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List of Employability/ Entrepreneurship/ Skill Development Courses with Course Contents

Colour Codes		
Name of the Subjects	Yellow	
Employability Contents	Green	
Entrepreneurship Contents	Light Blue	
Skill Development Contents	Pink	



**List of Courses Focus on Employability/ Entrepreneurship/
Skill Development**

Department : Zoology

Programme Name : B. Sc

Academic Year : 2018-19

List of Courses Focus on Employability/ Entrepreneurship/Skill

Sr. No.	Course Code	Name of the Course
01.	LS/ZOO/CC-101 L	Non-Chordates I: Protista to Pseudocoelomata
02.	LS/ZOO/CC-101 P	Lab Course
03.	LS/ZOO/CC-102 L	Principles of Ecology
04.	LS/ZOO/CC-102 P	Lab Course
05.	LS/ZOO/GE-101 L	Aquatic Biology (Practical)
06.	LS/ZOO/GE-101 P	Lab Course
07.	LS/ZOO/CC-201 L	Non Chordates-II(Coelomates)
08.	LS/ZOO/CC-201 P	Lab Course
09.	LS/ZOO/CC-202 L	Cell Biology
10.	LS/ZOO/CC-202 P	Lab Course
11.	LS/ZOO/GE-201 L	Environment and Public Health
12.	LS/ZOO/GE-201 P	Lab Course
13.	LS/ZOO/AE-201/ES	Environmental Science
14.	ZOO-CC301	Animal Diversity: Chordates
15.	ZOO-CC302	Animal Physiology: Life Sustaining Systems
16.	ZOO-CC-303 Practical	Lab Course (301 + 302)
17.	ZOO-CC-401	Basic and Applied Genetics
18.	ZOO-CC402	Animal Physiology: Controlling and Coordinating Systems
19.	ZOO-CC403 Practical	Lab Course (401 + 402)
20.	ZOO-CC-IX	Comparative Anatomy of Non-Chordates and Chordates
21.	ZOO-CC-X	Animal Physiology
22.	ZOO-CC- Practical	Lab Course (IX + X)
23.	ZOO-CC-XI IDLS C	Biostatistics and Computer Application
24.	ZOO-DSE-1	Elective-I (Endocrinology/ Fish Biology/ Toxicology)
25.	ZOO-CC-XII	Developmental Biology
26.	ZOO-CC-XIII	Biotechniques
27.	ZOO-CC- Practical	Lab Course (XII + XIII)
28.	ZOO-CC-XIV	Molecular Biology and Genetics Engineering
29.	ZOO-DSE-2	Elective- II (Endocrinology/Fish Biology/Toxicology)

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Sheme and Syllabus

B.Sc. Hon's (Zoology): CBCS 2018-2019

School of Life Sciences

Semester I				
Course Opted	Course Code	Name of the course	Credit	H/week
Core Course-1 Theory	LS/ZOO/CC-101 L	Non Chordates - I (Protozoa to Pseudocoelomate)	4	4
Core Course-1 Practical	LS/ZOO/CC-101 P	Lab Course	2	4
Core Course-2 Theory	LS/ZOO/CC-102 L	Principles of Ecology	4	4
Core Course-2 Practical	LS/ZOO/CC-102 P	Lab Course	2	4
Generic Elective-1 Theory	LS/ZOONGE-101 L	Aquatic Biology	4	4
Generic Elective-1 Practical	LS/ZOONGE-101 P	Lab Course	2	4
Ability Enhancement Compulsory Course-1	LS/ZOO/AE-101/EC	English Communication / MIL (Hindi Communication)	4*	4
Extracurricular activity		Tour, Field visit/ Industrial training/ NSS/ Swachhta/ Vocational Training/ Sports/ others	2	(2)
TOTAL			24	28
Semester II				
Core Course-3 Theory	LS/ZOO/CC-201 L	Non Chordates - II (Coelomates)	4	4
Core Course-3 Practical	LS/ZOO/CC-201 P	Lab Course	2	4
Core Course-4 Theory	LS/ZOO/CC-202 L	Cell Biology	4	4
Core Course-4 Practical	LS/ZOO/CC-202 P	Lab Course	2	4
Generic Elective-2 Theory	LS/ZOONGE-201 L	Environment and Public Health	4	4
Generic Elective-2 Practical	LS/ZOONGE-201 P	Lab Course	2	4
Ability Enhancement Compulsory Course-2	LS/ZOO/AE-201/ES	Environmental Science	4*	4
Extracurricular activity		Tour, Field visit/ Industrial training/ NSS/ Swachhta/ vocational Training/ Sports/ others	2	(2)
Total			24	28
Summer Internship: 15 days		Swayam Swachhta / NSS / Industrial/ others	2	100
Semester III				
Core Course-5 Theory	LS/ZOO/CC-301 L	Diversity of chordates	4	4
Core Course-5 Practical	LS/ZOO/CC-301 P	Lab Course	2	4
Core Course-6 Theory	LS/ZOO/CC-302 L	Physiology: Controlling and Coordinating systems	4	4
Core Course-6 Practical	LS/ZOO/CC-302 P	Lab Course	2	4
Core Course-7 Theory	LS/ZOO/CC-303 L	Fundamentals of Biochemistry	4	4
Core Course-7 Practical	LS/ZOO/CC-303 P	Lab Course	2	4
Generic Elective-3 Theory	LS/ZOO/GE-301 L	Food Nutrition and Health	4	4
Generic Elective-3 Practical	LS/ZOO/GE-301 P	Lab Course	2	4
Skill Enhancement Course-1	LS/ZOO/SEC-301 L	Sericulture	2	4
Skill Enhancement Course-1	LS/ZOO/SEC-301 P	Lab Course	2	4
Total			28	34
Semester IV				
Core Course-8 Theory	LS/ZOO/CC-401 L	Comparative anatomy of vertebrates	4	4
Core Course-8 Practical	LS/ZOO/CC-401 P	Lab Course	2	4
Core Course-9 Theory	LS/ZOO/CC-402 L	Physiology: Life Sustaining Systems	4	4
Core Course-9 Practical	LS/ZOO/CC-402 P	Lab Course	2	4
Core Course-10 Theory	LS/ZOO/CC-403 L	Biochemistry of Metabolic Processes	4	4



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Semester III:

Course type	Course Code	Title of Course	Credits	Hrs/ Wk	Hrs/ Sem
Zoology (H)	ZOO-CC301	Animal Diversity: Chordates	2	2	
	ZOO-CC302	Animal Physiology: Life Sustaining Systems	2	2	
	ZOO-CC303	Lab Course (301 + 302)	2	4	
<i>Total Credits</i>			6		
Chemistry	CHEM				
	CHEM				
	Practical				
(optional) Botany/ Biotech.	BOT/ BT				
	BOT/ BT				
	Practical				
Foundation course/ Ability Enhancement Compulsory Course (AECC)	EVS-I	Environment Science- I/ DM			

Semester IV:

Course type	Course Code	Title of Course	Credits	Hrs/ Wk	Hrs/ Sem
Zoology (H)	ZOO-CC401	Basic and Applied Genetics	2	2	
	ZOO-CC402	Animal Physiology: Controlling and Coordinating Systems	2	2	
	ZOO-CC403	Lab Course (401 + 402)	2	4	
<i>Total Credits</i>			6		
Chemistry	CHEM				
	CHEM				
	Practical				
(optional) Botany/ Biotech.	BOT/ BT				
	BOT/ BT				
	Practical				
Foundation course/ Ability Enhancement Compulsory Course (AECC)	EVS-II	Environment Science- II/ DM			

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Semester V:

Course type	Course Code	Title of Course	Credits	Hrs/ Wk	Hrs/ Sem
CC	ZOO-CC-IX	Comparative Anatomy of Non-Chordates and Chordates	3	3	
	ZOO-CC-X	Animal Physiology	3	3	
	ZOO-CC- Practical	Lab Course (VII + VIII)	3	6	
	ZOO-CC-XI	Biostatistics and Computer Applications	3	3	
	IDLS C				
DSE	ZOO-DSE-1	Elective-I (Endocrinology/ Fish Biology/ Toxicology)	3	3	
	Practical	Lab based on elective & Seminar to decide the project	3+2	6	
Total Credits			20		

Semester VI:

Course type	Course Code	Title of Course	Credits	Hrs/ Wk	Hrs/ Sem
CC	ZOO-CC-XII	Environmental Biology	3	3	
	ZOO-CC-XIII	Biotechniques	3	3	
	ZOO-CC- Practical	Lab Course (VI + VII)	3	6	
	ZOO-CC-XIV	Molecular Biology and Genetic Engineering	3	3	
DSE	ZOO-DSE-2	Elective-II (Endocrinology/ Fish Biology/ Toxicology)	3	3	
	ZOO-DSE-3	Dissertation/ Project work and Seminar	3+2	6	
Total Credits			20		

Note:

- Groups offered by the Department for Integrated UG/ PG students at entry level
 - Group I: Zoology, Chemistry and Botany (ZCB)
 - Group II: Zoology, Chemistry and Biotechnology (ZCBT)
- After the successful completion of IVth Semester students will have flexibility of changing of Core honors subject as per their interest and availability of the seats in the Department.

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Department of Zoology, School of Life Sciences, GGV, Bilaspur (C.G.)

CORE COURSE I

LS/ZOO/CC-101 L

NON-CHORDATES I: PROTISTA TO PSEUDOCOELOMATA

THEORY

(Credits 4)

Unit 1: Protista, Parazoa and Metazoa	19
General characteristics and classification up to classes; Study of <i>Euglena</i> , <i>Amoeba</i> and <i>Paramecium</i> ; Life cycle and pathogenicity of <i>Plasmodium vivax</i> and <i>Entamoeba histolytica</i> ; Locomotion and Reproduction in Protista; Evolution of symmetry and segmentation of Metazoa	
Unit 2: Porifera	7
General characteristics and classification up to classes; Type study of <i>Sycon</i> ; Canal system and spicules in sponges	
Unit 3: Cnidaria	12
General characteristics and classification up to classes; Type study of <i>Obelia</i> ; Polymorphism in Cnidaria, Corals and coral reefs	
Unit 4: Ctenophora	4
General characteristics and Evolutionary significance	
Unit 5: Platyhelminthes	10
General characteristics and classification up to classes; Type study, larval forms and pathogenicity of <i>Fasciola hepatica</i>	
Unit 6: Nematelminthes	8
General characteristics and classification up to classes; Type study of <i>Ascaris lumbricoides</i> ; Life cycle and pathogenicity of and <i>Wuchereria bancrofti</i> ; Parasitic adaptations in helminthes	

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Santosh Singh

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Department of Zoology, School of Life Sciences, GGV, Bilaspur (CG)

CORE COURSE I

LS/ZOO/CC-101 P

NON-CHORDATES I: PROTISTA TO PSEUDOCOELOMATA

PRACTICALS

(Credits 2)

1. Study of whole mount of *Euglena*, *Amoeba* and *Paramecium*. Binary fission and Conjugation in *Paramecium*
2. Examination of pond water collected from different places for diversity in Protista
3. Study of *Sycon* (T.S. and L.S.), *Hyalonema*, *Euplectella*, *Spongilla*
4. Study of *Obelia*, *Physalia*, *Millepora*, *Aurelia*, *Tubipora*, *Corallium*, *Alcyonium*, *Gorgonia*, *Metridium*, *Pennatula*, *Fungia*, *Meandrina*, *Madrepora*
5. One specimen/slide of any ctenophore
6. Study of adult *Fasciola hepatica*, *Taenia solium* and their life cycles (Slides/microphotographs)
7. Study of adult *Ascaris lumbricoides* and its life stages (slides/micro-photographs)
8. To submit a Project Report on any related topic on life cycles/coral/ coral reefs.

SUGGESTED READINGS

- Ruppert and Barnes, R.D. (2006). *Invertebrate Zoology*, VIII Edition. Holt Saunders International Edition.
- Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science
- Barrington, E.J.W. (1979). *Invertebrate Structure and Functions*. II Edition, E.L.B.S. and Nelson

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CORE COURSE II

LS/ZOO/CC-102 L

PRINCIPLES OF ECOLOGY

THEORY

(Credits 4)

Unit 1: Introduction to Ecology	6
History of ecology; Autecology and synecology; Levels of organization; Laws of limiting factors-Liebig's law of minimum and Shelford's law of tolerance; Study of physical factors	
Unit 2: Ecosystem	12
Types of ecosystems with one example in detail; Trophic levels; Food chain: Detritus and grazing food chains, Linear and Y-shaped food chains; Food web; Energy flow through ecosystem; Ecological pyramids and Ecological efficiencies; Nutrient and biogeochemical cycle (nitrogen cycle); Human modified ecosystem	
Unit 3: Population	18
Unique and group attributes of population: Density, natality, mortality, life tables, fecundity tables, survivorship curves, age and sex ratio, dispersal and dispersion, Exponential and logistic growth, equation and patterns, r and k strategies; Population regulation-density-dependent and independent factors; Population interactions;	
Unit 4: Community	10
Community characteristics: species richness, dominance, diversity, abundance, vertical stratification, Ecotone and edge effect; Ecological Succession, Types of Succession, Theories pertaining to climax community	
Unit 5: Human impact on environment	10
Environmental Pollution: Air, water and noise pollution; Global environmental issues: Greenhouse effect, Acid rain, Global Warming, Ozone depletion.	
Unit 6: Applied Ecology	4
Ecology in Wildlife Conservation and Management	

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CORE COURSE II

LS/ZOO/CC-102 P

PRINCIPLES OF ECOLOGY

PRACTICALS

(Credits 2)

1. Study of life tables and plotting of survivorship curves of different types from the hypothetical/real data provided
2. Determination of population density in a natural/hypothetical community by quadrat method and calculation of Shannon-Weiner diversity index for the same community
3. Study of an aquatic ecosystem: Phytoplankton and zooplankton, Measurement of area, temperature, turbidity/penetration of light, determination of pH, and Dissolved Oxygen content (Winkler's method), Chemical Oxygen Demand and free CO₂
4. Report on a visit to National Park/Biodiversity Park/Wild life sanctuary

SUGGESTED READINGS

- Colinaux, P. A. (1993). Ecology. II Edition. Wiley, John and Sons, Inc.
- Krebs, C. J. (2001). Ecology. VI Edition. Benjamin Cummings.
- Odum, E.P., (2008). Fundamentals of Ecology. Indian Edition. Brooks/Cole
- Robert Leo Smith Ecology and field biology Harper and Row publisher
- Ricklefs, R.E., (2000). Ecology. V Edition. Chiron Pres

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Santosh Singh

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Department of Zoology, School of Life Sciences, GGV, Bilaspur (CG)

GENERIC ELECTIVE COURSES

LS/ZOO/GE-101 L

AQUATIC BIOLOGY

THEORY

(Credits 4)

UNIT 1: Aquatic Biomes

Brief introduction of the aquatic biomes: Freshwater ecosystem (lakes, wetlands, streams and rivers), estuaries, intertidal zones, oceanic pelagic zone, marine benthic zone and coral reefs.

UNIT 2: Freshwater Biology

Lakes: Origin and classification, Lake as an Ecosystem, Lake morphometry, Physico-chemical Characteristics: Light, Temperature, Thermal stratification, Dissolved Solids, Carbonate, bicarbonates, Phosphates and Nitrates, Turbidity, dissolved gases (Oxygen, Carbon dioxide) Nutrient Cycles in Lakes-Nitrogen, Sulphur and Phosphorous.

Streams: Different stages of stream development, Physico-chemical environment, Adaptation of hill-stream fishes.

UNIT 3: Marine Biology

Salinity and density of Sea water, Continental shelf, Adaptations of deep sea organisms, Coral reefs, Sea weed.

UNIT 4: Management of Aquatic Resources

Causes of pollution: Agriculture, Industrial, Sewage, Thermal and Oil spills, Eutrophication, Management and conservation (legislations), Sewage treatment Water quality assessment- BOD and COD.

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Department of Zoology, School of Life Sciences, GGV, Bilaspur (CG)

GENERIC ELECTIVE COURSES

LS/ZOO/GE-101 P

AQUATIC BIOLOGY

PRACTICALS

(Credits 2)

1. Determine the area of a lake using planimetric and gravimetric method.
2. Identify the important macrophytes, phytoplanktons and zooplanktons present in a lake ecosystem.
3. Determine the amount of Turbidity/transparency, Dissolved Oxygen, Free Carbon dioxide, Alkalinity (carbonates & bicarbonates) in water collected from a nearby lake/ water body.
4. Instruments used in limnology (Secchi disc, Van Dorn Bottle, Conductivity meter, Turbidity meter, PONAR grab sampler) and their significance.
5. A Project Report on a visit to a Sewage treatment plant/Marine bioreserve/ Fisheries Institutes.

SUGGESTED READINGS

- Anathakrishnan : Bioresources Ecology 3rd Edition
- Goldman : Limnology, 2nd Edition
- Odum and Barrett : Fundamentals of Ecology, 5th Edition
- Pawlowski: Physicochemical Methods for Water and Wastewater Treatment, 1st Edition
- Wetzel : Limnology, 3rd edition
- Trivedi and Goyal : Chemical and biological methods for water pollution studies
- Welch : Limnology Vols. I-II

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CORE COURSE III

LS/ZOO/CC-201 I.

NON-CHORDATES II: COELOMATA

THEORY

(Credits 4)

Unit 1: Introduction to Coelomates Evolution of coelom and metamerism	2
Unit 2: Annelida General characteristics and Classification up to classes; Type study of <i>Pheretima</i>	10
Unit 3: Arthropoda General characteristics and Classification up to classes; Type study of <i>Periplaneta</i> ; Vision and Respiration in Arthropoda; Larval forms in Arthropoda; Metamorphosis in Insects; Social life in bees and termites	17
Unit 4: Onychophora General characteristics and Evolutionary significance with special reference to <i>peripatus</i>	4
Unit 5: Mollusca General characteristics and Classification up to classes; Type study of <i>Pila</i> ; Respiration in Mollusca; Torsion and detorsion in Gastropoda; Pearl formation in bivalves; Evolutionary significance of trochophore larva	15
Unit 6: Echinodermata General characteristics and Classification up to classes; Type study of <i>Asterias</i> ; Water-vascular system in Asteroidea; Larval forms in Echinodermata; Affinities with Chordates	12

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Department of Zoology, School of Life Sciences, GGV, Bilaspur (CG)

CORE COURSE III

LS/ZOO/CC-201 P

NON-CHORDATES II: COELOMATA

PRACTICALS

(Credits 2)

1. Study of following specimens:

Annelids - *Aphrodite*, *Nereis*, *Heteronereis*, *Sabella*, *Serpula*, *Chaetopterus*, *Pheretima*, *Hirudinaria* etc **Arthropods** - *Limulus*, *Palamnaeus*, *Palaeomon*, *Daphnia*, *Balanus*, *Sacculina*, *Cancer*, *Esopagurus*, *Scolopendra*, *Julus*, *Bombyx*, *Periplaneta*, termites and honey bees etc **Onychophora** - *Peripatus*

Molluscs - *Chiton*, *Dentalium*, *Pila*, *Doris*, *Helix*, *Unio*, *Ostrea*, *Pinctada*, *Sepia*, *Octopus*, *Nautilus* etc **Echinodermites** - *Pentaceros*/*Asterias*, *Ophiura*, *Chyocaster*, *Echinus*, *Cucumaria* and *Asterion* etc

2. Study of digestive system, septal nephridia and pharyngeal nephridia of earthworm

3. T.S. through pharynx, gizzard, and typhlosolar intestine of earthworm

4. Mount of mouth parts and dissection of digestive system and nervous system of *Periplaneta*

5. To submit a Project Report on any related topic to larval forms (crustacean, mollusc and echinoderm)

SUGGESTED READINGS

- Ruppert and Barnes, R.D. (2006). *Invertebrate Zoology*, VIII Edition. Holt Saunders International Edition
- Barnes, R.S.K., Calow, P., Olive, P. J. W., Golding, D.W. and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science
- Barrington, E.J.W. (1979). *Invertebrate Structure and Functions*, II Edition, E.L.B.S. and Nelson
- Nigam: *Biology of Chordates* (1997, S.Chand)
- Kopal: *Modern text book of Zoology: Vertebrates* (Rastogi Publication)

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CORE COURSE IV

LS/ZOO/CC-202 I

CELL BIOLOGY

THEORY

(Credits 4)

Unit 1: Overview of Cells	8
Prokaryotic and Eukaryotic cells, Virus, Viroids, Mycoplasma, Prions, Cell Theory.	
Unit 2: Plasma Membrane	12
Various models of plasma membrane, Structure And Function of Plasma Membrane. Transport across membranes: Active and Passive transport, Facilitated transport. Cell junctions: Tight junctions, Desmosomes, Gap junctions	
Unit 3: Cellular Organelles And Endomembrane System	12
Structure and Functions: Endoplasmic Reticulum, Golgi Apparatus, Lysosomes, Peroxisomes, Mitochondria: Structure, Semi-autonomous nature, Endosymbiotic hypothesis, Mitochondrial Respiratory Chain, Chemi-osmotic hypothesis.	
Unit 4: Cytoskeleton	8
Structure and Functions: Microtubules, Microfilaments and Intermediate filaments	
Unit 5: Nucleus	10
Structure of Nucleus: Nuclear envelope, Nuclear pore complex, Nucleolus Chromatin: Euchromatin and Heterochromatin and packaging (nucleosome). Giant Chromosomes: Polytene And Lampbrush	
Unit 6: Cell division and Signaling	10
Mitosis, Meiosis, Cell cycle and its regulation. GPCR and Role of second messenger (cAMP)	

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Department of Zoology, School of Life Sciences, GGV, Bilaspur (CG)

CORE COURSE IV

LS/ZOO/CC-202 P

CELL BIOLOGY

PRACTICALS

(Credits 2)

1. Familiarization with the student's Light and dissecting Microscope.
2. Staining of cell and different organelles (nucleus, mitochondria and chromosomes).
3. Permeability of Plasma membrane - effect of isotonic, hypertonic solution.
4. Mitosis in onion root tips and permanent slide and chart.
5. Meiosis in grasshopper testis (from slides/photographs provided) and permanent slide.
6. Study of Polytene chromosomes in Chironomous larva.
7. Preparation of permanent slide to show the presence of Barr body in human female blood cells/cheek cells.

SUGGESTED READINGS

- Karp, G. (2010). *Cell and Molecular Biology: Concepts and Experiments*. VI Edition. John Wiley and Sons. Inc.
- De Robertis, E.D.P. and De Robertis, E.M.F. (2006). *Cell and Molecular Biology*. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
- Cooper, G.M. and Hausman, R.E. (2009). *The Cell: A Molecular Approach*. V Edition. ASM Press and Sunderland, Washington, D.C.; Sinauer Associates, MA.
- Becker, W.M., Kleinsmith, L.J., Hardin, J. and Bertoni, G. P. (2009). *The World of the Cell*. VII Edition. Pearson Benjamin Cummings Publishing, San Francisco.
- Bruce Albert, Bray Dennis, Lewis Julian, Raff Martin, Roberts Keith and Watson James (2008). *Molecular Biology of the Cell*, V Edition, Garland publishing Inc. New York and London.
- P K Gupta: Cell Biology
- Lodish et al: Molecular Cell Biology (2008, Freeman

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Department of Zoology, School of Life Sciences, GGV, Bilaspur (CG)

GENERIC ELECTIVE COURSES

LS700/GE-201 L

ENVIRONMENT AND PUBLIC HEALTH

THEORY

(Credits 4)

Unit 1: Introduction

Sources of Environmental hazards, hazard identification and accounting, fate of toxic and persistent substances in the environment, dose Response Evaluation, exposure Assessment.

Unit 2: Climate Change

Greenhouse gases and global warming, Acid rain, Ozone layer destruction, Effect of climate change on public health

Unit 3: Pollution

Air, water, noise pollution sources and effects, Pollution control

Unit 4: Waste Management Technologies

Sources of waste, types and characteristics, Sewage disposal and its management, Solid waste disposal, Biomedical waste handling and disposal, Nuclear waste handling and disposal, Waste from thermal power plants, Case histories on Bhopal gas tragedy, Chernobyl disaster, Bhopal disaster and Three Mile Island accident and their aftermath.

Unit 5: Diseases

Causes, symptoms and control of Tuberculosis, Asthma, Cholera, Minamata disease, typhoid

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Department of Zoology, School of Life Sciences, GGV, Bilaspur (CG)

GENERIC ELECTIVE COURSES

LS/ZOO/GE-201 P

ENVIRONMENT AND PUBLIC HEALTH

PRACTICALS

(Credits 2)

1. To determine Ph in soil and water samples from different locations.
2. To determine Cl in soil and water samples from different Locations
3. To determine SO₄ in soil and water samples from different Locations
4. To determine NO₃ in soil and water samples from different Locations
5. To determine BOD in water samples from different locations

SUGGESTED BOOKS

- Cutter, S.L., Environmental Risk and Hazards, Prentice-Hall of India Pvt. Ltd., New Delhi, 1999.
- Kolluru Rao, Bartell Steven, Pitblado Ronald Stricoff "Risk Assessment and Management Handbook", McGraw Hill Inc., New York, 1996.
- Kofi Asante Duah "Risk Assessment in Environmental management", John Wiley and sons, Singapore, 1998.
- Kasperson, J.X. and Kasperson, R.E. and Kasperson, R.E., Global Environmental Risks, V.N. University Press, New York, 2003.
- Joseph F Louvar and B Diane Louver Health and Environmental Risk Analysis fundamentals with applications, Prentice Hall, New Jersey 1997.

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Department of Zoology, GGV, Bilaspur (CG)

B.Sc. (Hon's) Zoology SEMESTER - III

ZOO-CC-301

ANIMAL DIVERSITY: CHORDATES

(Credits-02)

Unit 1: Protochordata and Cyclostomata

(04 hrs)

Protochordates: General characters and classification up to classes with examples; Cyclostomata: General characters and classification with examples, Affinities.

Unit 2: Pisces and Amphibia

(05 hrs)

General characters and classification of Pisces and Amphibian up to orders with examples. Skin, scales, migration in fishes, Parental care in fishes and amphibia.

Unit 3: Reptilia

(05 hrs)

General characters and classification up to orders with examples, Poisonous and non poisonous snakes, Poison apparatus and futing mechanism.

Unit 4: Aves

(05 hrs)

General characters and classification up to orders with examples, Migration, flight adaptation, structure of beaks and claws in bird, flightless birds

Unit 5: Mammalia

(05 hrs)

General characters and classification of mammals up to orders, Prototheria, Metatheria, Dentition, Aquatic adaptation

Books Recommended

1. Dorit, Walker & Barnes: Zoology. Brooks Cole; 1 edition (February 15, 1991)
2. Cambell and Reece: Biology (7th ed. 2005, Pearson)
3. Nigam: Biology of Chordates (1997, S.Chand)
4. Kotpal Series of Chordates (Rastogi Publications)

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Department of Zoology, GGV, Bilaspur (CG)

B.Sc. (Hon's) Zoology SEMESTER - III

ZOO-CC: 302

MAMMA PHYSIOLOGY: LIFE SUSTAINING SYSTEMS

(Credits-02)

Unit 1: Digestion

(05 hrs)

Alimentary canal and associated digestive glands; Digestion and absorption of carbohydrates, proteins and fats; Control of secretion of digestive fluids.

Unit 2: Circulation

(05 hrs)

Heart; Double circulation, Origin and conduction of heart beat, Cardiac cycle and its regulation, Elementary knowledge of ECG, Composition of blood, Blood groups, coagulation of blood

Unit 3: Respiration

(05 hrs)

Lungs and associated respiratory organs; Mechanism and regulation of breathing, Exchange of gases, Transport of oxygen and carbon dioxide, Respiratory quotient, Chloride shift, Respiratory pigments, Hemoglobin.

Unit 4: Excretion

(04 hrs)

Kidney; Structure, type and function of Nephron; Urine formation, Hormonal control of renal function, Elementary knowledge of Dialysis.

Unit 5: Reproductive System

(05 hrs)

Histology of testis and ovary; Physiology of male and female reproduction; Puberty, Methods of contraception in male and female

Books Recommended

1. Ganong: Review of Medical Physiology (22nd ed. 2005, Lange Medical)
2. Guyton and Hall: A text book of Medical Physiology (11th ed. 2006, Saunders).
3. Keele & Neil: Samson Wright's Applied Physiology (13th ed. 1989, Oxford)
4. Nielson: Animal Physiology - Adaptation and Environment (5th ed. 2005, Cambridge)
5. Hoar: General and Comparative Physiology (3rd ed., 1987, Prentice Hall)
6. Tortora: Animal Physiology

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Department of Zoology, GGV, Bilaspur (CG)

B.Sc. (Hon's) Zoology SEMESTER III

ZDD- CC: 303

Practical (Credits- 02): Lab course based on 301 and 302

ANIMAL DIVERSITY: CHORDATES

1. Study of museum specimens of chordates:
2. Mounting of Placoid, cycloid and ctenoid scales.
3. Study of different types of feathers- contour, filoplume and down feathers
4. Histological slides of different tissues and organs of fishes, amphibians, reptiles, birds and mammal.

ANIMAL PHYSIOLOGY

1. Counting of red blood corpuscles
2. Counting of white blood corpuscles
3. Determination of hemoglobin content
4. Determination of erythrocyte sedimentation rate (ESR) and packed cell volume (PCV)
5. Study of activity of salivary amylase in relation to substrates, pH and temperature
6. Histological slides

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Department of Zoology, GGV, Bilaspur (CG)

B.Sc. (Hon's) Zoology SEMESTER - IV

ZOO.CC. 401

BASIC AND APPLIED GENETICS

(Credits-02)

Unit 1: Mendelism and its extensions

(05 hrs)

Mendel's laws of inheritance; Chromosomal basis of inheritance; Application of laws of probability to Mendelian inheritance, Co-dominance, Incomplete dominance, multiple allelism;

Lethal alleles, Pleiotropy; Epistasis, Polygenic inheritance; Cytoplasmic inheritance

Unit 2: Linkage and Crossing over

(04 hrs)

Linkage and crossing-over; Cytological basis of crossing over, Interference and coincidence.

Unit 3: Sex chromosome system

(04 hrs)

XX/XO, XX/XY, ZZ/ZW and haploidy/diploidy types and sex determination, Sex linkage

Unit 4: Human Genetics

(06 hrs)

Human karyotype, Banding, Nomenclature of chromosome subdivisions; Structural and numerical alterations of chromosome, Gene mutation; Disorders related to chromosomal and gene mutation (Down, Turner and Klinefelter syndromes, Chronic myeloid leukemia, "Cry of cat" syndrome, Cystic fibrosis); Introduction to pedigree analysis.

Unit 5: Transposable genetic elements

(6 hrs)

Transposons in bacteria, Ac-Da elements in males and P element in *Drosophila*, Transposons in human

Books Recommended

Gardner et al: Principles of Genetics (2006, John Wiley)

Griffith et al: An Introduction to Genetic Analysis (2008, Freeman)

Hartl & Jones: Essential Genetics - A Genomic Perspective (2009, Jones & Bartlet)

Pierce: Genetics - A Conceptual Approach (W. H. Freeman, 12-Apr-2011)

Russell: Genetics (2009, Benjamin Cummings)

Soustad & Simmons: Principles of Genetics (2012, John Wiley)

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Department of Zoology, GGV, Bilaspur (CG)

B.Sc. (Hon's) Zoology SEMESTER - IV

ZOO-CC: 402

ANIMAL PHYSIOLOGY: CONTROLLING AND COORDINATING SYSTEMS

(Credits-02)

Unit 1: Nervous System

(05 hrs)

Structure of neuron, resting membrane potential, Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibers; Types of synapse, Synaptic transmission and, Neuromuscular junction; Reflex action and its types - reflex arc;

Unit 2: Muscle

(04 hrs)

Histology of different types of muscle; Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction; Characteristics of muscle twitch; Motor unit, summation and tetanus

Unit 3: Sense Organs

(05 hrs)

Classification of receptors, Brief account of visual and auditory receptors, Structure of eye, ear nose and tongue.

Unit 4: Endocrine System

(05 hrs)

Histology of endocrine glands - pineal, pituitary, thyroid, parathyroid, pancreas, adrenal; hormones secreted by them and their mechanism of action, Accessory endocrine gland in heart and kidney

Unit 5: Endocrine System

(05 hrs)

Classification of hormones; Regulation of their secretion; Mode of hormone action, Signal transduction pathways for steroidal and non-steroidal hormones; Hypothalamus (neuroendocrine gland) - principal nuclei involved in neuroendocrine control of anterior pituitary and endocrine system; Placental hormones

Books Recommended

1. Ganong: Review of Medical Physiology (22nd ed. 2005, Lange Medical)
2. Guyton and Hall: A text book of Medical Physiology (11th ed. 2006, Saunders).
3. Nielson: Animal Physiology - Adaptation and Environment (5th ed. 2005, Cambridge)
4. Hoar: General and Comparative Physiology (3rd ed., 1987, Prentice Hall)
6. Tortora: Animal Physiology

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15

B.Sc. (Hon's) Zoology SEMESTER IV

ZOO-CC: 403

Practical (Credits-02): Lab Course (401 + 402)

GENETICS

1. Application of probability in the law of segregation with the coin tossing
2. Familiarization with techniques of handling *Drosophila*, identifying males and females; observing wild type and mutant (white eye, wing less) flies, and setting up cultures.
3. Study of structural chromosome aberrations (dicentric, ring chromosomes and inversions in polytene chromosomes) from prepared slides/photographs.
4. Study of human karyotypes and numerical alterations (Down, Klinefelter and Turner syndrome).
5. Preparation of temporary slide of Barr body by own cheek epithellium or hair root.

ANIMAL PHYSIOLOGY: CONTROLLING AND COORDINATING SYSTEMS

1. Study of histological slides of the following glands in rats: pituitary, thyroid, adrenal, endocrine pancreas, testis and ovary
2. Study of egg and tadpole of frog
3. Window preparation of fertilized egg
4. Study of whole mount preparations of chick embryos of 16-18, 24-28, 33-36 and 42-48 h of development.

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B.Sc. (Hon's) Zoology SEMESTER - V

ZOO-CC-IX: COMPARATIVE ANATOMY OF NON-CHORDATES AND CHORDATES

Unit 1: Overview of different patterns of digestion in non-chordates: Intracellular and extracellular; feeding mechanisms (suspension, deposit, cropping, sucking herbivores, raptorial, carnivorous); general pattern of respiration and circulation in non-chordates **7 hrs**

Unit 2: Overview of different patterns of excretory organs in non-chordates; Protonephridia, Metanephridia and Malpighian tubules; Types and pattern of reproduction: Asexual and Sexual. **7 hrs**

Unit 3: Integument and its derivatives in Chordates. Structure of integument, scales, feathers, hair, beak, claw, nail, hoof, horn, antler, gland, Endoskeleton: Skull, Vertebrae and Girdles. **7 hrs**

Unit 4: Digestive system in chordates: Modifications in relation to feeding habits; Oesophagus, Stomach; Dentition, dental formula in mammals; Respiratory System: Aquatic respiration, Aerial respiration; Circulatory system: Heart, Aortic arches. **7 hrs**

Unit 5: Nervous system in chordates: Evolution of cerebral hemispheres and cerebellum, Cranial and spinal nerve; Excretory system- Types and evolution of kidney tubules, Urinary duct and bladder; Reproductive system- General plan of gonads. **8 hrs**

Books Recommended

1. Kotpal: Modern Text Book of Zoology: Vertebrates (10th ed, 2012, Rastogi Publication)
2. Kardong: Vertebrates' Comparative Anatomy, Function and Evolution. (4th ed, 2005, McGraw-Hill Higher Education)
3. Kent and Carr: Comparative Anatomy of the Vertebrates (9th ed, 2000, The McGraw-Hill Companies)
4. Hildebrand: Analysis of Vertebrate Structure (1995, John Wiley)
5. Nigam: Biology of Chordates (1983, S Chand)
6. Romer & Parsons: The vertebrate Body (6th ed, 1986, Saunders)

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B.Sc. (Hon's) Zoology SEMESTER - V

ZOO-CC-X: ANIMAL PHYSIOLOGY

Unit 1: Nutrition and Digestion: Balanced diet; Role of salivary glands, Gall Bladder, Liver, Gastric glands, Pancreas, Intestinal Glands; Digestion and absorption of carbohydrates, proteins and fats; Control of secretion of digestive fluids. **07 hrs**

Unit 2: Blood: Buffer system in blood, Composition of blood, Blood groups, coagulation of blood, Homeostasis; Circulation: double circulation, origin and conduction heart beat, Cardiac cycle and its regulation, Elementary knowledge of ECG. **07 hrs**

Unit 3: Respiration: Mechanism and regulation of breathing, Structure and types of haemoglobin, Exchange of gases, Transport of oxygen and carbon dioxide, Respiratory quotient, Chloride shift. **07 hrs**

Unit 4: Excretion: Nephron, Urine formation, Hormonal control of renal function, Elementary knowledge of Dialysis; Muscles: Ultrastructure of skeletal muscle, Muscle proteins, Chemistry of muscle contraction, Elementary knowledge of muscle twitch, tetanus and fatigue. **08 hrs**

Unit 5: Nervous System: Myelinated and non-myelinated nerve fibres, Resting and action potential, Initiation and conduction of nerve impulse, Types of synapses and chemical transmission. **07 hrs**

Books Recommended

1. Vander, Sherman and Luciano: Vander's Human Physiology: The Mechanism of Body Function. (13th ed. 2014, McGraw Hills)
2. Victor P. Eroschenko.: diFiore's Atlas of Histology with Functional correlations. (12th ed. 2008, Lippincott W. & Wilkins)
3. Ganong: Review of Medical Physiology (22nd ed. 2005, Lange Medical)
4. Tortora and Grabowski: Principles of Anatomy & Physiology (11th ed. 2006, John Wiley & sons)
5. Guyton and Hall: A text book of Medical Physiology (11th ed. 2006, Saunders).
6. Keele & Neil: Samson Wright's Applied Physiology (13th ed. 1989, Oxford)
7. Nielson: Animal Physiology - Adaptation and Environment (5th ed. 2005, Cambridge)
8. Hoar: General and Comparative Physiology (3rd ed., 1987, Prentice Hall)

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B.Sc. (Hon'rs) Zoology SEMESTER V

ZOO-C1- Practical (Credits- 03)

Lab Course (V - 3)

Comparative anatomy of non-chordates and chordates

1. Study of specimens and models relevant to comparative anatomy of non-chordates
2. Study of placoid, cycloid and ctenoid scales through permanent slides/photographs
3. Study of different types of feathers- contour, filoplume and down feathers
4. Study of histological slides of different tissues and organs of fishes, amphibians, reptiles, birds and mammal.

Animal Physiology

1. Enumeration of red blood cells and white blood cells using haemocytometer
2. Estimation of haemoglobin using Sahli's haemoglobinometer
3. Preparation of haemin and haemochromogen crystals
4. Determination of Erythrocyte sedimentation rate (ESR) and Packed Cell Volume PCV
5. Study of activity of salivary amylase in relation to substrate, pH and temperature

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19

B.Sc. (Hons) Zoology SEMESTER - V

III S PAPER

ZOO-CC-XE BIOSTATISTICS AND COMPUTER APPLICATIONS

Unit - 1: Handling Data

7 hrs

Collection of Data, Sampling Design, Classification and Tabulation, Graphical representation of data, Measures of central tendency: Definition, Characteristics of satisfactory averages, types of averages, their merits and demerits.

Unit - 2: Basic analysis of data

7 hrs

Measures of dispersion: Range, Mean deviation, Standard deviation, Standard error of mean, Variance, Coefficient of variation and Calculation based on them, Correlation and Regression and their coefficients

Unit - 3: Probability and Distribution

12 hrs

Elementary idea of probability: Null hypothesis, Test of significance and calculations: Z-Test, Student t-test, Chi-square test and its significance, Frequency distribution: Binomial distribution, Poisson distribution and Normal distribution, Program used in biostatistics: SPSS, Minitab.

Unit - 4: Introduction to computer

4 hrs

Generations of Computer, Basics of computers (CPU, I/O units), memory, computer software,

Unit - 5: Networking

6 hrs

Networks (LAN, WAN) and Internet, Concept of hypertext and internet protocol (HTTP, TCP/IP), home-pages, web-pages and uniform resource locators (URL). Computer applications.

Books Recommended

Biostatistics:

1. James L. Bruning, B.L. Kintz, Computational Handbook of Statistics (4th Edition)
2. Helmut Fritz Van Emden, Statistics for Terrified Biologists, Wiley Blackwell (2008)
3. Rebecca W-Besmer, Martina, Statistics at the Bench-A Step-by-Step Handbook for Biologists by Dierge (2009)

Computer Applications:

1. V Rajaraman, Fundamentals of Computers, PHI.
2. A.Girol, Computer Fundamentals, PHI.


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B.Sc. (Hon'rs) Zoology SEMESTER - V

ZOO- DSE- I; ELECTIVE I (A)- Endocrinology

- Unit 1: Classification and characteristic of hormones and mechanism and effects of hormonal actions.
- Unit 2: Hypothalamus (neuroendocrine gland) - principal nuclei involved in neuroendocrine control of anterior pituitary and endocrine system
- Unit 3: Biosynthesis and secretion of adrenal, pancreas (insulin), ovarian, testicular and thyroid hormones, factors influencing hormone secretion
- Unit 4: Structure of Gonads, Hormonal regulation of spermatogenesis in testis and oogenesis in ovary, Placental hormones
- Unit 5: Role of gastrointestinal hormones on the secretion and control of enzymes of gastrointestinal tract

ZOO- DSE- I; ELECTIVE I (B) -Fish Biology

- Unit 1: General characters of fishes, Different types of fins and scales, lateral line system, Swim Bladder, sense and electric organ in fishes.
- Unit 2: Feeding habits of fishes, Age and growth, Growth rate and aging, Length weight relationship
- Unit 3: General morphological features of digestive system in fishes, Aquatic respiration, General features of heart and blood circulation.
- Unit 4: Oviparous, viviparous and ovoviviparous fishes, Structure of ovary and testes, Migration in fishes - anadromous and catadromous
- Unit 5: Endocrine organs in fishes, Excretion and osmoregulation in fishes, Brain and cranial nerves

ZOO- DSE- I; ELECTIVE I (C)- Toxicology

- Unit 1: Toxicology: Scope, basic division and goals of toxicology; Environment; Toxicant and toxicity; Factors affecting the environmental concentration of toxicant; Factors affecting toxicity: exposure, organism and chemicals.
- Unit 2: Dose and response: Dose-response relationship, toxicity curve, toxicity testing; route of exposure; duration of exposure; Acute, Subacute and Chronic; Toxicity tests.
- Unit 3: Public Health Hazards: Toxic chemicals; Toxic effects; Pesticides: Type and exposure; Generation of pesticides; Fertilizers; Pesticide and fertilizers residues from agriculture fields & control measures.
- Unit 4: Automobile emission: Carbon monoxide, sulphur dioxide, nitric oxide, hydrocarbon, photochemical products; Heavy metals: Source, emission and toxic effect.
- Unit 5: Radioactive substances: Kinds and source of radiation exposure; biological effect of radiation; Type, function and health hazards of food additives.







Department of Zoology, GGV, Bilaspur (CG)

B.Sc. (Hou's) Zoology SEMESTER - VI

ZOOCC-XII: Environmental Biology

Unit 1: Ecosystem Components of ecosystems, Ecological factors: Abiotic and Biotic; Trophic levels, food chains and food webs, Ecological pyramids, Energy flow in ecological systems	8 hrs
Unit 2: Population Ecology Population: Basic concepts, population characteristics - density, natality, mortality, age-structure, growth forms	5 hrs
Unit 3: Community Ecology Community: Basic concepts, community structure, habitat & niche concept, Concept of keystone species and ecotone; Succession: Concepts of succession, Types of Succession.	8 hrs
Unit 4: Biodiversity and Conservation Biodiversity concept, types of biodiversity, biodiversity and human welfare, mega diversity zones and biodiversity hot spots with special reference to India. Concept of conservation, in situ and ex-situ methods.	8 hrs
Unit 5: Pollution Pollution: types, sources and effects of major pollutants of air, water, soil and noise, Control of pollution	7 hrs

Books Recommended

1. Reece: Campbell Biology (9th ed, 2011), Pearson, New York)
2. Odum: Fundamentals of Ecology (2008, Indian Edition, Brooks/Cole)
3. Berry Joseph: Environmental Studies (2005, Tata McGraw Hill Publ. Co. Ltd.)
4. Primack: A primer of conservation biology (3rd ed, 2004, Sinauer Associates, Massachusetts)
5. Raven and Berg: Environment (3rd ed, 2001, Harcourt College Publishers, New York)
6. Ricklefs: Ecology. (5th ed, 2000, Chiron Press)
7. Krebs: Ecology. 6th ed, 2001, Benjamin Cummings)

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34

B.Sc. (Hon's) Zoology SEMESTER - VI

ZOO-CU-XIII: Biotechniques

LZC 601: Unit 1: Quantification techniques: Measuring of pH using paper strips, pH meter; Centrifugation (sedimentation, density gradient) 07 hrs

Unit 2: Principle of colorimeter and spectrophotometer; Cell counting by using haemocytometer cell sorting by flow cytometer. 07 hrs

Unit 3: Basic principles of microscopy: Type of microscopes: Bright field, dark-field, Phase Contrast, Fluorescence, confocal; Microscopic measurements: micrometry using the ocular and stage micrometer; Tissue fixation, block preparation and sectioning / microtomy. 08 hrs

Unit 4: Cell and tissue culture technique: Culture media; Sterilization; rooms, culture media and glass wares; types of animal cell culture; Cell viability, cryopreservation. 07 hrs

Unit 5: Electrophoresis: Nucleic acid and Protein electrophoresis; Chromatography: Principle and applications of i) Thin layer, ii) Gel filtration, iii) Ion change iv) HPLC and v) Gas Chromatography. 07 hrs

Books Recommended

1. Wilson & Walker: Experimental Biochemistry (2006, Cambridge)
2. Boyer: Modern Experimental Biochemistry (1993, Benjamin-Cummings,)
3. Pearse: Histochemistry - Theoretical and applied, Volume I-III (1980-1993, Churchill-Livingstones)
4. Plummer: An Introduction to Practical Biochemistry (1989, McGraw Hill)

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B.Sc. (Hon's) Zoology SEMESTER VI

ZOO-CC-Practical Credits-03

Lab Course ZM-300

Environmental Biology

1. Study of life tables and plotting of survivorship curves of different types from the hypothetical/real data provided
2. Collection and preservation of water and soil samples (Field Practical)
3. Estimation of the Moisture Content & Water Holding Capacity of soil
4. Study of an aquatic ecosystem: Phytoplankton and zooplankton, temperature, turbidity/penetration of light, determination of pH, total hardness and Dissolved Oxygen content, Chemical Oxygen Demand and free CO₂
5. Determination of population density in a natural/hypothetical community by quadrat method and calculation of Shannon-Weiner diversity index for the same community
6. Preparation of field report based on the survey of local fauna

Biotechniques

1. Principle and working of Centrifuges
2. Principle and working of Chromatography (Paper chromatography)
3. Principle and working of colorimeter and spectrophotometer
4. Cell counting using haemocytometer (by using suitable stain)
5. Working and principle of flow cytometer
6. Measuring of pH using a pH meter
7. Gel electrophoresis: Nucleic acid and Protein electrophoresis

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B.Sc. (Hon's) Zoology SEMESTER - VI

ZOO-CC-XIV: Molecular Biology and Genetic Engineering

Unit 1: Genetic Material	5 hrs
RNA as primitive genetic material, evidences for DNA as genetic material, concept of genetic code	
Unit 2: Gene Regulation in Prokaryotes	8 hrs
Transcription regulation in prokaryotes: Principles of transcriptional regulation with examples from <i>lac</i> operon and <i>trp</i> operon.	
Unit 3: Gene Expression in Eukaryotes	8 hrs
Types of DNA polymerase, Transcription unit, promoter and enhancer, Transcription regulation in eukaryotes: Activators and repressors enhancers, silencers elements	
Unit 4: Concept of genome, transcriptome and proteome	5 hrs
Unit 5: Genetic Engineering	10 hrs
Elementary concept of genetic engineering: Restriction enzymes, vectors; Construction of recombinant DNA, Concept of gene cloning, Production of recombinant protein.	

Books Recommended

1. McLennan, Bates, Turner, and White: Molecular Biology (4th ed. 2015, G&S, Taylor and Francis Group, New York and London)
2. Karp: Cell and Molecular Biology: Concepts and Experiments, (6th ed. 2010, John Wiley and Sons, Inc)
3. Becker, Kleinsmith, Hardin and Bertoni: The World of the Cell (7th ed, 2009, Pearson Benjamin Cummings Publishing, San Francisco)
4. Watson, Myers, Cardy and Witkowski: Recombinant DNA- Genes and Genomes- A Short Course. (3rd ed. 2007, Freeman and Co., N.Y., USA)
5. De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. (8th ed. 2006, Lippincott Williams and Wilkins, Philadelphia)
6. Glick and Pasternak: Molecular Biotechnology - Principles and Applications of Recombinant DNA, 4th ed. 2009, ASM press, Washington, USA).

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B.Sc. (Hon's) Zoology SEMESTER - VI

ZOO-DSE-2; ELECTIVE II (A)- ENDOCRINOLOGY

Unit 1. Control of hormone secretion: Synthesis, processing, and sorting of proprohormone precursor; Sequential stages of the regulated secretory pathway; Dense core granule; Exocytosis; Regulation of exocytosis by calcium and protein kinase C.

Unit 2. Receptors: Nuclear receptors, Structure, Families (glucocorticoids, thyroid and estrogen), Metabolism, Activation and recycling.

Unit 3. Membrane receptors, Enzyme-linked receptors, Cytokine receptors, G-Protein coupled receptors, Ligand-gated ion channels.

Unit 4. Hormone signaling: Receptor tyrosine kinase pathway, Cytokine receptors pathway, Cyclic AMP pathway; Phospholipid/calcium; Protein kinase C pathway, Nitric oxide signaling pathway, MAP kinase pathway, Hormonal control of gene expression.

Unit 5. Molecular basis of hormone synergism and antagonism; glycogen metabolism, Smooth muscle contraction; Termination of hormone action; Pathophysiology of hormone receptors, hormone analogues as drug and Xeno-estrogens.

ZOO-DSE-2; ELECTIVE II (B)- FISH BIOLOGY

Unit 1: Fishery resources of India. Inland fisheries, Riverine fishery: regulation and exploitation, river pollution, dams and their effect on fish migration.

Unit 2: Inland fishing gears and fishing methods: Types of fishing gears, Preparation and maintenance of fishing nets, Modern techniques and equipment for finding and capturing fishes.

Unit 3: Types of rearing ponds and Fish farm Management, Factors affecting the fish culture.

Unit 4: Fish culture technique, Monoculture and polyculture.

Unit 5: Fish by-products: production and utilization: Liver oils, Fish meal, Fishilage, Fish protein, Shark fins and fish rays, Fish roes, Bingleass, Fish skin, Pearl essence.

ZOO-DSE-2; ELECTIVE II (C)- TOXICOLOGY

Unit 1: Aquatic toxicology: toxicants, factors and effects; Bioaccumulation and Biomagnifications in aquatic organisms; Bioassay study; Aquatic pollution and toxicity; Types and sources of pollutants.

Unit 2: Methods of assessment of aquatic pollution; Biological indicators of pollution; Drinking water treatment and Disposal of sewage;

Unit 3: Xenobiotics and its life cycle: Membrane permeability and mechanism of chemical transfer; Absorption and translocation of xenobiotics; Membrane barriers: Blood-Brain barriers, Placental barriers, Blood-Testes barrier, Blood-Urine barrier, Blood-Bile barrier; Binding of xenobiotics and storage depot; Routes of excretion of xenobiotics.

Unit 4: Biotransformation of Xenobiotics: selective toxicity receptor sites; type of biotransformation; Biotransformation of pesticide (DDT), chemicals (CCl₄) and drugs (Acetaminophen).

Unit 5: Biomonitoring: Definition and objectives, Biological Monitoring Program; Parameters of Biomonitoring; Bioindicators and Environmental Monitoring; Application of Bioassay in Toxicology.


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