Directorates

C) Changing Nature of District Administration and the role of District Collector

Module IV: Accountability & Control

a).Legislative, and Executive Control

b).Judicial control and Judicial Review

C). Right to Information Act

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Vth Semester
GE Paper
Politics of Development

Unit- I: Development: Meaning, Nature, and Importance
> Types of Development: Economic, Political and Social.

Unit- II: Development Debates
>Capitalist,Socialist,Gandhian, Sustainable Development

Unit- III: State and Development in India
> Planning, Mixed Economy, Socialistic Pattern of Society
> Sectors of Development: Industry, Agriculture, Irrigation, Land Reforms.

Unit- IV: Issues of Development in the Post-Economic Reforms period
> Economic Reforms: Liberalisation, Privatisation, Globalisation
> Development and Displacement
> Development and Environment

22/3/2022

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B.Sc. BIOTECHNOLOGY III YEAR
SEMESTER- V
GENERIC ELECTIVE (GE)
BASICS IN BIOTECHNOLOGY

I. Unit: Agricultural Biotechnology

1.1 Plant tissue culture - media, sterilization, culture types
1.2 Micro-propagation, Synthetic seeds, Somatic hybrids and haploid plants
1.3 Transgenic plants - direct & indirect methods of gene transfer
1.4 Applications of transgenic plants - improving productivity & nutritional quality
1.5 Applications of transgenic plants - stress tolerant plants & molecular farming
1.6 Biofertilizers and biopesticides

2. Unit: Microbial and Industrial Biotechnology

2.1. Exploitation of micro-organisms and their products
2.2. Isolation, screening and selection of microorganisms for industrial products
2.3 Preservation of microorganisms
2.4 Strain development and improvement, strategies of strain improvement selection and recombination.
2.5 Production of recombinant DNA vaccine, amino acids, vitamins
2.6 Single cell protein, dairy products, penicillin and streptomycin production

3. Unit: Animal and Medical Biotechnology

3.1 Cell culture technique and its applications
3.2 Animal breeding (selective breeding and cross breeding) andits limitations
3.3 In vitro techniques in animal improvement: in vitro fertilization & microinjection
3.4 Genetically modified animals: transgenic & knock-outs
3.5 Mouse models of disease: cancer and diabetes
3.6 Biotechniques: gel electrophoresis and PCR

4. Unit: Computer applications in Biotechnology

4.1 Scope of computer applications in Biotechnology
4.2 Biotechnology tools and resources- role of the internet, free online tools, downloadable freesoftware
4.3 Biotechnology web portals - NCBI, EBI, ExPASy
4.4 Biological databases: classification of databases - the primary (Genbank), secondary (PIR) databases
4.5 Sequence databases - DNA sequence databases (ENA &DDBJ)
4.6 Protein sequence databases (Swissprot & PROSITE)

Semester - V.
TELANGANA ECONOMY
Generic Elective - Paper

Module- I: State and District Domestic Product:
Growth and Sectoral Composition state domestic product per capita Income of Telangana State and its Districts

Module- II: Trends in Population Growth:
Occupational structure work participation - Population policies, Unemployment and its magnitude and direction

Module- III: The Structure of Agriculture and Allied Sectors:

Trends in productivity of food and non-food crops. Profile of Irrigation policies and institutional support to Agricultural Marketing, Sources of Agricultural finance Impact of New seed technology on production and productivity.

Module- IV: The Structure of Industrial Development:
Commodity specific growth rates in industrial sector- Infrastructure development -Industrial policies and programs in support of industrial growth. TS-iPASS.

Module- V: The structure of Tertiary Sector:

Service sector specific growth rates, Policies and Programs initiated to promote growth of services in Telangana State.

Basic Reading List:

1. Rao S Kishan and Rahul A Shastry (2009): Andhra Pradesh Economy - Dynamics of Transformation with a focus on Regional Disparities, National Academy of Development,
2. Hanumantha Rao and S.Mahender Dev (2003); Andhra Pradesh Development - Economic Reform and Challenges Ahead, Centre for Economic and Social Studies, Hyderabad.
3. Kankalatha Mukund (1990); "Andhra Pradesh Economy in Transition; Centre for Economic and Social Studies, Hyderabad and Book Links Corporation, Hyderabad.
4. Mahendra Dev, S.C.Ravi and M.Venkatanarayana (2009); Human Development in Andhra Pradesh: Experiences, Issues and Challenges; Centre for Economic and Social Studies (CESS), Hyderabad.

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B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20

B.Sc. ZOOLOGY III YEAR
SEMESTER – V
PAPER-V (DSE – I): PHYSIOLOGICAL CHEMISTRY AND ENDOCRINOLOGY

Instructions: 4hr per week
No. of period: 60
No. of credits: 4

UNIT-I: Biomolecules of Importance (15 Periods)

1.1 Types of biomolecules –Carbohydrates,Proteins ,Lipids,Nucleic acids and their significance in biological systems.
1.2 Classification of protein; Function of proteins based on their chemical nature
1.3 Protein metabolism: Transamination, deamination, urea cycle
1.4 Classification and function of carbohydrates
1.5 Carbohydrate metabolism: Glycolysis, Kreb's cycle, electron transport and oxidative phosphorylation

UNIT-II: Lipids and enzyme Classification (15 Periods)

2.1 Lipids: nomenclature and classification of lipids
2.2 Fatty acid synthesis and beta oxidation of lipids
2.3 Cholesterol synthesis and metabolism of steroidal hormones
2.4 Enzyme definition, nomenclature, classification and Enzyme kinetics, Lineweaver-Burk plot
2.5 Mechanism of enzymes: Action, enzyme inhibition, coenzymes

UNIT - III: Introduction to Endocrinology (15 Periods)

3.1 Concept and Scope of endocrinology; Hormones as chemical messengers.
3.2 Classification of hormones
3.3 Mechanism of action of aminoacid derivatives, peptide hormones and steroid hormones.
3.4 Positive feedback mechanism and Negative feedback control
3.5 Concept of internal environment and homeostasis.

UNIT - IV: Endocrine Glands and their Hormones (15 Periods)

4.1 Hypothalamus and its Hormones.
4.2 Structure, hormones and functions of Pituitory gland.
4.3 Structure, hormones and functions of Thyroid, Parathyroid, thymus
4.4 Structure, hormones and functions of Adrenal, Pancreas, Pineal,
4.5 Hormones and reproduction

REFERENCE BOOKS:

1. Text book of biochemistry
2. Text book of biochemistry
3. Text book of physiology and biochemistry
4. Text book of biochemistry
5. Molecular cell biology
6. Comparative Endocrinology of Invertebrates by Highman and Hill.
7. Comparative Vertebrate Endocrinology by P.J.Bentley, Cambridge Univ. Press
8. Text Book of Endocrinology by Turner and Bangnara (W.B.Sanders)
9. Essential Endocrinology by Joen Laycock and Peter Loise Oxford Univ. Press.
10. Text Book of Endocrinology by R.H.Williams (W.B.Saunders).

B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20

B.Sc. ZOOLOGY III Year PRACTICAL SYLLABUS
SEMESTER – V
PAPER-V (DSE – I): PHYSIOLOGICAL CHEMISTRY AND ENDOCRINOLOGY

Instructions: 3hr per week
No. of credits: 1

1. Identification of carbohydrates –Molisch test,Benedict's/Fehling's test,Iodine test,Barfoed's test.
2. Identification of proteins-Biuret test,Sodium hydroxide test
3. Identification of amino acids-Xanthoproteic test,Nin-hydrin test,Millon's test.
4. Identification of lipids-Sudan-IV test.
5. Histology of Endocrine glands, Pituitory, Thyroid, Parathyroid, Thymus, Adrenal Pancreas, Ovary & Testis, Uterus.
6. Effect of Eye Stalk ablation on Blood Glucose levels in Crabs.
7. Identification of Gonadotrophin in Human urine samples.
8. Effect of Thyrosine and thiourea (antithyroid agent) on oxygen consumption in fish.

- Laboratory record work shall be submitted at the time of practical examinations
- Computer-aided techniques shall be adopted as per UGC guidelines

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B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20

B.Sc. III Year
SEMESTER-V,
Paper – V (DSE – I): LABORATORY ANIMALS MAINTENANCE AND APPLICATIONS

Instructions: 4hr per week
No. of period: 60
No. of credits: 4

UNIT I: Introduction to Laboratory Animals& Animal Care **(15 Periods)**

1.1 Laboratory Animals – Introduction; Species of Laboratory Animals, Laboratory Animals for Research; Genetically Modified Laboratory Animals
1.2 Animal Experimentations – Implications; Principles, LaboratoryAnimals and Models of Human Diseases, Results of Animal Experimentations
1.3 Animal Care – Animal Ethics; ethical theories –Virtue ethics, Humean Theory, Utilitarian Theory, Capabilities Theory, Persons Theory
1.4 Animal Care – Regulations and Policies; Prevention of Cruelty to Animal Act, 1960; Breeding of and Experiments on Animals (Control and Supervision) Rules, 2006
1.5 Animal Care – CPCSEA, Standard Operating Procedures (SOP) for IAEC; CPCSEA Guidelines for Laboratory Animal Facility

UNIT II: Maintenance, Quality Control & Welfare of Laboratory Animals **(15 Periods)**

2.1 Environment and Facilities of Laboratory Animals for Terrestrial Animals and Aquatic Animals
2.2 Nutrition and Animal Experimentation – Nutrients, energy, nutritional needs, animal feeds
2.3 Genetic Standardization of Laboratory Animals – Animal Breeding System; Inbred strains; Strains Made from Multiple Inbred Strains; F1 Hybrids, Outbred Strains and Closed Colonies; Genetic Quality Control
2.4 Microbiological Standardization of Laboratory Animals – Reasons, causes, zoonosis; Contamination sources and routes of transmission
2.5 Concept of Animal Welfare – Origin and Connotation; Concept of Stress, Pain, and Distress in Laboratory Animals; Humane End Points of Animal Experiments

UNIT III: Management & Husbandry of Laboratory Animals **(15 Periods)**

3.1 Management of Laboratory Animals – Introduction, Laboratory Animal Welfare and controversy of animal experimentation
3.2 Alternative Methods of Animal Experimentation - 3Rs Theory;Protocol of animal experimentation
3.3 Laboratory Management and Husbandry – Mice: general biological characteristics including anatomy and physiology; sexual differentiation, health features, cages and housing; husbandry and recording
3.4 Laboratory Management and Husbandry - Ratsgeneral biological characteristics including anatomy and physiology; sexual differentiation, health features, cages and housing; husbandry and recording
3.5 Laboratory Management and Husbandry – Fishes; general biological characteristics including anatomy and physiology; health features, water system, water management, feeding

UNIT IV: Applications of Laboratory Animals **(15 Periods)**

4.1 Animal Models – Need, Classification and Selection of animal models
4.2 Animal Models – Types: Induced AM, Spontaneous AM, and Genetically Modified AM
4.3 Applications in biomedical research –systemic diseases, transplantation studies, studies on embryogenesis and developmental biology
4.4 Applications in behavioural research – neurological responses, behavioural changes, brain function, acclimatization studies
4.5 Applications in toxicology and drug research – safety testing of pesticides, medications, food additives; cosmetic testing; drug testing: metabolic tests, toxicology tests

B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20

B.Sc. III Year PRACTICAL SYLLABUS

SEMESTER-V, DSE – I
Paper – V
LABORATORY ANIMALS MAINTENANCE AND APPLICATIONS

Instructions: 3hr per week
No. of credits: 1

1. Mounting zooplanktons for microscopic viewing
2. Demonstration of microscopic drawings of zooplanktons
3. SDH or LDH activity using colorimeter
4. Demonstration of ELISA using kit
5. Measurements of soil characteristics – temperature, pH, humus content and moisture content
6. Measurement of physico-chemical parameters of water – temperature, pH, oxygen levels, alkalinity
7. Exercise on data collection, tabulation and preparation of graphs
8. Calculation of averages (mean, median, mode) and standard deviation
9. Calculation of difference in means using Student's t Test

- **Laboratory record work shall be submitted at the time of Practical Examination.**
- **Computer-aided teaching material too can be used for these experiments as per UGC guidelines**

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B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20

B.Sc. ZOOLOGY III YEAR
SEMESTER-V
PAPER – V(DSE – I): IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

Instructions: 4hr per week
No. of period: 60
No. of credits: 4

UNIT-I: Basics of Immune system (15 Periods)

1.1 Cells of the immune system and the lymphoid organs(Primary and secondary).
1.2 First line of defenses-physical and chemical barriers; second line of defenses- inflammation and phagocytosis.
1.3 Types of immunity-Inherent(Active and passive) and acquired immunity(Active and passive) Humoral and cell mediated immunity
1.4 Major histocompatibility complex (MHC)–structure and function of class I and class II proteins.
1.5 Significance of MHC in organ tranaplantation.MHC restriction

UNIT-II: Antibodies and Antigens and Immune system diseases (15 Periods)

2.1 Antibodies/immunoglobulins- structure, functions and classification, antibody diversity, Monoclonal antibodies and applications.
2.2 Antigens structure, antigenic determinants/epitopes, haptens, adjuvants and antigenicity.
2.3 Antigen-antibody reactions-agglutination, precipitation, opsonization, cytotoxicity
2.4 Hypersensitivity reactions
2.5 Autoimmunity and Immunodeficiency diseases.

UNIT – III: Animal Biotechnology and Genetically modified organisms (15 Periods)

3.1 Concept and Scope of Animal Biotechnology.
3.2 Recombinant DNA technology and its applications.
3.3 Cloning vectors - Plasmids, Cosmids and shuttle vectors; Cloning methods (Cell, Animal and Gene cloning).
3.4 Transgenesis – Methods of Transgenesis.
3.5 Production of Transgenic animals - sheep and fish.

UNIT –IV: Applications of Biotechnology (15 Periods)

4.1 In vitro fertilization and embryo transfer.
4.2 Hybridoma technology – concepts and applications.
4.3 Stem cells –types and their applications.
4.4 Biopesticides; *Bacillus thuringiensis* – mode of action of toxin.
4.5 Animal Bioreactors – concepts and applications.

Reference Books:

1. Text book of immunology-Ivan Riott
2. Text book of immunology-C.V.Rao
3. Text book of immunology-Nandini shetty
4. Text book of immunology-Kubey
5. Culture of Animal cells. R. Ian Freshney, Wiley Liss.
6. Biotechnology – S. Mitra.
7. Animal Cell culture – Practical Approach – Ed. John R W Masters, Oxford.
8. Biotechnology – B. D. Singh

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B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20

B.Sc. ZOOLOGY III YEAR PRACTICAL SYLLABUS
SEMESTER-V
PAPER – V(DSE – I): IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

Instructions: 3hr per week
No. of credits: 1

I. Immunology

1. Demonstration of agglutination(ABO-blood grouping/Widal test) using kit
2. Demonstration of precipitation(VDRL/RPR test)using kit
3. Radial immunodiffusion using kit.
4. Histology of lymphoid organs-Spleen, Thymus, Lymphnode, Bone marrow

II. Animal Biotechnology

1. Study the following techniques through photographs / virtual lab
   a. Identification of Vectors
   b. Identification of Transgenic animals
   c. DNA sequencing (Sanger's method)
   d. DNA finger printing
   e. Southern blotting
   f. Western blotting

2. PCR demonstration /virtual lab

- **Laboratory Record work shall be submitted at the time of practical examination**
- **Computer aided techniques should be adopted as per UGC guide lines.**

Reference Books:

1. A hand book of practical immunology-Ivan Riott
2. Animal Biotechnology – PK Gupta

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B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20

B.Sc. ZOOLOGY III YEAR
SEMESTER – VI
PAPER- VI (DSE-II): FISHERIES AND LIMNOLOGY

Instructions: 4hr per week
No. of period: 60
No. of credits: 4

UNIT-I: Introduction to Fisheries, aquaculture systems, management practices **(15 periods)**

1.1 Introduction, definition, history, scope and significance of 'Fisheries'. Present status and prospects of Fisheries at global, national and local (state) level. Blue revolution.

1.2 Classification of Fisheries.
- i) Fin fisheries & Shell fisheries;
- ii) Capture fisheries & Culture fisheries;
- iii) Freshwater (inland), Brackish water & Marine fisheries.

1.3 Aquaculture systems: Pond culture, pen culture, cage culture. Monoculture, composite culture, integrated culture systems.

1.4 Culture phases and management practices: Nursery, rearing and grow-out pond preparation. Liming, fertilization/manuring, and water quality management. Control of aquatic weeds, algal blooms, and weed fishes.

1.5 Traits of important cultivable finfish and shellfish: Indian major carps and Minor carps, Exotic carps, air breathing fishes, cold water fishes, fresh water prawns, mussels.

UNIT-II: Feeding, Breeding and hatchery management of finfish and shellfish **(15 periods)**

2.1 Bundh breeding: Concept; wet and dry bundhs; Collection and hatching of eggs.

2.2 Induced breeding: Environmental factors affecting spawning; Hypophysation of fishes; Fish pituitary gland: Structure, collection, preservation, and preparation of extract for injection, dosages and methods of injection, dosages and methods of injection.

2.3 Brood-stock management and transportation of brood fish. Synthetic hormones are used for induced breeding of carps.

2.4 Types of fish hatcheries: Traditional, Chinese, Glass jar, Modern controlled hatcheries. Breeding and hatchery management of *Penaeus monodon* and *Macrobrachium rosenbergii*.

2.5 Fish nutrition: Natural and supplementary feeding of cultivable finfish and shellfishes. Forms of feeds: Wet feeds, dry feeds, mashes, pelleted feeds, floating and sinking pellets.

UNIT-III: Limnology **(15 periods)**

3.1 Introduction to limnology, Inland water bodies: Characteristics and distribution of Ponds, Lakes, Reservoirs, Streams and Rivers.

3.2 Dynamics of lentic and lotic environments.

3.3 Major rivers and fresh water lakes of India. Origin, classification and morphometry of lakes.

3.4 Influence of physical and chemical conditions on living organisms in inland waters- Temperature, Light, pH, Turbidity, Thermal stratification, Dissolved Oxygen (DO), Alkalinity, Acidity, Hardness, BOD, COD etc.

3.5 Major groups of organisms in freshwater bodies: Planktons, Periphytons, Neustons, Nektons, Benthos, large aquatic plants etc. Ecological adaptations of freshwater fauna.

UNIT-IV: Productivity of lakes **(15 periods)**

4.1 Ecology of ponds and lakes (Lentic ecosystems) – Structure and dynamics – Energy flow.

4.2 Productivity of water bodies: Concept of productivity, primary, secondary and tertiary productivity. Factors affecting productivity. Classification of lakes based on productivity.

4.3 Laws of minimum and quantitative relationships in a standing crop.

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4.4 Biotic potential and environmental resistance Succession phenomenon and indices of productivity of lakes

4.5 Eutrophication – causes, consequences and control mechanisms.

Reference Books:

1. Goldman CR. And Home AJ. 1983. Limnology. Mc Graw - Hill International Book Company.
2. Ruttner F. 1953. Fundamentals of Limnology. University of Toronto press, Toronto.
3. Welch PS, 1952. Limnology, 2nd Ed. Mc Graw-Hill Book Co., New York.
4. Golterman, HL. 1975. Physiological Limnology. Elsevier Publishing Co., Amsterdam
5. Cole GA. 1983. Text book of Limnology. C.V Mosby Company, St. Louis, Missouri, USA.
6. Wetzel RG. 1975. Limnology. W.B. Sanders Company, Philadelphia

22/3/2022

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B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20

B.Sc. ZOOLOGY III YEAR PRACTICAL SYLLABUS
SEMESTER – VI
PAPER-VI (DSE-II): FISHERIES AND LIMNOLOGY

Instructions: 3hr per week
No. of credits: 1

1. Aquaculture production statistics – World, India, and Telangana state.
2. Aquaculture resources of the World, India, and Telangana state.
3. Histological studies of testis, ovary of fish.
4. Identification of important cultivable fresh water fishes-Indian major carps, exotic carps, mahaseers, trouts, tilapias, catfishes, murrel fish.
5. Removal of fish pituitary gland and preparation of pituitary gland extract.
6. Morphometry of lakes, ponds and streams.
7. Determination of physical and chemical characteristics of lotic and lentic water bodies: Temperature, transparency, turbidity, pH, electrical conductivity, salinity, total dissolved solids, dissolved oxygen, free carbondioxide, total alkalinity, total hardness, calcium, magnesium, inorganic nitrogen(ammonium and nitrate) and phosphorous.
8. Collection and identification of fresh water Phytoplankton.
9. Collection and identification of fresh water Zooplankton.
10. Estimation of primary productivity in fresh water bodies.
11. Field trip to local or nearby fisheries unit/fresh water body is to be conducted and certified field note book should be submitted at the time of practical examination.

References:

1. Ayyappan, S., 2011. Handbook of Fisheries and Aquaculture, ICAR Publications, New Delhi.
2. Rath, R.K., 2011. Freshwater Aquaculture, Scientific publications.
3. Santhanam, R., Sukumaran, N. and Natarajan, P. 1987. A manual of Aquaculture. Oxford-IBH, New Delhi.
4. Ramanathan, N. and Francis T., 1996. Manual on breeding and larval rearing of cultivable fishes, Fisheries College and Research Institute, Tuticorin.
5. Jhingran, V.G., Pullin, R.S.V., 1997. A hatchery manual for the Common, Chinese and Indian Major Carps. Asian Development Bank, International Centre for living Aquatic Resources Management, Philippines.

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B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20

B.Sc. ZOOLOGY III YEAR
SEMESTER-VI
PAPER – VI (DSE-II): ECOLOGY, ZOOGEOGRAPHY AND EVOLUTION

Instructions: 4hr per week
No. of period: 60
No. of credits: 4

UNIT – I: (15 Periods)

1.1 Ecology - I

1.1 Ecosystem structure and functions Types of Ecosystems –Aquatic and Terrestrial
1.2 Biogeochemical cycles - Nitrogen, Carbon, Phosphorus and Water
1.3 Energy flow in ecosystem.
1.4 Food chain, food web and ecological pyramids.
1.5 Animal Associations - Mutualism, commensalism, parasitism, competition, predation

UNIT – II: (15 Periods)

2.1 Ecology - I

2.1 Concept of Species, Population dynamics and Growth curves.
2.2 Community Structure and dynamics and Ecological Succession.
2.3 Ecological Adaptations.
2.4 Environmental Pollution – Sources, Effect and Control measures of Air, Water, Soil and Noise Pollution.
2.5 Wildlife conservation - National parks and Sanctuaries of India, Endangered species.

UNIT – III: (15 Periods)

3.1 Zoogeography

3.1 Zoogeographical regions – Palaearctic, Nearctic, Neotropical, Oriental, Australian and Ethiopian regions - their Climatic and faunal peculiarities
3.2 Wallace line, Discontinuous distribution
3.3 Continental Drift
3.4 Biodiversity and hotspots of Biodiversity in India

UNIT – IV: (15 Periods)

4.1 Evolution

4.1 Theories of evolution – Lamarckism and Neo-Lamarckism, Darwinism and Neo-Darwinism, Modern synthetic theory.
4.2 Evidences of Evolution. Causes and Role of Extinction in Evolution
4.3 Forces of Evolution – mutation, gene flow, genetic drift, and natural selection. Hardy Weinberg Law
4.4 Isolation – Pre-mating and post mating isolating mechanisms
4.5 Speciation: Methods of speciation - Allopatric and sympatric

Suggested Readings:

1. **M.P.Arora**, *'Ecology'* Himalaya Publishing company.
2. **P.D.Sharma**, *Environmental Biology'*
3. **P.R.Trivedi and Gurdeep Raj**. *'Environmental Ecology'*
4. **Buddhadev Sarma and Tej Kumar**, *Indian Wildlife Threats and Preservation*
5. **Chapman J.L. and Reiss M.J,** *Ecology Principles and Applications*, Second
6. Ed., Cambridge University Press, London.
7. **Benny Joseph,** *Environmental Studies*, TATA MGraw Hill Com., New Delhi.

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8. **Eugene P. Odum**, *Fundamentals of Ecology* Third Ed., NataraJ Publishers, Dehradun.
9. **Veer Bala Rastogi**, "Ecology and Animal Distribution"
10. **P.K. Gupta**, "Text Book of Ecology and Environment"
11. **Bhatnagar and Bansal**, "Ecology and Wildlife biology
12. **Ridley, M. (2004).** *Evolution*. III Edition. Blackwell Publishing
13. **Douglas, J. Futuyma (1997).** *Evolutionary Biology*. Sinauer Associates.
14. **Minkoff, E. (1983).** *Evolutionary Biology*. Addison-Wesley.
15. **Jan M. Savage**. *Evolution*, 2nd ed, Oxford and IBH Publishing Co., New Delhi.

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B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20

B.Sc. ZOOLOGY III YEAR PRACTICAL SYLLABUS
SEMESTER- VI
PAPER – VI (DSE-II): ECOLOGY, ZOOGEOGRAPHY AND EVOLUTION

Instructions: 1hr per week
No. of credits: 2

1. Determination of pH of Soil and Water
2. Estimation of salinity (chlorides) of water in given samples.
3. Estimation of Carbonates and bicarbonates in the given water samples.
4. Estimation of dissolved oxygen of pond water, sewage water and effluents.
5. Identification of Zooplankton from a nearby water body.
6. Study of Pond Ecosystem / local polluted site - Report submission
7. Study of at least 3 endangered or threatened wild animals of India through photographs / specimens / models
8. Field visit to Zoo Park to study the management, behavior and enumeration of wild animals.
9. Identification of Zoogeographical realms from the Map and identify specific fauna of respective regions.
10. Museum Study of Fossil animals: *Peripatus, Coelacanth Fish, Dipnoi fishes, Sphenodon, Archeopteryx*.
11. Study of homology and analogy from suitable specimens and pictures
12. Problems on Hardy-Weinberg Law
13. Macroevolution using Darwin finches (pictures)

Laboratory Record work shall be submitted at the time of practical examination

Computer aided techniques should be adopted as per UGC guide lines.

Suggested manuals

1. **Robert Desharnais,Jeffrey Bell,** 'Ecology Student Lab Manual, Biology Labs'
2. **Darrell S Vodopich,** 'Ecology Lab Manual'

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22/3/2022

B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20
OPTIONAL PAPER IN PLACE OF THE PROJECT
B.Sc. ZOOLOGY III YEAR
SEMESTER - VI
PAPER - VI: TOOLS AND TECHNIQUES IN BIOLOGY

Instructions: 4hrs per week No. of period: 60 No. of credits: 4

UNIT- I: Microscopy Centrifugation (15 Periods)

1.1 Microscopy -Basic principle of microscopy, types of microscopes and their application

1.2 Histopathological techniques - principle and its applications

1.3 Centrifugation -Basic principle of centrifugation; Preparatory and analytical centrifugation techniques and its applications

UNIT- II: Separation techniques (15 Periods)

2.1 Colorimetery and Spectrophotometry - Basic principle of colorimetry and its applications, Basic principle of spectrophotometry, and applications.

2.2 Chromatography - Basic principle of chromatography; Types of chromatography techniques and their applications

2.3 Electrophoresis - Basic principle of electrophoresis and their applications

UNIT- III: Advanced techniques (15 Periods)

3.1 Immunoassay-Principle andapplications of ELISA

3.2 PCR Techniques - DNA extraction and isolation; Principles and applications of PCR techniques

3.3 RIA and its applications

UNIT- IV: Statistical tools (15 Periods)

4.1 Data - Definition and types of data, Concept of variables; summarising data: averages (Mean, median, mode), dispersion (range, standard deviation, confidence limits);

4.2 Representing data - Arraying data, tabulation; graphical representation of data (Histogram, bar graph, line graph, scatter plot, pie diagram)

4.3 Non-parametric tests -Chi Square test and parametric tests -Correlation;

4.4 Student's t-Test; Regression analysis

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Reference Books

1. Gurumani, N. An Introduction to Biostatistics. MJP Publisher, Chennai

2. Gurumani, N. Research Methodology. MJP Publishers, Chennai

3. Tembhare, D.B. Techniques in Life Sciences, Himalaya Publishing House, Delhi

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