

**DAYALBAGH EDUCATIONAL INSTITUTE****FACULTY OF SCIENCE****DEPARTMENT OF ZOOLOGY: 2018-19**

Course Number	Course Title	Credits	End Sem. Exam.Exists	Theory/ Practical
ZOH101	ZOOLOGY THEORY	4.0	Yes	T
ZOH102	ZOOLOGY PRACTICAL	2.0	Yes	P
ZOW101	CELL BIOTECHNOLOGY I	2.0	No	P
ZOW102	BIOINFORMATICS I	2.0	No	P
ZOM101	LOWER INVERTEBRATES	3.0	Yes	T
ZOM102	HIGHER INVERTEBRATES	3.0	Yes	T
ZOM103	PRACTICAL	2.0	Yes	P
ZOM104	SEMINAR & GROUP DISCUSSION	0.5	No	P
ESC191	ENVIRONMENTAL STUDIES	2.0	No	T
GKC191	SC.METH.,G.K. & CURRENT AFFAIRS	1.0	No	T
RDC191	RURAL DEVELOPMENT	1.0	No	P
CEC191	CULTURAL EDUCATION	2.0	No	P
ZOH281	BASICS OF NEUROSCIENCE	3.0	Yes	T
ZOH201	ZOOLOGY THEORY	4.0	Yes	T
ZOH202	ZOOLOGY PRACTICAL	2.0	Yes	P
ZOW201	CELL BIOTECHNOLOGY II	2.0	No	P
ZOW202	BIOINFORMATICS II	2.0	No	P
ZOM201	CHORDATA I	3.0	Yes	T
ZOM202	CHORDATA II	3.0	Yes	T
ZOM203	PRACTICAL	2.0	Yes	P
ZOM204	SEMINAR & GROUP DISCUSSION	0.5	No	P
GKC291	SC.METH. G.K. & CURRENT AFFAIRS II	1.0	No	T
RDC291	AGRICULTURE OPERATIONS	1.0	No	P
RDC292	SOCIAL SERVICE	1.0	No	P
CAC291	CO-CURRICULAR ACTIVITIES	3.0	No	P
CRC291	COMPARATIVE STUDY OF RELIGION	2.0	No	T
ZOM301	ANIMAL ECOLOGY	3.0	Yes	T
ZOM302	CELL BIOLOGY	3.0	Yes	T
ZOM303	GENETICS	3.0	Yes	T
ZOM304	PRACTICAL	3.0	Yes	P
ZOM305	SEMINAR & GROUP DISCUSSION	0.5	No	P
GKC391	SC.METH. G.K. & CURRENT AFFAIRS III	1.0	No	T
ZOM401	ANIMAL PHYSIOLOGY	3.0	Yes	T
ZOM402	EVOLUTION & ZOOGEOGRAPHY	3.0	Yes	T
ZOM403	MICROBIOLOGY	3.0	Yes	T
ZOM404	PRACTICAL	3.0	Yes	P
ZOM405	SEMINAR & GROUP DISCUSSION	0.5	No	P
GKC491	SC.MATH. G.K. & CURRENT AFFAIRS IV	1.0	No	T
CAC491	CO-CURRICULAR ACTIVITIES	3.0	No	P

ZOM501	BIOLOGICAL CHEMISTRY	3.0	Yes	T
ZOM502	PARASITOLOGY	3.0	Yes	T
ZOM503	DEVELOPMENTAL BIOLOGY	3.0	Yes	T
ZOM504	ENTOMOLOGY	3.0	Yes	T
ZOM505	WILD LIFE CONSERVATION & MANAGEMENT	3.0	Yes	T
ZOM506	PRACTICAL	9.0	Yes	P
ZOM601	IMMUNOLOGY	3.0	Yes	T
ZOM602	QUANTITATIVE BIOLOGY	3.0	Yes	T
ZOM603	MOLECULAR GENETICS	3.0	Yes	T
ZOM604	NEUROBIOLOGY	3.0	Yes	T
ZOM605	HYDROBIOLOGY	3.0	Yes	T
ZOM606	PRACTICAL	9.0	Yes	P
ZOM701	CELL & MOLECULAR BIOLOGY	3.0	Yes	T
ZOM702	RESOURCE MANAGEMENT STRATEGIES	3.0	Yes	T
ZOM703	TOXICOLOGY	3.0	Yes	T
ZOM704	INSTRUMENTATION & STATISTICAL APPLS.	3.0	Yes	T
ZOM705	ENVIRONMENTAL PARASITOLOGY	3.0	Yes	T
ZOM706	PRACTICAL	9.0	Yes	P
ZOM801	WILDLIFE TECHNIQUES	3.0	Yes	T
ZOM802	BIOCHEMISTRY	3.0	Yes	T
ZOM803	ANIMAL BEHAVIOUR	3.0	Yes	T
ZOM804	ADVANCED PHYSIOLOGY	3.0	Yes	T
ZOM805	RECENT TRENDS IN BIOLOGY	3.0	Yes	T
ZOM806	PRACTICAL	9.0	Yes	P
ZOM001	BASIC RES. METH., SC.COMPUT.& ANAL.	4.0	Yes	T
ZOM002	PRE-DISSERTATION	4.0	No	P
ZOM901	DISSERTATION	12.0	Yes	P
ZOM902	MOLECULAR TECHNIQUES	4.0	Yes	T
ZOM903	GENETIC DIVERSITY ASSESSMENTS	4.0	Yes	T
ZOM904	ADVANCES IN PARASITOLOGY	4.0	Yes	T
ZOM905	ADVANCED TECHNIQUES IN PARASITOLOGY	4.0	Yes	T
ZOM906	EXPERIMENTAL ENTOMOLOGY	4.0	Yes	T
ZOM907	ENVIRONMENTAL TOXICOLOGY	4.0	Yes	T
ZOM908	PESTS MANAGEMENT	4.0	Yes	T
ZOM909	ADVANCED NEUROBIOLOGY I	4.0	Yes	T
ZOM910	ADVANCED NEUROBIOLOGY II	4.0	Yes	T
ZOM951	DISSERTATION I	8.0	Yes	P
ZOM952	DISSERTATION II	16.0	Yes	P
ZOM953	SELF STUDY COURSE	4.0	Yes	P
ZOM954	ADV. SCIENTIFIC METHODOLOGY& ANALYSIS	4.0	Yes	T
ZOM955	GENE, GENOME & BIOINFORMATICS	4.0	Yes	T
ZOM956	MOLECULAR PARASITOLOGY& VECTOR CTRL	4.0	Yes	T
ZOM957	RESTORATION ECOLOGY CONSERV.& MNGT.	4.0	Yes	T
ZOM958	VECTOR BIOLOGY AND MANAGEMENT	4.0	Yes	T
ZOM959	ANIMAL COGNITION	4.0	Yes	T

**Course Number: ZOH101, Course Title: ZOOLOGY THEORY**

Class: B.Sc./B.Sc. H.S., Status: ANCILIARY COURSE, Approved since session: 2017-18

Total Credits:4, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

UNIT 1: SYSTEMATICS AND CELL BIOLOGY [9 pds]

a) Outline classification of animal kingdom (b) Branches of Zoology (c) Cell and Protoplasm-RNA and DNA and their role in heredity (d) Cell division: Amitosis, Mitosis and Meiosis.

UNIT 2: TYPE STUDY [6 pds]

Structure, physiology and life cycle of the following: (a) *Frog* (b) *Ascaris*.

UNIT 3: MAMMALIAN PHYSIOLOGY [6 pds]

Physiology of (a) Digestion (b) Respiration (c) Excretion.

UNIT 4: GENETICS, EUGENICS AND EVOLUTION [9 pds]

(a) Mendelian theories (b) Determination of sex-linked inheritance, (c) Eugenics-Positive and Negative, (d) Evolution: Evidences, Darwinism & Lamarckism.

UNIT 5: ECOLOGY [9 pds]

(a) Definition, branches, Different factors-Physical, chemical and biological (b) Concept of Ecosystem (c) Population and Community (d) Destruction of fertile land and pollution of water and air resources (e) Balance of Nature.

**SUGGESTED READINGS:**

Parker and Hasewell: A TEXT BOOK OF ZOOLOGY (VOL.I & II)

Kotpal and Khetarpal: A TEXT BOOK OF INVERTEBRATE ZOOLOGY

Jordan and Nigam: ANIMAL BIOLOGY

Majumuria TC: A TEXT BOOK OF ZOOLOGY (VOL.1 & II)

Hyman, LH: THE INVERTEBRATE Vol I & II

Nigam, HC: BIOLOGY OF INVERTEBRATES

Bordaille, LA & Potts, EA: INVERT

Jordan, EL: INVERTEBRATE ZOOLOGY

Kotpal & Khetarpal: MODERN TEXTBOOK OF INVERTEBRATE ZOOLOGY

**Course Number: ZOH102, Course Title: ZOOLOGY PRACTICAL**

Class: B.Sc./B.Sc. H.S., Status: ANCILIARY COURSE, Approved since session: 2015-16

Total Credits:2, Periods(55 mts. each)/week: 5(L-0+T-0+P/S-5),Min.pds./sem.:65

(a) Important museum specimens from invertebrates and vertebrates (b) Histological slides from invertebrates and vertebrates (c) Permanent slides Preparations (d) Practical Record (e) Viva voce.

**Course Number: ZOW101, Course Title: CELL BIOTECHNOLOGY I**

Class: B.Sc., Status of Course: Work Exp. Course, Approved since session: 2015-16

Total Credits:2, Periods(55 mts. each)/week: 4(L-0+T-0+P/S-4),Min.pds./sem.:52

**Biochemistry & Biochemical methods**

**Theory:** (a) Concept of ions and chemical bonds (b) Proteins and nucleic acid (c) Membrane structure and function energy

**Practical:** (a) Preparation of Buffers and other solutions (b) Qualitative analyses of enzymes and proteins by SDS-PAGE technique (c) Protein Extraction.

**Course Number: ZOW102, Course Title: BIOINFORMATICS I**

Class: B.Sc., Status of Course: Work Exp. Course, Approved since session: 2016-17

Total Credits:2, Periods(55 mts. each)/week: 4(L-0+T-0+P/S-4),Min.pds./sem.:52

**Introduction to Bioinformatics and bioinformatics tools**

**Theory:** (a) Bioinformatics: Introduction, importance, goal, scope and limitations (b) Data generation and Data retrieval (c) Biological Databases: Primary, secondary and composite (d) Sequence alignment and Phylogenetic analysis

**Practical:** (a) Assessing biological databases (b) Retrieval of nucleotide and protein sequences from databases (c) BLAST (d) FASTA (g) Phylogenetic analysis: UPGMA

**Course Number: ZOM101, Course Title: LOWER INVERTEBRATES**

Class: B.Sc., Status of Course: MAJOR COURSE, Approved since session: 2017-18

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

LOWER INVERTEBRATES, INTRODUCTION, SYMMETRY, COELOM, ACOELOM AND PARASITISM

General characteristics and Classification up to classes of each phylum:

UNIT 1: PHYLUM-PROTOZOA [10 pds]

(a) *Paramecium*- Biology; ciliated biology (b) *Plasmodium*- Life cycle and pathogenicity (c) *Trypanosoma*- Life cycle and pathogenicity.

UNIT 2: PHYLUM-PORIFERA [5 pds]

(a) *Sycon*- Canal system in sponge

UNIT 3: PHYLUM-COELENTERATA [8 pds]

(a) *Obelia*- Polymorphism, metagenesis, Coral reefs

UNIT 4: PHYLUM-PLATYHELMINTHES [8 pds]

(a) *Fasciola*- Life cycle and pathogenicity (b) *Taenia*- Life cycle and pathogenicity

UNIT 5: PHYLUM-NEMATHELMINTHES [8 pds]

(a) *Ascaris*- Life cycle and pathogenicity (b) Parasitic adaptations in helminths

**SUGGESTED READINGS:**

Jordan, EL: INVERTEBRATE ZOOLOGY

Majumuria, TC: TEXTBOOK OF INVERTEBRATE ZOOLOGY

Hyman, LH: THE INVERTEBRATE Vol I & II

Nigam, HC: BIOLOGY OF INVERTEBRATES

Kotpal & Khetarpal: MODERN TEXTBOOK OF INVERTEBRATE ZOOLOGY

Bordaille, LA & Potts, EA: INVERTEBRATA

**Course Number: ZOM102, Course Title: HIGHER INVERTEBRATES**

Class: B.Sc., Status of Course: MAJOR COURSE, Approved since session: 2016-17

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

UNIT 1: INTRODUCTION TO COELOMATES

Evolution of coelom and metamerism

UNIT 2: ANNELIDA

(a) General characteristics and classification up to classes (b) Excretion in Annelida

UNIT 3: ARTHROPODA

(a) General characteristics and classification up to classes (b) Vision and respiration in Arthropoda

(c) Metamorphosis in insects (d) Social life in bees and termites (e) General characteristics and evolutionary significance of Onychophora

UNIT 4: MOLLUSCA

(a) General characteristics and classification up to classes (b) Respiration in Mollusca (c) Torsion and detorsion in Gastropoda (d) Pearl formation in bivalves (e) Evolutionary significance of trochophore larva

UNIT 5: ECHINODERMATA

(a) General characteristics and classification up to classes (b) Water vascular system in Asteroidea (c) Larval forms in Echinodermata (d) Affinities with chordates

**SUGGESTED READINGS:**

Jordan EL: INVERTEBRATE ZOOLOGY

Kotpal & Khetarpal: MODERN TEXTBOOK OF INVERTEBRATE ZOOLOGY

Bordaille, LA & Potts, EA: INVERTEBRATA

Hyman, LH: THE INVERTEBRATES Vol I & II

Majumuria, TC: TEXTBOOK OF INVERTEBRATE ZOOLOGY

Nigam, HC: BIOLOGY OF INVERTEBRATES

Jordan EL: INVERTEBRATE ZOOLOGY

Bordaille, LA & Potts, EA: INVERTEBRATA

**Course Number: ZOM103, Course Title: PRACTICAL**

Class: B.Sc., Status of Course: MAJOR COURSE, Approved since session: 2016-17

Total Credits:2, Periods(55 mts. each)/week: 4(L-0+T-0+P/S-4),Min.pds./sem.:52

1. Study of museum specimens from all the important Invertebrate phyla: - Protozoa to Echinodermata.

2. Study of Histological and whole mount slides based on the theory course

3. Study of pond waters for diversity of Protista.

4. Temporary and permanent slide preparation: *Companularia*.

5. Collection and identification of agriculture pests

6. *Paramecium* - Collection and identification

7. Project record.

**Course No.: ZOM104, Course Title: SEMINAR & GROUP DISCUSSION**

Class: B.Sc., Status of the Course: Major Course, Approved since session: 2015-16

Total Credits: 0.5, Periods(55 mts. each)/week: 1(L-0+T-0+P/S-1), Total Periods per semester: 13

Topics related to courses ZOM101 & ZOM102

**Course No.: ESC131/151/161/171/181/191/281 Course Title: ENVIRONMENTAL STUDIES**

Class: BA/BCom/BSc/BTech/BBM/BEd, Status of Course: CORE COURSE, Approved since session: 2018-19

Total Credits:2, Periods(55 mts. each)/week:2(L-2+T-0+P/S-0), Min.pds./sem.:26

**UNIT 1: INTRODUCTION TO NATURAL RESOURCES**

Introduction to natural resources (soil, water, air, flora and fauna).

**UNIT 2: ECOSYSTEMS**

Structure and function of an ecosystem. Different types of ecosystems (Forest, Grassland, Desert, Aquatic etc.), Ecological succession, Food chain, Food Webs, Ecological pyramids.

**UNIT 3: BIODIVERSITY AND ITS CONSERVATION**

Value of biodiversity. India as a mega-biodiversity Nation. Threats to biodiversity. Methods of conservation of biodiversity.

**UNIT 4: DEGRADATION OF NATURAL RESOURCES**

Overexploitation, soil, water and air pollution, waste generation. Remediation and management of degraded soil.

**UNIT 5: ENVIRONMENT AND SOCIAL ISSUES**

Environmental ethics. Human population and Environment and Human health Status report on environmental issues related to natural resource management and socio-economic conditions.

**SUGGESTED READINGS:**

Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380013, India

Heywood, V. H & Watson, R. T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.

Jadhav, H & Bhosale, V. M. 1995. Environmental Science Protection and Laws. Himalaya Pub. House, Delhi 284 p.

Odum, E. P. 1971. Fundamentals of Ecology. W. B. Saunders Co. USA, 574p

Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science

Wanger K. D., 1998 Environmental Management. W. B. Saunders Co. Philadelphia, USA 499 p.

**Course Number GKC191, Title: SC. METH., G.K. & CURRENT AFFAIRS**

Class: B.Voc., Status of Course: CORE COURSE, Approved since Session: 2015-16

Total Credits: 1, Periods(55 mts. each)/week:1 (L-1+T-0+P/S-0), Min.pds./sem.:13

1. GEOGRAPHY (INDIA): States, Union territories, capitals, Area, population, languages, and religions.
2. HISTORY (INDIA): Brief History from Indus valley civilization to the present day. History of Independence, historical places.
3. POLITICAL SCIENCE (INDIA): Constitution, national anthem, national song, current political scene.. Political parties, general elections, famous leaders.
4. ENGINEERING & SCIENCE (INDIA): Famous Engineers and scientist. Recent developments and inventions. Research labs. Space and atomic Energy project.
5. SPORTS & GAMES (INDIA): Olympic Movement, Major games, Indian Rewards, Famous Tournaments and Trophies. Achievements of Indians in world sports and games.
6. FILMS (INDIA): History of Indian film Industry, Personalities and achievements of Indian film industry.
7. Current Affairs.

**SUGGESTED READINGS:**

NCERT: TEXT BOOKS ON HISTORY, GEOGRAPHY, CIVICS

MANORAMA YEAR BOOK

MR Agarwal: GENERAL KNOWLEDGE DIGEST

NEWS PAPAERS AND MAGAZINES:

HINDI & ENGLISH DAILY NEWS PAPERS

COMPETITION MASTER

COMPETITION SUCCESS AND REVIEWS

INDIA TODAY

SPORTS STAR

YOJNA

ILLUSTRATED WEEKLY

SCIENCE DIGEST

INVENTIONS

**Course Number: RDC191, Course Title: RURAL DEVELOPMENT**

Class: B.Sc., Status of Course: Major Course, Approved since session: 2000-01

Total Credits: 1, Periods (55 mts. each)/week: 2 (L:1+T:0+P:1+S:0), Min.pds./sem: 26

**Land Surveying:** Introduction. Measurement of distance. Different types of instruments used in measurements. Obstacles in measurement.

(a) Chain Surveying-Instruments used. Method of conducting and plotting. Compass survey. Instruments required. Method of conducting and plotting.

(b) Plane Table Survey. Various instruments used. Different methods of conducting plane table survey.

(c) Levelling. Instruments used. Method of conducting levelling to find out longitudinal sector along a line.

**Agriculture Farming:** Importance of Agriculture in Indian economy and life. Soil. Its constituents. Their importance and classification.

**Preparation of land for Agriculture Farming:** Levelling. Ploughing. Watering. Manuring.

**Different Operations of Farming:** Sowing, Weeding, Interculture, Harvesting.

**Course Number: CEC131/151/161/191/441/681****Course Title: CULTURAL EDUCATION**

Class: B.Sc., Status of Course: MAJOR COURSE, Approved since session: 2001-02

Total Credits: 2, Periods (55mts. each)/week: 3 (L-3+T-0+P/S-0), Min.pds./sem: 39

**UNIT 1: INDIA AND INDIAN CULTURE**

- (a) Geographical background and Indian people
- (b) Culture and Civilization: Meaning and significance
- (c) Characteristic features of Indian culture
- (d) Unity in Diversity.

**UNIT 2: CULTURAL BACKGROUND OF THE SOCIAL ORGANISATION**

- (a) Marriage and family institutions
- (b) Varnashram System, Caste System and their modern form.
- (c) Education system and Institutions.

**UNIT 3: LANGUAGE AND LITERATURE**

- (a) Sanskrit and Literature
- (b) Pali, Prakrit, Apabhramsha, Regional Languages and Literature (introduction only)
- (c) Scientific Traditions- Ayurvedigyan, M

**UNIT 4: INDIAN CREATIVE TRADITIONS-INTRODUCTION**

- (a) Performing Arts- Music and dance
- (b) Visual Arts- Painting, Sculpture and Architecture
- (c) Scientific Traditions- Ayurvedigyan, Mathematics astronomy.

**UNIT 5: INDIA AND THE WORLD**

Indian cultural contribution to the world.

**SUGGESTED READINGS:**

AL Basham: THE WONDER THAT WAS INDIA

Stella Kamrich: INDIAN SCULPTURE

AK Coomaraswamy: ARTS AND CRAFTS OF INDIA

Sunit Kumar Chatterjee: LANGUAGES AND LITERATURE OF MODERN INDIA

Bishan Swarup: THEORY OF INDIAN MUSIC

Edward Conze: BUDDHIST SCRIPTURES

Rajkishore Singh: BHARTIYA KALA AUR SANSKRITI

Rawlinson: CULTURAL HISTORY OF INDIA

BN Lunia: PRACHIN BHARTIYA SANSKRITI

Baldeo Upadhyaya: SANSKRIT SHASTRON KA ITIHAS

**Course Number: ZOH201, Course Title: ZOOLOGY THEORY**

Class: BA(SS)/BA, Status of Course: N.F. ANCILIARY COURSE, Approved since session: 2017-18  
Total Credits: 4, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: INTRODUCTION, TAXONOMY AND EVOLUTION [10 pds]**

(a) What is Biology? Scientific study of living beings (b) Difference between living and non-living (c) Main branches of Zoology (d) Taxonomy of Animal kingdom (e) Evolution-Evidences (f) Darwinism and Lamarckism.

**UNIT 2: MAMMALIAN PHYSIOLOGY [8 pds]**

(a) Digestion (b) Respiration (c) Excretion.

**UNIT 3: CYTOLOGY, GENETICS AND EUGENICS [8 pds]**

(a) The cell-structure and different types of cell divisions (b) Difference between animal cell and plant cell (c) Mendelism (d) Inheritance of Sex (e) Sex Determination (f) Genetic engineering

**UNIT 4: ECOLOGY [8 pds]**

(a) Definition, branches and different factors viz. physical, chemical and biological (b) Ecosystem (c) Population (d) Community (e) Pollution of water and air

**UNIT 5: GENERAL BIOLOGY [8 pds]**

Introduction to: (a) Disease causing animals and micro organisms (b) Economic importance of animals: Honey bees, Fish, Cattle, Poultry, Earthworm

**SUGGESTED READINGS:**

Parker and Hasewell: A TEXT BOOK OF ZOOLOGY (Vol. I and II)

Kotpal: INVERTEBRATES

Jordan and Nigam: A TEXT BOOK OF ZOOLOGY (Vol. I and II)

Kotpal: VERTEBRATES

Hegner and Robert: COLLEGE ZOOLOGY

**Course Number: ZOH202, Course Title: ZOOLOGY PRACTICAL**

Class: BA(SS)/BA, Status of Course N.F. ANCILIARY COURSE, Approved since session: 2017-18  
Total Credits: 2, Periods(55 mts. each)/week: 4(L-0+T-0+P/S-4),Min.pds./sem.:52

(a) Important museum specimens from invertebrates and vertebrates (b) Histological slides from invertebrates and vertebrates (c) Preparation of Permanent slides (d) Virtual demonstration of Dissection of *Pheretima*: Digestive and Reproductive system (e) Practical Record (f) Viva voce.

**Course Number: ZOH281, Course Title: BASICS OF NEUROSCIENCE**

Class: B.Tech/BA(SS)/BA, Status of Course: N.F. HALF COURSE, Approved since session: 2016-17  
Total Credits: 3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: INTRODUCTION TO NEUROSCIENCE [7 pds]**

(a) Historical perspectives of neuroscience (b) Neuroanatomy: Central Nervous System (CNS), Peripheral Nervous System (PNS), Autonomic Nervous System (ANS), Spinal cord.

**UNIT 2: THE NERVOUS SYSTEM- AN INTRODUCTION [8 pds]**

(a) Introduction to the structure and function of the nervous system; Cellular components: Neurons, Neuroglia (b) Neuron doctrine; The prototypical neuron- axons and dendrites as unique structural components of neurons (c) The ionic bases of resting membrane potential; The action potential, its generation and properties (d) The action potential conduction.

**UNIT 3: ION CHANNELS AND NEUROTRANSMITTERS [8 pds]**

(a) Ion channels (b) Different types of neurotransmitters- catecholamines, amino acidergic and peptidergic neurotransmitters (c) transmitter gated channels; G-protein coupled receptors and effectors (d) Neurotransmitter receptors; Ionotropic and metabotropic receptors.

**UNIT 4: CELLULAR AND MOLECULAR NEUROPHYSIOLOGY [8 pds]**

(a) Molecular and cellular approaches used to study the CNS at the level of single molecules; Synapse: Synaptic transmission, types of synapses, Synaptic function (b) Principles of chemical synaptic transmission (c) Principles of synaptic integration (d) EPSPs and IPSPs (e) Ion channels (f) Neural transmission.

**UNIT 5: TECHNIQUES TO STUDY BRAIN [8 pds]**

(a) Sensory systems (b) Molecular basis of behavior including learning and memory; Types of memory with reference to Artificial Intelligence (AI) (c) Neuroimaging techniques e.g. MRI, fMRI, PET scan and EEG (d) Molecular pathogenesis of pain (e) Neurodegenerative diseases e.g. Parkinson's, Alzheimers, Huntington's, psychological disorders and addiction.

**SUGGESTED READINGS:**

Dale Purves et al: NEUROSCIENCE. 5th Ed (2012). Sinauer Associates Inc.

Eric R. Kandel et al: PRINCIPLES OF NEURAL SCIENCE. 5th Ed (2012). Elsevier

Scanlon & Tina Sander. ESSENTIALS OF ANATOMY AND PHYSIOLOGY. 5th Ed (2012). F.A. Davis Company

Frank Amthor. NEUROBIOLOGY FOR DUMMIES. 1st Ed (2014). For Dummies, A Wiley Brand

**Course Number: ZOW201, Course Title: CELL BIOTECHNOLOGY II**

Class: B.Sc., Status of Course: Work Exp. Course, Approved since session: 2015-16

Total Credits:2, Periods(55 mts. each)/week: 4(L-0+T-0+P/S-4),Min.pds./sem.:52

**Molecular and Cellular Techniques**

**Theory:** (a) Eukaryotic and Prokaryotic cells (b) The cell culture environment (c) Maintenance of the culture-cell line. (d) Microscopy.

**Practical:** (a) Aseptic and sterilization technique (b) Media preparation (c) Cell counting and Growth-cycle (d) Microscopic methods and cytometry (e) Staining of Gram +ve and Gram -ve bacteria.

**Course Number: ZOW202, Course Title: BIOINFORMATICS II**

Class: B.Sc., Status of Course: Work Exp. Course, Approved since session: 2015-16

Total Credits:2, Periods(55 mts. each)/week: 4(L-0+T-0+P/S-4),Min.pds./sem.:52

**Phylogenetic Tree Analysis and Structure Prediction**

**Theory:** (a) Determination of Protein structure (b) RNA Structure (c) Protein-Protein interactions

**Practical:** (a) Protein Primary structure prediction (b) Protein Secondary structure prediction (c) Protein Tertiary structure prediction (d) Nucleotide secondary structure prediction (e) DIP (f) BioGRID

**Course Number: ZOM201, Course Title: CHORDATA I**

Class: B.Sc., Status of Course: MAJOR COURSE, Approved since session: 2016-17

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: PROTOCHORDATA**

(a) General characteristics and outline classification up to orders (b) Study of larval forms in Protochordates (c) Retrogressive metamorphosis in Urochordates

**UNIT 2: ORIGIN OF CHORDATA**

(a) Dipleurula concept and Echinoderm theory of origin of chordates (b) General characteristics and classification of Cyclostomes up to orders

**UNIT 3: PISCES AND AMPHIBIA**

(a) General characteristics and outline classification up to orders (b) Migration, osmoregulation and parental care in fishes (c) Evolution of terrestrial ectotherms, parental care in Amphibia

**UNIT 4: REPTILES AND AVES**

(a) General characteristics and outline classification up to orders (b) Poison apparatus and biting mechanism in snakes (c) Principles and aerodynamics of flight (d) Perching mechanism, flight adaptations and migration in birds

**UNIT 5: MAMMALIA**

(a) General characteristics and outline classification up to orders (b) Affinities of Prototheria (c) Adaptive radiation with reference to locomotory appendages

**SUGGESTED READINGS:**

McNeil Alexander: THE CHORDATES

Berril NJ: THE ORIGIN OF VERTEBRATES

Hardisty MW & Potter IC: THE BIOLOGY OF LAMPREYS

Barrington EJW: THE BIOLOGY OF HEMICHORDATES AND PROTOCHORDATES

Jordan EL & PS Verma: CHORDATE ZOOLOGY

Khetarpal & Kotpal: TEXTBOOK OF CHORDATE ZOOLOGY

Majupuria TC: CHORDATE ZOOLOGY

Prasad SN: TEXTBOOK OF CHORDATE ZOOLOGY



**Course Number: ZOM202, Course Title: CHORDATA II**

Class: B.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

COMPARATIVE VERTEBRATE ANATOMY OF THE SYSTEMS WITH RESPECT TO PISCAN, AMPHIBIAN, REPTILIAN, AVIAN AND MAMMALIAN:

UNIT 1: INTEGUMENTARY SYSTEM [8 pds]

Structure and derivatives of integument: (a) Structure of Skin (b) Epidermal Derivatives (c) Dermal Derivatives

UNIT 2: DIGESTIVE SYSTEM [8 pds]

(a) Alimentary canal and associated glands (b) Dentition in mammals

UNIT 3: CIRCULATORY AND RESPIRATORY SYSTEMS [8 pds]

(a) Evolution of heart and respiratory organs – skin, gills, air bladder and lungs

UNIT 4: UROGENITAL SYSTEM [8 pds]

(a) Evolution of kidney (b) genital organs

UNIT 5: NEURO-ENDOCRINE SYSTEM [7 pds]

(a) Central nervous system (b) sensory organs (c) endocrine glands

**SUGGESTED READINGS:**

Jordan EL & PS Verma: CHORDATE ZOOLOGY

Prasad SN: TEXTBOOK OF CHORDATE ZOOLOGY

Majupuria TC: CHORDATE ZOOLOGY

Khetarpal & Kotpal: TEXTBOOK OF CHORDATE ZOOLOGY

**Course Number: ZOM203, Course Title: PRACTICAL**

Class: B.Sc., Status of Course: MAJOR COURSE, Approved since session: 2017-18

Total Credits:2, Periods(55 mts. each)/week: 4(L-0+T-0+P/S-4),Min.pds./sem.:52

1. Study of museum specimens from all major lower Chordata, Pisces and Amphibia, Reptiles, Aves and Mammals.
2. Histological slides based on theory course.
3. Dissection of commercial fishes- Cranial nerves, ear ossicles. Comparative Skeletal System of vertebrates.
4. Permanent slide preparation of various fish scales-Placoid, ganoid, ctenoid and Cycloid.
5. Project report based on field visit.
6. Microtomy upto ribbon formation (if dissection is not allowed)

**Course No.: ZOM204, Course Title: SEMINAR AND GROUP DISCUSSION**

Class: B.Sc., Status of the Course: Major Course, Approved since session: 2015-16

Total Credits: 0.5, Periods(55 mts. each)/week:1(L-0+T-0+P/S-1), Total Periods per semester: 13

Topics related to courses ZOM201 & ZOM202.

**Course No.GKC231/251/261/291/681, Title: SC.METH. G.K. & CURRENT AFFAIRS II**

Class: BBM/BSSc/BA/BCom/BSc/BSc Engg., Status: Core Course, Approved since session: 2004-05

Total Credits: 1, Periods(55 mts. each)/week:1(L-1+ T -O+P/S-O), Min.pds./sem. :13

**UNIT 1: POLITICAL SCIENCE-INDIA**

Constitution-preamble, citizenship, fundamental, rights, Distribution of powers, General elections, Mode of amendments, Some important amendments, President, Prime Minister and their tenure, salary, powers etc., Defence Forces and Awards.

**UNIT 2: POLITICAL SCIENCE**

INDIA-Important Indian Political Parties and their symbols, Important Indian Newspapers.

WORLD-United Nations Organisation - its main organs, specialised agencies of UNO, major blocks, treaties, alliances, conferences and associations.

**UNIT 3: ECONOMICS-INDIA**

Some basic economic facts, Five Year Plans, Industrial developments, Principal industries, Industrial Financial Institutions.

**UNIT 4: ECONOMICS-WORLD**

Important international monetary organisations, Currencies of different countries, Glossary of economic terms.

**UNIT 5: ENVIRONMENTAL STUDIES-ECO SYSTEM & BIODIVERSITY**

(a) Ecosystem - Concept, Structure and Function, Energy Flow in the Ecosystem, Food Chain, Forest Ecosystem, Grassland Ecosystem, Desert Ecosystem, Aquatic Ecosystem (b) Biodiversity and its Conservation - Introduction, genetic species and Ecosystem Diversity, Value of Bio-diversity, India as a Mega-Diversity Nation, Hot-spots of Biodiversity, Threats to Biodiversity, Endangered and Endemic Species in India, Conservation of Biodiversity.

**SUGGESTED READING:**

NCERT: TEXT BOOKS ON HISTORY, GEOGRAPHY, CIVICS

MANORAMA YEAR BOOK

MR Agarwal: GENERAL KNOWLEDGE DIGEST

NEWS PAPERS AND MAGAZINES:

HINDI & ENGLISH DAILY NEWS PAPERS

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YOJNA

**Course Number: CRC251, Course Title: COMPARATIVE STUDY OF RELIGION**

Class: B.Sc., Status of Course: CORE COURSE, Approved since session: 1999-2000

Total Credits: 2, Periods(55 mts. each)/week: 2 (L-2+T-0+P/S-0), Min.pds./sem.: 26

1. INTRODUCTION: (a) Meaning of Religion-Importance and value of religion in human life. (b) Primitive Religious ideas and beliefs. (c) Historical Religions: Theistic religions: Non-Theistic religions and secular humanism. (d) Religion and Science: Faith and reason.
2. THE HINDU RELIGIOUS TRADITIONS: (a) Pre-Vedic Indus Religious ideas: Yoga, Sakti, Cult and other forms of religious life. (b) The Vedic Religion: Gods, Sacrifices, Priests. (c) Upanishadic religion: Brahman-atman, Knowledge, Moral virtues.
3. THE BUDDHIST RELIGIOUS TRADITIONS: (a) Sramana thought and the origins of Buddhism: Life of Buddha. (b) The basic teachings of the Buddha: Four Holy truths, Sila, Samadhi, Prajna, Middle ways, Nirvana, Samsara. (c) Spread of Buddhism in India and the world.(Sects and schools of Buddhism, Ashoka) (d) Mahayana and the Buddhist view, Doctrine of Karuna and Universal liberation.
4. JAINISM: (a) Antiquity of Munis: Parsvanatha's teachings. (b) Life of Mahavira, His teachings: Great vows. (c) Jain doctrine of self and liberation, Ahimsa.
5. JUDAISM AND CHRISTIANITY: (a) Prophets of Israel: Moses and His teachings. (b) Life of Jesus Christ and Ten Commandments, the Bible. (c) Christian Doctrine of God and Salvation. (d) Sects of Christian Church with special reference to India.
6. ISLAM: (a) Life of Prophet Mohammed. (b) The teachings of the Islam and Muslim creed. (c) Sects of Islam and Sufism.
7. THE SANT TRADITIONS OF INDIA: (a) Bhakti Renaissance. (b) Kabir and Guru Nanak: Teachings. (c) Radhasoami Faith.
8. MODERN RELIGION MOVEMENTS: Arya Samaj, Brahma Samaj, Theosophical Society etc.
9. LESSONS FROM COMPARATIVE RELIGIONS AND INTER-RELIGIOUS UNDERSTANDING:  
*Note: The teacher while discussing the principles of Religions will also touch upon Major scriptures and lives of important religious leaders.*

**SUGGESTED READINGS:**

Joshi LM & Singh Harbans: AN INTRODUCTION TO INDIAN RELIGIONS

Tagore, Ravindranath: RELIGION OF MAN.

Misra, Brahm Shanker: DISCOURSES ON RADHASOAMI FAITH

Bhagwan Das: SAB DHARMON KI BUNYADI EKTA

Bhagwandass: ESSENTIAL UNITY OF ALL RELIGIONS

Singh GR & Devis CW: VISHWA KE PRAMUKH DHARM

Chaturvedi, Parashuram: UTTARI BHARAT KI SANT PARAMPARA

**Course Number: RDC291, Course Title: AGRICULTURAL OPERATIONS**

Class: B.Sc., Status of Course: Major Course, Approved since session: 2000-01

Total Credits: 1, Periods (55 mts. each)/week: 2(L:1+T:0+P:1+S:0), Min.pds./sem: 26

**UNIT 1**

Concept of Agriculture- importance, problems of modern agriculture, classification of crops, Agriculture at a glance

**UNIT 2**

Land management and seed sowing- Field preparation (hoeing, harrowing, planking) nursery raising soil treatment, Seed types, seed rate, spacing, seed treatment method of sowing

**UNIT 3**

Nutritional management- Essential elements, their role, deficiency symptoms and classification, difference between organic manure and chemical fertilizers, types, green manures vermin compost, bio fertilizers, modes of manurial application.

**UNIT 4**

Intercultural operations-(i) Water management- Irrigation importance, critical stages methods of irrigation.

(ii) Crop protection- Importance diseases (casual organism and symptoms), insect and non-insect pests and prominent weeds causing damage to important crops, preventive and curative measures.

**UNIT 5**

Harvesting and post harvest management- Harvesting, threshing, winnowing, grain drying and storage of the produce.

**PRACTICAL**

1. Acquaintance with layout of an ideal agricultural farm through field visit
2. Identification of important crop seeds, manures fertilizers, diseases, insect pests and weeds
3. Understanding of the plant protection measures
4. Actual in-field participation in various farm activities viz., field preparation, sowing, intercultural activities (weeding, earthing, rouging, watering, manorial application), spraying and dusting of plant protection chemicals, harvesting, bundling threshing winnowing

**Course Number: RDC292, Course Title: SOCIAL SERVICE**

Class: B.Sc., Status of course: CORE COURSE, Approved since Session: 2015-16

Total Credits: 1, Periods: 55 min. each (L-0+T-0+P/S-1), Min.Pds./Sem.:13

To familiarize and participate in cleaning, field preparation, seeding, weeding, harvesting and threshing activities related to Agricultural Operations.

To sensitize students regarding keeping their surroundings clean by practically carrying the activity in campus and around D.E.I. (Deemed University) and work for all round development of society.

**Course Number: CAC291, Course Title: CO-CURRICULAR ACTIVITIES**

Class: B.Sc., Status of course: MAJOR COURSE, Approved since Session: 2015-16

Total Credits: 1, Periods: 55 min. each (L-0+T-0+P/S-1), Min.Pds./Sem.:13

To encourage students in cultural activities viz. Dramatics & Music Competition, Games & Sports and literary activities viz. Hindi & English Essays, Hindi & English Debate Competition to have overall development of the student.

**Course Number: ZOM301, Course Title: ANIMAL ECOLOGY**

Class: B.Sc., Status of Course: MAJOR COURSE, Approved since session: 2017-18

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: HISTORY, INTRODUCTION AND NATURE OF ECOSYSTEM**

(a) Nature and constituents of ecosystem: (i) Concepts of ecosystem, types of ecosystem- fresh water, marine water, aerial, desert and terrestrial ecosystem, (ii) Abiotic components (iii) Biotic component (iv) Trophic levels (v) Intra and interspecific relationships

**UNIT 2: BIOGEOCYCLES AND LAWS**

(a) Cycles of chemical elements in ecosystems/ Biosphere: water, Oxygen, Nitrogen and CO<sub>2</sub> and mineral cycle, environment of hydrosphere, lithosphere and atmosphere (b) Limiting factors: (i) Liebig's law of minimum (ii) Shelford's law of tolerance (c) Energy Flow

**UNIT 3: POPULATION & COMMUNITY ECOLOGY**

(a) Characteristics of population: mortality, dispersal and natality (b) Population dynamics (c) structure and attributes-density dependant and independent: diversity (c) Ecological succession and Indicators

**UNIT 4: WILD LIFE CONSERVATION AND MANAGEMENT**

(a) Principles and practices of wild life management (b) Sampling techniques; mark capture techniques, Radio- telemetry (c) Foraging habits and territoriality (d) wild life forensics

**UNIT 5: AQUATIC ECOLOGY**

(a) Water resources- Lentic and lotic systems (b) Ramsar sites (c) Water quality indices (d) Water pollution and its hazards (e) Yamuna action plan

**SUGGESTED READINGS:**

Elton C: ANIMAL ECOLOGY

EP ODUM: FUNDAMENTALS OF ECOLOGY

Basic Ecology: Fundamentals of Ecology by Eugene P.Odum (Author)Publisher: Brooks/Cole; Rev Sub edition (1 February 1983)

Principles of environmental science, inquiry and applications. By W.P. Cunningham, and M.A. Cunningham, (2003)Publisher: Tata McGraw-Hill Publ. Co. Ltd

Ecology: Science and practice by Faurie and Claude (2008)Publisher: Oxford &IbhPublishing Co. Pvt Ltd (2008)

Concepts of Ecology by R.L. Kotpal and N.P. Bali Publisher: Vishal Publishing Co

Ecology and Environment by P.D. Sharma Publisher: Rastogi Publications (2011)

**Course Number: ZOM302, Course Title: CELL BIOLOGY**

Class: B.Sc., Status of Course: MAJOR COURSE, Approved since session: 2017-18

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: OVERVIEW OF CELL [8 pds]**

(a) Cell concept and theory (b) Types of cells- eukaryotic, prokaryotic and Mycoplasma (c) Tools and techniques of cell biology- microscopic, analytical and separation

**UNIT 2: PLASMA MEMBRANE [8 pds]**

(a) Structure (b) Dynamics (c) Transmembranal transport (d) Cell junctions and communication

**UNIT 3: CELL ORGANELLES AND INCLUSIONS: STRUCTURE, FUNCTIONS AND INTERACTIONS**

[8 pds]

(a)Nucleus (b) Mitochondria (c) ER (d) Lysosomes (e) Golgi bodies (f) Peroxysomes

**UNIT 4: CELL DIVISION [8 pds]**

(a) Cell cycle checkpoints and its regulation (b) Mitosis (c) Meiosis

**UNIT 5: CHROMOSOMES [7 pds]**

(a) Nucleosome model (b) Euchromatin and heterochromatin (c) Lampbrush chromosomes (d) Polytene chromosomes (e) Chromosomal aberrations

**SUGGESTED READINGS:**

Molecular Biology of the Cell – Bruce Alberts

Cell Biology - Gerald Karp

Molecular Biology of the Cell – Lodish

The World of the Cell- WM Becker, L J Kleinsmith, J Hardin

**Course Number: ZOM303, Course Title: GENETICS**

Class: B.Sc., Status of Course: MAJOR COURSE, Approved since session: 2017-18

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: MENDELISM**

[8 pds]

(a) Mono-, di- and trihybrid crosses and its application (b) Test cross (c) Probability concept (d) Pedigree analysis.

**UNIT 2: GENE ACTION**

[8 pds]

(a) Codominance (b) Multiple alleles (c) Lethal genes (d) Pleiotropic genes (e) Gene interaction and Epistasis (f) Linkage and crossing over (g) Extranuclear inheritance.

**UNIT 3: MUTATION, MUTAGENESIS AND REPAIR**

[8 pds]

(a) Cytological evidences on mutation (b) Concept of gene-mutation (c) Chemical and radiation mutagenesis (d) DNA repair mechanism.

**UNIT 4: SEX DETERMINING SYSTEMS AND DOSAGE COMPENSATION**

[8 pds]

(a) XX/XO, XX/XY, ZZ/ZW and Haploidy/Diploidy types (b) Chromosome anomalies (c) Dosage compensation – Lyons hypothesis. (d) Barr bodies and inactivation.

**UNIT 5: GENE EXPRESSION AND APPLICATIONS**

[7 pds]

(a) Replication (b) Prokaryotic - transcription (c) Eukaryotic – transcription (d) Recombinant DNA Technology.

**SUGGESTED READING:**

GENETICS : Strickberger. John Wiley and sons.

CONCEPTS OF GENETICS : Klug, Cummings, Spencer and Palladino; Pearson Publication.

GENETICS : Snustad and Simmons. John Wiley and sons.

MODERN GENETIC ANALYSIS: Griffiths, Gelbert, Lewontin, and Miller. W.H. Freeman and Company.

GENETICS: Russel, Benjamin-Cummings Publ. company

**Course Number: ZOM304, Course Title: PRACTICAL**

Class: B.Sc., Status of Course: MAJOR COURSE, Approved since session: 2017-18

Total Credits:3, Periods(55 mts. each)/week: 4(L-0+T-0+P/S-4),Min.pds./sem.:52

**1. ECOLOGICAL EXPERIMENTS**

(a) Biomass measurement (b) Animal Adaptation Exercises (c) BOD measurement (d) Soil testing (e) Water testing

**2. CYTOLOGICAL STUDIES**

(a) Study of various stages of mitosis and meiosis (b) Chiasma frequency determination (c) Mapping of polytene chromosomes.

**3. GENETICAL EXPS**

(a) Preparation of metaphase Chromosome from Grasshopper gonads (b) Preparation of Polytene Chromosome from Chironomid larvae (c) Study of Barr body from buccal smear/ hair buds (d) Blood group genetic testing.

4. Project report based on field visit.

5. Viva voce.

**Course Number: ZOM305, Course Title: SEMINAR AND GROUP DISCUSSION**

Class: B.Sc., Status of the Course: Major Course, Approved since session: 2015-16

Total Credits: 0.5, Periods per semester: 1 (L-0+T-0+P/S-1), Total Periods per semester: 13

Topics related to courses ZOM301, ZOM302 & ZOM303

**Course No.GKC391, Title: SC.METH., G.K. & CURRENT AFFAIRS III**

Class: B.Voc., Status: Core Course, Approved since session: 2004-05

Total Credits: 1, Periods(55 mts. each)/week:2(L-2+ T -O+P/S-O), Min.pds./sem. :26

UNIT 1: SCIENCE - Some basic definitions of Scientific terms.

UNIT 2: SCIENCE - Human Physiology and anatomy, Hygiene, Drugs, Diseases.

UNIT 3: SCIENCE - Information Technology - basic terminology, development in India, Bio-technology - basic terminology, important centres in India and World.

UNIT 4: SCIENCE - Inventions and discoveries, Indian Space Programmes, Atomic energy in India, Research centres and Laboratories in India.

UNIT 5: ENVIRONMENTAL STUDIES-POLLUTION AND DISASTER MANAGEMENT

Definition, Causes, Effects and Control Measures of Air, Water, Soil, Marine, Noise and Thermal Pollution, Nuclear Hazards, Solid Waste Management, Role of an Individual in Prevention of Pollution. Floods, Earthquake, Cyclone and Land Slides.

**SUGGESTED READING:**

NCERT: TEXT BOOKS ON HISTORY, GEOGRAPHY, CIVICS

MR Agarwal: GENERAL KNOWLEDGE DIGEST

HINDI & ENGLISH DAILY NEWS PAPERS

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MANORAMA YEAR BOOK

NEWS PAPAERS AND MAGAZINES:

INDIA TODAY

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**Course Number: ZOM401, Course Title: ANIMAL PHYSIOLOGY**

Class: B.Sc., Status of Course: MAJOR COURSE, Approved since session: 2017-18

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: PHYSIOLOGY OF DIGESTION**

(a) Structural organization and functions of gastrointestinal tract and associated glands; (b) Mechanical and chemical digestion of food; (c) Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins; (d) Hormonal control of secretion of enzymes in Gastrointestinal tract

**UNIT 2: BLOOD VASCULAR SYSTEM**

(a) Components of blood and their functions; (b) Structure and functions of haemoglobin  
Haemostasis: Blood clotting system, Kallikrein-Kininogen system, Complement system & Fibrinolytic system, Haemopoiesis Blood groups: Rh factor, ABO and MN (c) Physiology of Heart (d) Structure of mammalian heart; Structure and working of conducting myocardial fibers. Origin and conduction of cardiac impulses Cardiac cycle; (e) Cardiac output and its regulation, Frank-Starling Law of the heart, (f) nervous and chemical regulation of heart rate. (g) Electrocardiogram, Blood pressure and its regulation

**UNIT 3: PHYSIOLOGY OF RESPIRATION**

(a) Histology of trachea and lung; (b) Mechanism of respiration, (c) Pulmonary ventilation; (d) Respiratory volumes and capacities; (e) Transport of oxygen and carbon dioxide in blood; (f) Respiratory pigments, (g) Dissociation curves and the factors influencing it; (h) Carbon monoxide poisoning; (i) Control of respiration

**UNIT 4: RENAL PHYSIOLOGY AND MUSCLE**

(a) Structure of kidney and its functional unit (b) Mechanism of urine formation (c) Regulation of water balance (d) Regulation of acid-base balance (e) Histology of different types of muscle (f) Ultra structure of skeletal muscle (g) Molecular and chemical basis of muscle contraction (h) Characteristics of muscle twitch, Motor unit, summation and tetanus

**UNIT 5: ENDOCRINE SYSTEM**

(a) Histology of endocrine glands - pineal, pituitary, thyroid, parathyroid, pancreas, adrenal; hormones secreted by them and their mechanism of action (b) Classification of hormones (c) Regulation of their secretion (d) Mode of hormone action (e) Signal transduction pathways for steroidal and non-steroidal hormones (f) Hypothalamus (neuroendocrine gland) - principal nuclei involved in neuroendocrine control of anterior pituitary and endocrine system (g) Placental hormones

**RECOMMENDED READINGS**

The World Of the Cell-WM Becker, LJ Kleinsmith, J Hardedin

**SUGGESTED READINGS**

D'Amour FE: BASIC PHYSIOLOGY, INDIAN EDITION

Heilbrunn LV: AN OUTLINE OF GENERAL PHYSIOLOGY

Mitchell PH: A TEXTBOOK OF PHYSIOLOGY

Sheer BT: COMPARATIVE PHYSIOLOGY

Tuttle WW & Schottelius BA: TEXT BOOK OF PHYSIOLOGY

Wood DW: PRINCIPLES OF ANIMAL PHYSIOLOGY

Gordon MS: ANIMAL FUNCTION, PRINCIPLES AND ADAPTATION

Schmidt-Nielson K: ANIMAL PHYSIOLOGY, ADAPTATION AND ENVIRONMENT

Brachet J & AE Mirsky: THE CELL: BIOCHEMISTRY, PHYSIOLOGY AND MORPHOLOGY

Downen RM: GENERAL PHYSIOLOGY

Hoar HS: GENERAL AND COMPARATIVE PHYSIOLOGY

Ruch TC & JF Fulton: TEXT BOOK OF PHYSIOLOGY

Schmidt-Nielson K: ANIMAL PHYSIOLOGY

Wilson JA: PRINCIPLES OF ANIMAL PHYSIOLOGY

Tapp WB: AN INTRODUCTION TO ANIMAL PHYSIOLOGY

**Course Number: ZOM402, Course Title: EVOLUTION & ZOOGEOGRAPHY**

Class: B.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

UNIT 1: ORIGIN [10 pds]

(a) Origin of earth (b) Geological time scale (c) Chemical origin of life: Oparin's hypothesis.

UNIT 2: THEORIES OF EVOLUTION [8 pds]

(a) Darwinism and Neo-Darwinism (b) Lamarckism and Neo-Lamarckism (c) Mutation Theory (d) Cladistic Analysis.

UNIT 3: EVIDENCES [8 pds]

(a) Evidences of evolution (b) Adaptation (c) Isolation (d) Dating of fossils.

UNIT 4: GENETIC BASIS OF EVOLUTION [8 pds]

(a) Gene pool (b) Genetic drift (c) Hardy Weinberg law (d) Molecular clock.

UNIT 5: ZOOGEOGRAPHY [8 pds]

Zoogeographical regions-Zoogeographical habitats and characteristics of faunal diversity.

**SUGGESTED READINGS:**

Carter,GS: ANIMAL EVOLUTION

Darlington, PT: ZOOGEOGRAPHY

Dobzhansky,T: GENETICS AND ORIGIN OF SPECIES

Huxley, J: EVOLUTION: THE MODERN SYNTHESIS

Hyndmann,OR: THE ORIGIN OF LIFE AND THE EVOLUTION OF LIVING THINGS

**Course Number: ZOM403, Course Title: MICROBIOLOGY**

Class: B.Sc., Status of Course: MAJOR COURSE, Approved since session: 2017-18

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

UNIT 1: INTRODUCTION [10 pds]

(a) Introduction and branches of microbiology (b) Culture methods and various types of media (b) Application and culture techniques

UNIT 2: VIRUS [8 pds]

(a) Virus- Discovery, classification, properties (b) Morphology, size, stability (c) Multiplication (d) Lytic and Lysogenic cycle (e) Prions.

UNIT 3: BACTERIA [8 pds]

(a) Classification, structure, nutrition and growth curve (b) Reproduction- Asexual, Sexual- Transformation, transduction, conjugation (c) Archaeobacteria

UNIT 4: MICROBIAL DISEASES [8 pds]

(a)Micro bacterium diseases- tuberculosis (b) Hepatitis (c) RMS Host, Vectors and pathogenicity (d) Typhoid (e) Venereal Disease(f) Water and water associated disease

UNIT 5: APPLIED MICROBIOLOGY [8 pds]

(a) Role of microbes in biotechnology-fermentation technology and downstream processing (b) Soil microbiology

**SUGGESTED READINGS:**

Microbiology 3<sup>rd</sup> Edition by P.D. Sharma Rastogi Publications

Prescott's microbiology by Christopher J. Wolverton Joanne Willey and Linda Sherwood.2010

Prescott's Microbiology -10 edition (January 4, 2016)

Authors: Joanne Willey, Linda Sherwood and Christopher J. Woolverton Publisher: McGraw-Hill Education

Microbiology: An Introduction Authors: Gerard J. Tortora, Berdell R. Funke and Christine L. CasePublisher: Pearson; 12 edition (2 July 2015)

Brock Biology of Microorganisms 14<sup>th</sup> Edition Authors: Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, David A. Stahl and Thomas BrockPublisher: Pearson; 14 edition (2 January 2014)

Foundations in microbiology .1992, by Barry chess and Kathleen Park Talaro

Essential microbiology by Stuart Hogg, 2005



**Course Number: ZOM404, Course Title: PRACTICAL**

Class: B.Sc., Status of Course: MAJOR COURSE, Approved since session: 2016-17

Total Credits:3, Periods(55 mts. each)/week: 4(L-0+T-0+P/S-4),Min.pds./sem.:52

1. BACTERIA: (a) Staining and Identification of gram positive and gram negative Bacteria.
2. FUNGI: (a) Slide preparation (b) Determination of fungal spore.
3. PHYSIOLOGICAL EXPS  
(a) Haemoglobin Percentage test (b) Haemin Crystal preparation (c) Blood Pressure measurement  
(d) Demonstration of unconditioned reflex actions (Knee jerk action) (e) Recording of simple muscle twitch with electrical stimulation (or Virtual) (f) Microtomy: Histochemical staining of prepared microtome slides.
4. Exercise on cladistic analysis.
5. project report based on field visit

**Course Number: ZOM405, Course Title: SEMINAR AND GROUP DISCUSSION**

Class: B.Sc., Status of the Course: Major Course, Approved since session: 2015-16

Total Credits: 0.5, Periods(55 mts. each)/week: 1 (L-0+T-0+P/S-1), Total Periods per semester: 13

Topics related to courses ZOM401, ZOM402 & ZOM403

**Course No.GKC431/451/461/491/881, Title: SC.METH., G.K. & CURRENT AFFAIRS IV**

Class: BBM/BSSc/BA/BCom/BSc/BSc Engg., Status: Core Course, Approved since session: 2004-05

Total Credits: 1, Periods(55 mts. each)/week:1(L-1+ T -O+P/S-O), Min.pds./sem. :13

**UNIT 1: LITERATURE**

Well known Books and their authors (Indian and Foreign). Foreign Words and phrases in common use. Nobel Prizes.

**UNIT 2: INDIAN CINEMA**

History and Important Personalities, Academic and other Institutions, Classical Dances of India, Who is Who?

**UNIT 3**

Abbreviations, Sobriquets, Superlatives

**UNIT 4: SPORTS & GAMES**

Olympic Games - History, Games Played.

**UNIT 5: ENVIRONMENTAL STUDIES-SOCIAL ISSUES**

(a) Social Issues and the Environment - From Unsustainable to Sustainable Development, Water Conservation, Rain Water Harvesting, Environmental Ethics, Climate Change, Global Warming (b) Human Population and the Environment - Population Growth, Environment and Human Health, Human Rights, Value Education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and Human Health.

**SUGGESTED READING:**

NCERT: TEXT BOOKS ON HISTORY, GEOGRAPHY, CIVICS

MANORAMA YEAR BOOK

MR Agarwal: GENERAL KNOWLEDGE DIGEST

NEWS PAPAERS AND MAGAZINES:

HINDI & ENGLISH DAILY NEWS PAPERS

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YOJNA

**Course Number: CAC491, Course Title: CO-CURRICULAR ACTIVITIES**

Class: B.Voc., Status of course: MAJOR COURSE, Approved since Session: 2015-16

Total Credits: 3, Periods: 55 min. each (L-0+T-0+P/S-1), Min.Pds./Sem.:13

To encourage students in cultural activities viz. Dramatics & Music Competition, Games & Sports and literary activities viz. Hindi & English Essays, Hindi & English Debate Competition to have overall development of the student

**Course Number: ZOM501, Course Title: BIOLOGICAL CHEMISTRY**

Class: B.Sc. Hons, Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: BIOENERGETICS [10 pds]**

(a) Thermodynamic Principles (b) Concept of Free energy (c) Priming and Coupling (d) ATP as universal energy (e) Electron transport mechanism (f) Buffers and pKa values.

**UNIT 2: AMINO ACIDS AND PROTEINS [8 pds]**

(a) Structure and Classification (b) Ionization (c) Peptide bond formation (d) Architectural levels and classification of proteins (e) Trans-amination and deamination (f) Urea cycle

**UNIT 3: ENZYMES [8 pds]**

(a) Nomenclature and Classification (b) Mechanism of action (c) Derivation of Michaelis-Menten equation and modifications (d) Coenzyme & isozyme.

**UNIT 4: CARBOHYDRATES [8 pds]**

(a) Glycolysis and Glycogenolysis (b) Krebs' cycle (c) HMP pathway (d) Gluconeogenesis, Glycogenesis

**UNIT 5: LIPIDS AND NUCLEIC ACIDS [8 pds]**

(a) Structure and function based classification of Lipid (b)  $\beta$ -Oxidation of unsaturated and saturated fatty acids (c) *de novo* synthesis of Lipid (d) Chemistry of nucleotides and polymer formation

**SUGGESTED READING**

Lehninger Freeman and company: PRINCIPLES OF BIOCHEMISTRY

Zubay: BIOCHEMISTRY

Murray, Granner & Rodwell. Harpers: HARPER'S ILLUSTRATED BIOCHEMISTRY.

Wilson & Walker: PRACTICAL BIOCHEMISTRY- PRINCIPLE & TECHNIQUE, Cambridge Publ.

Donald Voet, Judith G. Voet: BIOCHEMISTRY

William H. Elliott, Daphne C. Elliott: BIOCHEMISTRY AND MOLECULAR BIOLOGY

**Course Number: ZOM502, Course Title: PARASITOLOGY**

Class: B.Sc.Hons, Status of Course: MAJOR COURSE, Approved since session: 2017-18

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: LIVING TOGETHER AND SYMBIOSIS [8 pds]**

(a) Introduction: Growth and Development of Parasitology (b) Origin and history of Parasites (c) Various types of relationships amongst animals (d) Cynernetics Parasitism

**UNIT 2: PARASITISM [8 pds]**

(a) Effect of parasitism on the host and parasites (b) Parasitic adaptations (c) Types of parasites external and internal, permanent and temporary, accidental and facultative.

**UNIT 3: LIFE HISTORIES OF SOME PROTOZOAN AND HELMINTH [8 pds]**

(a) *Entamoeba histolytica* (b) *Plasmodium* (c) *Trichomonas vaginalis* (d) *Fasciola buski* (e) *Schistosoma mansoni* (f) *Nectar americanus* (g) *Echinococcus granulosus* (h) *Taenia taeniaformis*.

**UNIT 4: LIFE HISTORIES OF ARTHROPODS [8 pds]**

(a) *Lipeurus squalidus* (b) *Dermacentor andersoni* (c) *Xenopsylla cheopsi* (d) *Dermanyssus gallinae*.

**UNIT 5: APPLIED PARASITOLOGY [8 pds]**

(a) Malarial parasite- Genetic factors, Drug resistance and Culture methods (b) Resistance to Helminths (c) Parasite control.

**SUGGESTED READINGS**

Foundations of Parasitology 9th Edition by Larry Roberts, John Janovy Jr., Steve Nadler Publisher: McGraw-Hill Education; 9 edition (November 27, 2012)

The Biology of Parasites 1st Edition by Richard Lucius, Brigitte Loos-Frank, Richard P. Lane, Robert Poulin, Craig Roberts, Richard K. Grenier Publisher: Wiley-Blackwell

Introduction to Animal Parasitology, 3<sup>rd</sup> Edition by J.D. Smyth (1994) Publisher: Cambridge University Press; 3 edition (24 November 1994)

Cheng: PARASITOLOGY

Medical Parasitology (2010) by D. R. Arora Publisher: CBS; 3 edition (1 December 2010)

Parasitology (Protozoology and Helminthology) (2009) by K.D. Chatterjee Publisher: CBS; 13 edition (1 December 2009)

Bhale Rao: PARASITE OF DOMESTIC ANIMALS

Chandler: PARASITOLOGY

Chowdhury, N & Tada, I: HELMINTHOLOGY

Boothroyd, J & Komunacki: MOLECULAR APPROACHES TO PARASITOLOGY

MBL Lectures in Biology vol 12

**Course Number: ZOM503, Course Title: DEVELOPMENTAL BIOLOGY**

Class: B.Sc. Hons, Status of Course: MAJOR COURSE, Approved since session: 2017-18

Total Credits: 3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: BASIC CONCEPTS OF DEVELOPMENT [8 pds]**

(a) Introduction (b) Historical perspective and basic concepts (c) Phases of development, Cell-Cell interaction, Pattern formation, Differentiation and growth, Differential gene expression, Cytoplasmic determinants and asymmetric cell division

**UNIT 2: EMBRYOGENESIS [8 pds]**

(a) Commitment (b) Induction (c) Competence (d) Early Embryonic Development (e) Gametogenesis (f) Spermatogenesis (g) Oogenesis (h) Types of eggs, Egg membranes (i) Fertilization (External and Internal): Changes in gametes, Blocks to polyspermy (j) Planes and patterns of cleavage; Types of Blastula, Embryonic induction and organizers.

**UNIT 3: ORGANOGENESIS [8 pds]**

(a) Fate maps (including Techniques) (b) Gradient theory (c) Early development of frog and chick up to gastrulation (d) Regeneration: Modes of regeneration, epimorphosis, morphallaxis and compensatory regeneration (with one example each) (e) Ageing: Concepts and Theories Teratogenesis: Teratogenic agents and their effects on embryonic development (f) In vitro fertilization, Stem cell (ESC)

**UNIT 4: DEVELOPMENTAL MODEL SYSTEMS- INVERTEBRATES [8 pds]**

(a) Drosophila (b) C. elegans, (c) Dictyostelium, life cycle, cell lineage and genetic control of development

**UNIT 5: DEVELOPMENTAL MODEL SYSTEMS- VERTEBRATES [7 pds]**

(a) Danio (b) Chick embryology (c) Placentation in mammals; Including Late Embryonic Development, Fate of Germ Layers; Extra-embryonic membranes in birds; Implantation of embryo in humans, Placenta (Structure, types and functions of placenta), Post Embryonic Development, Metamorphosis: Changes & hormonal regulations.

**SUGGESTED READINGS:**

Gilbert, S F(2010) Developmental Biology, IX Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA  
Balinsky B. I. and Fabian B. C. (1981). An Introduction to Embryology, V Edition, International Thompson Computer Press  
Lewis Wolpert (2002). Principles of Development. II Edition, Oxford University Press

**Course Number: ZOM504, Course Title: ENTOMOLOGY**

Class: B.Sc.Hons, Status of Course: MAJOR COURSE, Approved since session: 2016-17

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: INSECT TAXONOMY [7 pds]**

(a) General features of insects, their distribution and dominance on Earth (b) Basis of insect classification; Classification of insects up to orders

**UNIT 2: GENERAL INSECT MORPHOLOGY [8 pds]**

(a) External features; Head-Eyes, types of antennae, mouth parts with their feeding habit (b) Thorax: Wings and wing articulation (c) Types of legs adapted to diverse habitat (d) Abdominal appendages and genitalia

**UNIT 3: INSECT PHYSIOLOGY [8 pds]**

(a) Structure and physiology of insect body systems– Integumentary, digestive, excretory, circulatory, respiratory, endocrine, reproductive and nervous system (b) Sensory receptors (c) Growth and metamorphosis

**UNIT 4: INSECT PATHOLOGY [8 pds]**

(a) Sites of pathogen entry (Integument and alimentary canal) (b) Spread of pathogens (Egress and transmission) (c) Types of pathogens (viral, bacterial, fungal and protozoans) (d) Pathogens and their impacts on insects

**UNIT 5: INSECT'S ROLE AS [8 pds]**

(a) A source for commercial products (honey, wax, silk, lac and medicines) (b) In forensic science (c) Pests and their management (physical, chemical, mechanical, cultural, legal and biological control) (d) Pollinators (bees and butterflies) and their role in pollination (e) Insects as vectors (Houseflies and mosquitoes) (f) As social animals (social organization, social behaviour in honey bee and ants)

**SUGGESTED READINGS**

Chapman RF: THE INSECT STRUCTURE AND Imms AD, Richards DW &Daviea RG: GENERAL TEXTBOOK OF ENTOMOLOGY  
Metcalf CL etal: DESTRUCTIVE AND USEFUL INSECTS - THEIR HABITS AND CONTROL  
Rockstein M: THE PHYSIOLOGY OF INSECTS  
Scott W, Patton & Francis William: A TEXT BOOK OF MEDICAL ENTOMOLOGY  
Snodgrass RE: PRINCIPLES OF INSECT MORPHOLOGY

**Course Number: ZOM505, Course Title: WILDLIFE CONSERVATION & MANAGEMENT**

Class: B.Sc.Hons, Status of Course: MAJOR COURSE, Approved since session: 2017-18

Total Credits:3, Periods(55 mts. each)/week: 4(L-3.5+T-0+P/S-0.5),Min.pds./sem.:52

UNIT 1: WILDLIFE HABITAT STUDIES [10 pds]

(a) Wildlife habitat structure and classification (b) Brief idea of Phyto geographical regions of the world (c) Major vegetation /Forest/Grassland types and their distribution endemism.

UNIT 2: HABITAT MANAGEMENT [8 pds]

(a) Overview and habitat management problems (b) Accidental and Intentional force and its impact on flora and fauna (c)Livestock grazing and its impact, weed eradication.

UNIT 3: CONSERVATION [8 pds]

(a) Protected Area Network systems in India (b) *in-situ* conservation with examples of successful conservation projects (c) *ex-situ* conservation with examples of captive breeding projects.

UNIT 4: WILDLIFE TRADE [8 pds]

(a) Extent and type of trade (b) Species affected by trade, their marketing and misuse by traders and buyers (c) Biological and ecological consequences of wildlife trade.

UNIT 5: WILDLIFE LEGISLATION [8 pds]

(a)Wildlife Protection Act 1972 (b) Important conservation agencies-National and International (c) Red Data Book

SUGGESTED READINGS:

WPA-Natraj Publication

Rogers and Panwar manual of PAMS/Protected area Management System

Wildlife management –Rajesh Gopal

Subramanyam&Sambamurty: ECOLOGY

WWF HANDBOOK: WILDLIFE CONSERVATION & MANAGEMENT ACT 1972

**Course Number: ZOM506, Course Title: PRACTICAL**

Class: B.Sc. Hons, Status of Course: MAJOR COURSE, Approved since session: 2016-17

Total Credits:9, Periods(55 mts. each)/week: 24(L-0+T-0+P/S-24),Min.pds./sem.:312

**BIOLOGICAL CHEMISTRY**

1. Preparation of Buffer using Handerson-Hassalbach equation and determination of its buffering capacity.
2. Preparation of chemical/molecular models with coloured beads and pins.
3. Analysis of a mixture of carbohydrates by their colour reactions.
4. Qualitative tests for functional groups of lipids.
5. Formal titration of amino acids
6. Separation of amino acids and carbohydrates by paper chromatography and TLC.

**PARASITOLOGY**

1. Study of permanent slides of specimens of (a) Protozoan Parasites, (b) Trematodes, (c) Nematodes, (d) Cestodes.
2. Preparation of larvae and eggs of the Cestodes, Trematodes and Nematodes.
3. Examining of snails for Cercaria.
4. Collection and preparation of parasitic mites, ticks from cattles and vectors of disease.

**DEVELOPMENTAL BIOLOGY**

1. Prepared Embryological slides of various vertebrates.
2. Observation of various stages of chick development in eggs.
3. To observe the development of *C. elegans*.
4. Study of the developmental stages and life cycle of *Drosophila* from stock culture.
5. Effect of Thyroxin on tadpole larva of Frog.

**ENTOMOLOGY**

1. Classification and identification of local insects fauna with special reference to pests.
2. Mounting of salivary gland (cockroach), mouth parts (cockroach, honey-bee, housefly, mosquito), Poison gland (wasp & honey-bee).
3. Study of Permanent slides of wings, mouth parts, genitals, egg, larvae & pupae.
4. Dose calculation of pesticide/ insecticide.
5. Practical record and insect collection.

**WILDLIFE CONSERVATION AND MANAGEMENT**

1. Plot and plot less methods assessment
2. Point count
3. Call count
4. Identification and Census of wetland water fowl
5. Interpretation (Visual and automated) of remote sensing information for landscape differentiation
6. Familiarization with IUCN strategies for determining species status (Threatened, Endangered, Vulnerable, Extinct)
7. Demonstration of tranquillising techniques

**Course Number: ZOM601, Course Title: IMMUNOLOGY**

Class: B.Sc. Hons, Status of Course: MAJOR COURSE, Approved since session: 2016-17

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: IMMUNOLOGY**

(a) Overview of Immune System: Historical perspective of Immunology, Early theories of Immunology (b) Cells and organs of the Immune system (c) Cell and molecules involved in innate and acquired immunity.

**UNIT 2: INNATE AND ADAPTIVE IMMUNITY**

(a) Anatomical barriers, Inflammatory response, TLR and Pattern recognition (b) Adaptive immunity (Cell mediated and humoral) (c) Passive: Artificial and natural Immunity, Active: Artificial and natural Immunity (d) Complement System, Components and pathways of complement activation.

**UNIT 3: ANTIGENICITY AND IMMUNOGENICITY**

(a) Antigens, Immunogens, Adjuvants and haptens (b) Factors influencing immunogenicity, B and T-Cell epitopes Immunoglobulins (c) Structure and functions of different classes of immunoglobulins, Antigen antibody interactions, Immunoassays (ELISA and RIA), Polyclonal sera, (d) Hybridoma technology: Monoclonal antibodies in therapeutics and diagnosis.

**UNIT 4: MAJOR HISTOCOMPATIBILITY COMPLEX**

(a) Structure and functions of MHC molecules (b) Endogenous and exogenous pathways of antigen processing and presentation (c) Cytokines, Properties and functions of cytokines, Therapeutics Cytokines

**UNIT 5: HYPERSENSITIVITY AND TOLERANCE**

(a) Brief description of various types of hypersensitivities, Tolerance, Autoimmunity, (b) Immunity against bacterial, viral and protozoan diseases, (c) Various types of vaccines.

**SUGGESTED READINGS**

Kindt, T. J., Goldsby, R.A., Osborne, B. A. and Kuby, J (2006). Immunology, VI Edition. W.H. Freeman and Company.

David, M., Jonathan, B., David, R. B. and Ivan R. (2006). Immunology, VII Edition, Mosby, Elsevier Publication.

Abbas, K. Abul and Lichtman H. Andrew (2003.) Cellular and Molecular Immunology. V Edition. Saunders Publication

Cellular and molecular immunology, by Abul Abbas, Andrew Lichtman, and Jordan Pober Publisher: Elsevier Health - INR; 7 edition (2011)

Immunology by Ivan Roitt, Jonathan Brostoff, and David Male Publisher: Elsevier Health - UK; 8 edition(24 Sep.2012)

Immunology by Janis Kuby and Richard A. GoldsbyPublisher: W.H. Freeman

Janeway'sImmunobiology Author: Kenneth Murphy Publisher: Garland Science; 8 edition (2 August 2011)

Immunology by Mohan P. AroraPublisher: ANE Books (1 January 2010)

**Course Number: ZOM602, Course Title: QUANTITATIVE BIOLOGY**

Class: B.Sc. Hons, Status of Course: MAJOR COURSE, Approved since session: 2016-17

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: INTRODUCTION**

[8 pds]

(a) Scope, importance and limitations of biostatistics (b) Samples and Populations (c) Sampling techniques (d) Variables (e) Accuracy and precision (f) Collection and tabulation of data.

**UNIT 2: DESCRIPTIVE STATISTICS**

[8 pds]

(a) Measures of Central Tendencies- Mean and its types, Mode and Median (b) Concept of variation-measures of dispersion (c) Skewness and Kurtosis.

**UNIT 3: CORRELATION AND REGRESSION**

[8 pds]

(a) Covariance (b) Rank Correlation (c) Correlation Coefficient (d) Regression and Regression Coefficient.

**UNIT 4: GRAPHICAL REPRESENTATION OF DATA**

[8 pds]

(a) Graphs like Histograms, ogives and frequency curve (b) Representation of Central Tendencies (c) Graphical representation of correlation, Scatter diagrams and regression lines (d) Applications of software.

**UNIT 5: HYPOTHESIS TESTING**

[7 pds]

(a) Null and alternative hypothesis (b) Procedure of testing of hypothesis (c) Level of significance (d) Power of test (e) Degree of freedom (f) Tests of simple hypothesis using normal and 't' distribution (g) Types of Errors (h) parametric and non-parametric tests (i) 't' Tests – one sample, two sample and paired t-test (j) Chi-square for goodness of fit (k) 'F' test for comparing variants.

**SUGGESTED READINGS**

S.P. Gupta: STATISTICAL METHODS

Levin and Reuben: STATISTICS FOR MANAGEMENT

Mahajan: METHODS IN BIOSTATISTICS

Sokal and Rohlf: INTRODUCTION TO BIOSTATISTICS

Zar: Biostatistical analysis

**Course Number: ZOM603, Course Title: MOLECULAR GENETICS**

Class: B.Sc. Hons, Status of Course: MAJOR COURSE, Approved since session: 2016-17

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: DNA REPLICATION**

(a) DNA Replication in prokaryotes and eukaryotes (b) RNA priming (c) Replication of circular, linear *ds* DNA and telomeres.

**UNIT 2: TRANSCRIPTION**

(a) RNA polymerase and transcription unit (b) Initiation of replication (c) Mechanism of transcription in prokaryotes and eukaryotes (d) synthesis of rRNA and mRNA.

**UNIT 3: TRANSLATION**

(a) Ribosome structure and assembly in prokaryotes.  
(b) Aminoacyl tRNA synthetases and charging of tRNA.  
(c) Proteins involved initiation, elongation and termination of polypeptide chains.  
(d) Inhibitors of protein synthesis.

**UNIT 4: POSTTRANSLATIONAL MODIFICATIONS (PTM)**

(a) Structure of globin mRNA.  
(b) Concept of introns and exons.  
(c) Split genes and splicing mechanism.  
(d) RNA editing.

**UNIT 5: GENE REGULATION & TRANSPOSONS**

(a) Transcription regulation in prokaryotes- Operon model.  
(b) Transcription regulation in eukaryotes- activators, repressors and enhancers.  
(c) Gene silencing.  
(d) Transposable elements.

**SUGGESTED READINGS:**

Levin B: GENE IX edition, Pearsons Publ.

Strikberger MW: GENETICS, Johns & Barlette Publ.

Fitzgerald- Hayes & Reichsman: DNA & Biotechnology, Academic Press.

Sharma and Sharma: CHROMOSOME TECHNIQUES, Harper Publ.

Ayala F: GENETICS-MODERN APPROACH, Thomsons Publ.

Snustad P and Simmons MJ: GENETICS, John Wiley & Sons Inc

Suzuki et al: GENETIC ANALYSIS

**Course Number: ZOM604, Course Title: NEUROBIOLOGY**

Class: B.Sc.Hons, Status of Course: MAJOR COURSE, Approved since session: 2016-17

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: BRAIN ARCHITECTURE:** [8 pds]

(a) Neuron: structure, classification and function; nerves: structure, classification and function; (b) Nerves: cranial and spinal nerves (c) Synapse: chemical and electrical synapses and mechanism (d) Introduction to the structural and functional organization of brain (e) Blood brain barrier and brain CSF barrier.

**UNIT 2: DEVELOPMENTAL NEUROANATOMY:** [8 pds]

(a) Evolution, Development of nerve tissue (b) Development of brain with special emphasis on human brain (c) Genetic and molecular basis of development

**UNIT 3: NEUROPHYSIOLOGY** [10 pds]

(a) Sodium potassium pump and restoration of ionic concentration (b) Nerve impulse: generation and conduction of nerve impulse, irritability, conductivity, polarization, action potential, graded potential, depolarization and repolarization; (c) Impulse conduction: direction, voltage, potential and velocity (d) Role of microtubules and microfilaments (e) Influence of juxta-axonal environment on nerve impulse (f) reflex arc and action (g) sensations: general and special (only introduction not tracts) (h) Sensation (Mechanoreception, taste, olfaction and vision)

**UNIT 4: NEURO-ENDOCRINOLOGY:** [8 pds]

(a) Neurohormones: location and secretions (b) Chemical composition (c) Inhibitory and excitatory factors for release (d) circadian rhythm related to the hormones (e) Neuro-peptides, Neurotransmitters, Neuro & modulator

**UNIT 5: NEUROBIOLOGY OF AGING AND SLEEP:** [8 pds]

(a) Aging changes in brain (b) Structural changes: neurons and neuroglia (c) Biochemical changes (d) Functional changes (e) reversal of aging (f) Sleep and its types.

**SUGGESTED READINGS**

Eric Kandel: PRINCIPLES OF NEURAL SCIENCE

Bailey: WILDLIFE BIOLOGY Giles: WILDLIFE MANAGEMENT TECHNIQUES

Teague: A MANUAL OF WILDLIFE CONSERVATION Saharia VB: WILDLIFE IN INDIA

Majupuria TC: WILDLIFE WEALTH OF INDIA

Neuroscience, Fifth Edition: Dale Purves, Augustines Fitzpatrick Hall. Eds. Sinauer Associates Publishers: Sunderland Massachusetts USA

Eric Kandel: PRINCIPLES OF NEURAL SCIENCE

Cellular Physiology and Neurophysiology, 2<sup>nd</sup> Edition. Eds. Blaustein, Kao Matteson, Elsevier Publications



**Course Number: ZOM605, Course Title: HYDROBIOLOGY**

Class: B.Sc.Hons., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: LIMNOLOGY**

[8 pds]

(a) Definition (b) History (c) Branches of Limnology and importance (d) Water resources and their management (e) Origin and classification of different rivers, lakes and other water bodies.

**UNIT 2: AQUATIC MANAGEMENT**

[8 pds]

(a) Impact of water resources project like dams, sediments in river, lakes & reservoirs, (b) Role of sediments in flood, (c) Origin and impact, (d) Control of floods

**UNIT 3: RAMSAR CONVENTION**

[7 pds]

(a) Ramsar sites (b) Wetland Policies (c) Origin and classification of different rivers, lakes and other water bodies.

**UNIT 4: WATER POLLUTION**

[8 pds]

(a) Water pollution, its hazards and control (b) Water quality Indices (c) Monitoring (d) Waste water treatment.

**UNIT 5: HYDROBIOLOGY OF RIVER YAMUNA**

[8 pds]

(a) Characteristics of the stretch of Yamuna from Sikandara to Tajmahal (b) Yamuna action plan-phase I, Phase II for river quality management

**SUGGESTED READINGS:**

Bouwer: GROUND WATER HYDROLOGY (McGraw Hill Kogakusha Ltd 1978)

Michael AM: IRRIGATION (Vikas Pub Ltd 1981)

Higgins IJ & Burns RG: THE CHEMISTRY AND MICROBIOLOGY OF POLLUTION

Shirkande RP & Varade SB: ECOLOGY OF WATER AND LAND MANAGEMENT (1991)

Kurian CV and Sebastian VO: PRAWN FISHERIES OF INDIA (Hindustan pub 1986)

Robert G. Wezel: Limnology (2001)

**Course Number: ZOM606, Course Title: PRACTICAL**

Class: B.Sc.Hons, Status of Course: MAJOR COURSE, Approved since session: 2016-17

Total Credits:9, Periods(55 mts. each)/week: 24(L-0+T-0+P/S-24),Min.pds./sem.:312

**IMMUNOLOGY**

(i) Lysis of RBCs (ii) Counting of WBC (c) Titer determination by double diffusion method (d) Dot Blot assay: Detection method of Ag-Ab specificity.

**QUNATITATIVE BIOLOGY**

(a)Simple random Sampling (b)analysis of central tendency of data generated (c) Analysis of dispersion (d)Correlation analysis

**MOLECULAR GENETICS**

(a) Preparation of karyotype (b) Study of chiasma frequency (c) Polytene chromosome mapping Drosophila Genetics:(i) Preparation of culture medium (ii) Study of mutants (iii) Determination of sex-ratio (iv) Study of life cycle; handling of flies (v) Experimental crosses with autosomal and sex linked mutants (e) Application of probability in the laws of segregation with coin tossing (f) Analysis of mode of inheritance of the following traits by pedigree charts-attached ear lobe and widow's peak, & finger prints.

**NEUROBIOLOGY**

(a) Observation of permanent slides of neural components  
(b) Slide preparation with differential staining to identify- neuro and glial cells  
(c) To measure conductance in nerves of cockroach  
(d) Reflex action  
(e) Study of cyto-architectural plan of nervous system

**HYDROBIOLOGY**

(b) Identification and biometry of Fish.  
(c) Water quality analysis-Qualitative tests of chloride, carbonate and total hardness & BOD and COD in given water sample (d) Determination of MPN & Plankton (e) To test the presence of chloride, carbonate and total hardness & BOD in given water sample (f) Study of Physical parameters like TON, TTN, Conductivity & Transparency (g) Project report based on field visit

**Course Number: ZOM701, Course Title: CELL & MOLECULAR BIOLOGY**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 20015-16

Total Credits:3, Periods(55 mts. each)/week: 4(L-3.5+T-0+P/S-0.5),Min.pds./sem.:52

**UNIT 1: CELL MEMBRANE [8 pds]**

(a) Recapitulation of Plasma membrane - Fluid-Mosaic model (b) Donnan's Equilibrium and ion movements (c) Mechanism of active transport (d) Bulk transport (f) Cytoskeletal elements-microtubules and microfilaments (e) Cell motility, interactions and gap Junctions

**UNIT 2: GENOME ORGANISATION [10 pds]**

(a) Chromatin organisation and remodeling (b) Role of histones on structure and function of Chromatin (c) C value paradox and genome size (d) Cot curve - Cot1/2 and Rot 1/2 value (e) Repetitive and non repetitive DNA (f) Overlapping Genes, split genes and oncogenes

**UNIT 3: DNA REPLICATION AND REPAIR [10 pds]**

(a) DNA replication in *E. coli* (b) Eukaryotic DNA replication (c) Multiple replicons (d) Origin recognition Complex (ORC) (f) Nucleotide excision repair, base excision repair, mismatch repair and transcriptional coupled repair (g) Transcriptional process.

**UNIT 4: RNA PROCESSING [8 pds]**

(a) Mechanism of RNA splicing (b) micro RNA and non coding RNA (c) Translational machinery and translational control (d) tRNA and its modifications (e) Regulation of initiation of translation in eukaryotes; elongation and inhibitors.

**UNIT 5: MOBILE DNA ELEMENTS [8 pds]**

(a) Transposable elements in bacterial (b) IS elements (c) Composite transposon (d) Replicative and non replicative transposon (e) retrovirus and retrotransposon.

**SUGGESTED READINGS:**

DeRobertis and DeRobertis: CELL AND MOLECULAR BIOLOGY

Geise: CELL PHYSIOLOGY

Levin: GENE XII

Lodishetal: MOLECULAR CELL BIOLOGY

Suzuki et.al.: AN INTRODUCTION TO GENETIC ANALYSES

**Course Number: ZOM702, Course Title: RESOURCE MANAGEMENT STRATEGIES**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2017-18

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: ENVIRONMENTAL CHALLENGES [8 pds]**

(a) Environmental Challenges confronting India and developing countries (c) Global Environmental Monitoring and assessment

**UNIT 2: CLIMATE CHANGE [8 pds]**

(a) An introduction to climate change (b) Effect of climate change on natural resources (c) World strategy to combat Climate change

**UNIT 3: ALTERNATIVE RESOURCES [8 pds]**

(a) Bio-inspired alternative resources (b) Bio-fertilizer, Biogas, Bio diesel (c) Rain water harvesting (d) Solar resources

**UNIT 4: BIO-REMEDIATION [8 pds]**

(a) Concept, need and future outlook (b) Biodegradation (c) Bioaccumulation (d) Bioremediation through microbes (e) Phyto-remediation-Biotechnology of cleaning environment by plants

**UNIT 5: RESOURCE MANAGEMENT AND CONSERVATION POLICIES [10 pds]**

(a) Introduction to international policies and legal instruments for conservation of natural resources (b) Nature and formation, Participation and interpretation of Treaties and Reservations (c) NBSAP (Natural Biodiversity Strategy and Planning)

**SUGGESTED READINGS**

Odum E: FUNDAMENTALS OF ECOLOGY

ADVANCES IN ECOLOGICAL SCIENCES

Andrewartha: FUNDAMENTAL OF ECOLOGY

Ito S: ECOLOGY

Clarke: FUNDAMENTALS OF ECOLOGY

Kormondy: ECOLOGY

NBSAP document of ministry of Env

**Course Number: ZOM703, Course Title: TOXICOLOGY**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2017-18

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: APPLICATION OF TOXICOLOGY [10 pds]**

(a) Scope and branches of Toxicology(b)Forensic toxicology, Bioassay(c) Toxicity testing (Acute and chronic concept of LD<sub>50</sub>/LC<sub>50</sub>)

**UNIT 2: MECHANISM OF TOXICITY (XENOBIOTIC METABOLISM) [8 pds]**

(a) Route of exposure; absorption and Excretion (b) Metabolic transformation of Toxicants (c) Detoxification and role of cytochrome p450 and oxidase

**UNIT 3: ORGAN TOXICITY [8 pds]**

(a) Liver(b) Respiration (c) Nephrotoxicity (c) Circulation/ Endocrine (d) Immunotoxicity (e) Reproductive

**UNIT 4: SPECIFIC RESPONSES OF TOXICITY MUTAGENECITY [8 pds]**

(a) Genetic toxicology: DNA damage DNA repair (b) carcinogenesis (c) Teratogenesis (d) Measuring Genotoxicity

**UNIT 5: CLASSIFICATION OF TOXIC SUBSTANCES [8 pds]**

(a) WHO standard for toxic substance classification(b) Industrial solvents and their biological affect (Alcohols, Xylol, Methanol, Acetone and formalin (c) Radiation and nano-toxicity (d) Metals (Mercury and lead)

**SUGGESTED READINGS**

Haytes, AS: PRINCIPLES AND METHODS OF TOXICOLOGY

Iron RD & Gibson JE: TOXICOLOGY OF BLOOD

Kimmel CA & Rudka-Sam: DEVELOPMENTAL TOXICOLOGY

Bruscik D: PRINCIPLES OF GENETIC TOXICOLOGY

Cassarette Douls: PRINCIPLES OF TOXICOLOGY

**Course Number: ZOM704, Course Title: INSTRUMENTATION & STATISTICAL APPLS.**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: MICROSCOPY [8 pds]**

(a) Phase contrast and fluorescence microscopy (b) Scanning and Transmission Electron Microscope (c) Cytometry and flow cytometry (d) Confocal microscopy, live cell imaging

**UNIT 2: SEPARATION TECHNIQUES [8 pds]**

(a) Principles and application of Chromatography and Gel Filtration (b) Ion exchange, affinity, TLC, GLC and HPLC (c) Electrophoresis PAGE & STAGE, Electrofocussing (d) Centrifugation.

**UNIT 3: SPECTROMETRY AND RADIOGRAPHY [8 pds]**

(a) Determination of X-Ray diffraction (b) UV, Visible, Fluorescence, NMR, ESR, AAS Spectroscopy (c) Autoradiography.

**UNIT 4: IMMUNOLOGICAL TECHNIQUES [8 pds]**

(a) Immuno diffusion (b) Immuno electrophoresis (c) Immunocytochemistry

**UNIT 5: BIOSTATISTICAL APPLICATIONS [10 pds]**

(a) Probability concept (b) Random Bionomial & Poisson's distribution (c) Design of experiment (d) Student's 't' test, Chis quare test and Snedecor test (e) ANOVA – one way and two way (f) Man-Whitney test & Kruskal-Wallis test

**SUGGESTED READINGS:**

Alberts etal: MOLECULAR BIOLOGY OF CELLS

Freifelder: PHYSICAL BIOCHEMISTRY

Plummer: AN INTRODUCTION TO PRACTICAL BIOCHEMISTRY

Ruthnam: METHODS IN CELL RESEARCH

Work & Work: LAB TECHNIQUES IN BIOCHEMISTRY

Albertsetal: MOLECULAR BIOLOGY OF CELLS

Freifelder: PHYSICAL BIOCHEMISTRY

Plummer: AN INTRODUCTION TO PRACTICAL BIOCHEMISTRY

Work & Work: LAB TECHNIQUES IN BIOCHEMISTRY

S.P. Gupta: STATISTICAL METHODS

Levin and Reuben: STATISTICS FOR MANAGEMENT

**Course Number: ZOM705, Course Title: ENVIRONMENTAL PARASITOLOGY**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:3, Periods(55 mts. each)/week: 4(L-3.5+T-0+P/S-0.5),Min.pds./sem.:52

**UNIT 1: PARASITISM**

[8 pds]

(a) Origin and history of parasitism (b) Types of Parasitism (c) Parasitism, symbiosis and other types of relationship (d) Parasitism in aquatic, terrestrial ecosystems (e) Parasite dispersal- National & International.

**UNIT 2: ENVIRONMENTAL PROTOZOOLOGY**

[8 pds]

(a) Introduction to the parasitic mastigophora-flagellates, sarcodina and opalinata (b) Amoebal and opalinids, spirocomplexa, microspora (c) *Ascotospora and myxozoa ciliophora* (d) Ciliates

**UNIT 3: TREMATODES**

[10 pds]

(a) Monogenia - Biology, (b) Digenea- morphology, Host specificity (c) Physiology of Trematodes, (d) Host-parasite relationship Classification (e) Ecology of Trematodes.

**UNIT 4: CESTODES AND NEMATODES**

[8 pds]

(a) Eucestoda: tape worm, morphology, life cycle, biology (b) Cestodes: classification (c) Acanthocephala: morphology, life history (d) Nematodes: lifecycle.

**UNIT 5: PARASITIC ARTHROPODS**

[8 pds]

(a) Dipterans-house fly, mosquito, their diseases and control (b) Biology of ticks and mites (c) Life history of some epizootes.

**SUGGESTED READINGS:**

Cheng, TC: FUNDAMENTAL OF PARASITOLOGY

Chandler, AC: INTRODUCTION TO PARASITOLOGY

Roy Chaudhary: HELMINTHOLOGY

Schmidt, GD: ESSENTIAL OF PARASITOLOGY

Scientific Material from WHO

Bhalerao, GD: HELMINTHES, PARASITES OF THE DOMESTICATED ANIMALS IN INDIA

Parasite Adaptation to Environmental Constraints: by R. C.Tinsley Publisher: Cambridge University Press (28 October 2002)

Medical Parasitology (2010) by D. R. Arora Publisher: CBS; 3 edition (1 December 2010)

Parasitology (Protozoology and Helminthology) (2009) by K.D. Chatterjee Publisher: CBS; 13 edition (1 December 2009)

**Course Number: ZOM706, Course Title: PRACTICAL**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:9, Periods(55 mts. each)/week: 24(L-3.5+T-0+P/S-0.5),Min.pds./sem.:312

**CELL AND MOLECULAR BIOLOGY**

(a) Sterilization techniques - inoculation techniques (b) Isolation of DNA from Human cells (c) Denaturation of DNA (d) Measuring  $A_{260}$  changes by hyperchromic effect (e) Isolation of DNA from coconut endosperm/ yeast (f) Isolation of RNA from yeast (g) Estimation of known and unknown DNA (h) Digital imaging of microcomponents of a cell (i) Familiarisation with statistical software & MS Office (j) Preparation of reports of visits to Laboratories and institutions.

**RESOURCE MANAGEMENT STRATEGIES**

(a) Habitat mapping techniques (b) Determination of species diversity in plants- Density, frequency and abundance (c) Determination of species diversity in animals- density, frequency and abundance (d) Humus analysis (e) Soil habitat strata.

**TOXICOLOGY**

(a) Determination of  $LC_{50}$  by Probit method (b) Studies of histological slides of different organs of fishes and mammals before and after the treatment with certain toxicants (c) Microtomy.

**ENVIRONMENTAL PARASITOLOGY**

(a) Study of local vectors of diseases (b) Collection and classification of parasites from local environment (c) Study of permanent slides Helminthological, (d) Arthropodal parasites

Study of permanent slides Helminthological, Arthropodal parasites (e) Parasite egg collection by concentration method (f) Collection of Monocystis from earthworm (g) Collection of *Trichonympha* from termites (h) Collection of nematode eggs from soil by Baerman's method.

**INSTRUMENTATION AND STATISTICAL APPLICATION**

(a) Application of paper chromatography and TLC (b) Native PAGE and SDS-PAGE (c) Centrifugation (d) Data collection, analysis and application of test of significance.

**VISIT TO ESTABLISHED RESEARCH LABS AND FIELD SITES. SUBMISSION OF VISIT REPORTS BY STUDENTS FOR EVALUATION**

**Course Number: ZOM801, Course Title: WILDLIFE TECHNIQUES**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: BASIC RESEARCH TECHNIQUES [10 pds]**

(a) Planning wild life investigations and projects (b) Wildlife Management: The practices of Management (c) Making observations and records (d) Writing a scientific report.

**UNIT 2: POPULATION ANALYSIS [8 pds]**

(a) Sex and age determination (b) Life table (c) Population Vulnerability analysis.

**UNIT 3: NUTRITION AND BIOENERGETICS [7 pds]**

(a) Nutrition content of foods (b) Feeding Strategies: Field Methods (c) Chemical analysis of Food (d) Energy Partitioning (e) Faecal matter analysis.

**UNIT 4: HABITAT MANAGEMENT [7 pds]**

(a) Habitat improvement techniques (b) Wildlife damage assessment and control (c) Effect of Invasive species on native flora and fauna.

**UNIT 5: WILDLIFE HEALTH AND DISEASES MONITORING [7 pds]**

(a) Importance of Wildlife Health monitoring (b) Monitoring Protocols for wild animals (i) Free living animals (ii) Chemical capture Techniques (iii) Post mortem analysis (c) Infectious and Non infectious diseases.

**SUGGESTED READINGS:**

Robert H Giles: WILDLIFE MANAGEMENT TECHNIQUES

Black, JD: THE MANAGEMENT AND CONSERVATION OF BIOLOGICAL RESOURCES

Mosby, HS: WILDLIFE INVESTIGATION TECHNIQUES

Stacey PD: WILDLIFE IN INDIA; ITS CONSERVATION & MANAGEMENT

**Course Number: ZOM802, Course Title: BIOCHEMISTRY**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:3, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:39

**UNIT 1: STRUCTURE OF BIOMOLECULE AND BIOENERGETICS [8 pds]**

(a) Structure of biomolecules-amino acid, carbohydrate, nucleic acid and lipid (b) Energy transducers (c) ATP phosphorylation (d) Energy rich bonds and Group transfer

**UNIT 2: PROTEINS [8 pds]**

(a) Conformation – Ramachandran plot; Secondary structure Domains; motif and folds; tertiary structure (b) Protein structure and function (c) Protein sequencing (d) Determination of 3 D structure (e) Denaturation (f) Protein-protein interaction (g) Activation and Deactivation of proteins-phosphorylation, post translational modifications

**UNIT 3: ENZYME CATALYSIS AND KINETICS [10 pds]**

(a) Catalysis (b) Hyperbolic kinetics and Allosteric enzymes (c) Multienzyme complex (d) Regulation – effect of pH, temperature and inhibitor (e) structural features of enzyme proteins conferring catalytic activity - mechanism of chymotrypsin reaction and other serine proteases, other proteases (f) Ribozymes and Abzyme

**UNIT 4: METABOLISM-CATABOLISM [8 pds]**

(a) Amino acid metabolism – Fate of amino acid skeleton; Urea cycle; inborn errors of metabolism (b) Carbohydrate metabolism – Glycolytic pathway and related disorders; TCA energetics (c) Lipid metabolism –  $\beta$  oxidation of palmitate; cholesterol – HDL, LDL and VLDL.

**UNIT 5: METABOLISM-ANABOLISM [8 pds]**

(a) *de novo* synthesis of purine and pyrimidine nucleotide (b) Glycogenesis (c) Gluconeogenesis (d) Synthesis of Cholesterol

**SUGGESTED READINGS:**

Conn et al.: OUTLINES OF BIOCHEMISTRY 5TH ED (JOHN WILEY AND SONS 1987)

Lehninger et al.: PRINCIPLES OF BIOCHEMISTRY 2ND ED (WORTH PUB INC 1993)

Segal: BIOCHEMICAL CALCULATIONS 2ND ED (JOHN WILEY AND SONS 1993)

Stryer: BIOCHEMISTRY 3RD ED (FREEMAN AND CO 1988)

Donald Voet, Judith G. Voet-BIOCHEMISTRY

William H. Elliott, Daphne C. Elliott- BIOCHEMISTRY AND MOLECULAR BIOLOGY

**Course Number: ZOM803, Course Title: ANIMAL BEHAVIOUR**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:3, Periods(55 mts. each)/week: 4(L-3.5+T-0+P/S-0.5),Min.pds./sem.:52

**UNIT 1: BEHAVIOUR AND COGNITION**

[8 pds]

(a) Ethological concepts and models (b) Instinct V/s Learning (c) Types of learning – Habituation, Classical and Operant Conditioning, Song learning in birds, Imprinting, Reasoning (d) Motivation, Drives and Emotions (e) Neural and endocrine mechanisms of behavior

**UNIT 2: RHYTHMIC BEHAVIOURS**

[10 pds]

(a) Rhythms – Chronobiology, Infradian, circadian and ultradian rhythms, Exogenous rhythms – Zeitgebers, Endogenous rhythms – circa annual, lunar and circadian (b) Orientation – Taxis and Kinesis (c) Navigation- mental compass and map, navigation cues and barriers (d) Migration with reference to Birds and fishes

**UNIT 3: SOCIAL BEHAVIOUR**

[8 pds]

(a) Communication- visual, olfactory, acoustic, vocal, tactile, chemical signals and pheromones (b) Social Hierarchies, aggression, altruism and eusociality (c) Co-operation, conflict and kin selection (d) Social behavior in insects, birds and mammals

**UNIT 4: FEEDING AND REPRODUCTIVE BEHAVIOUR**

[8 pds]

(a) Feeding strategies (b) Predator- prey strategies (c) Mating systems – monogamy, polygamy and polyandry (d) Nesting (e) Parental care

**UNIT 5: BEHAVIOR ASSESSMENT**

[8 pds]

(a) Methods in quantitative ethology – for sampling and recording (b) Laboratory v/s field studies (c) Softwares and instrumentation for behaviour research-water maze, Y maze, open field and motor activity test (d) Web based resources

**SUGGESTED READINGS**

Suther RA & Gallant RA: BIOLOGY- THE BEHAVIOURAL VIEW

Alcock, J : Animal Behavior – An Evolutionary Approach

Lehner, PN : Handbook of Ethological Methods

Manning, A & Dawkins, MS : An Introduction to Animal Behavior

**Course Number: ZOM804, Course Title: ADVANCED PHYSIOLOGY**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2017-18

Total Credits:3, Periods(55 mts. each)/week: 4(L-3.5+T-0+P/S-0.5),Min.pds./sem.:52

**UNIT 1: MUSCLE PHYSIOLOGY**

[8 pds]

(a) Structural basis of muscle contraction (b) Muscle proteins (c) Sliding filament theory of muscle contraction (d) Mechanical properties of contracting muscles-skeletal smooth and cardiac (e) Neural control of muscle contraction.

**UNIT 2: PHYSIOLOGY DISORDERS AND THEIR DETECTION**

[10 pds]

(a) Cardiovascular disorders (b) Neural disorders (c) Muscular disorders (d) Respiratory disorders (e) Excretory disorders (f) Digestive system disorders.

**UNIT 3: HORMONES REGULATION**

[8 pds]

(a) Endocrine glands (b) hormone, Sources, types, mechanism of action, control and role in different body functions (c) Estrus cycle, Menstruation

**UNIT 4: THERMOREGULATION**

[8 pds]

(a) Homeostasis (b) Behavioural and physiological regulation of body temperature (c) Endothermy and ectothermy (d) Neuroendocrine mechanism of thermoregulation

**UNIT 5: STRESS PHYSIOLOGY**

[8 pds]

(a) Chronic and acute stress (b) Neurons and endocrine control of stress (c) ACTH pathway (d) Vision, hearing and tactile response.

**SUGGESTED READINGS:**

Animal Physiology- Mechanism & adaptation Roger Eckest, David Randell, G. Augustine (W.H. Freeman & Company)

Guyton & Hall, Medical Physiology 10<sup>th</sup> edition, Harcourt Publications

Bell,GH, Davidson,JN and Emsk-Smith,D: TEXTBOOK OF PHYSIOLOGY AND BIO-CHEMISTRY Thiman, KV, Prossor, CL and Brunn EA: COMPARATIVE ANIMAL PHYSIOLOGY

Bourne,GH: THE STRUCTURE AND FUNCTION OF MUSCLES Florey,E: GENERAL AND COMPARATIVE ANIMAL PHYSIOLOGY

Gergely, J: BIOCHEMISTRY OF MUSCULAR CONTRACTION Hoar, WS: GENERAL AND COMPARATIVE PHYSIOLOGY

Johnson,FH: THE LUMINESCENCE OF BIOLOGICAL SYSTEMS Karlson,P: THE MECHANISM OF HORMONE ACTION

Samson Wright: APPLIED PHYSIOLOGY William RH: TEXT BOOK OF ENDOCRINOLOGY

**Course Number: ZOM805, Title: RECENT TRENDS IN BIOLOGY**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:3, Periods(55 mts. each)/week: 4(L-4+T-0+P/S-0),Min.pds./sem.:52

UNIT 1: COMMAND AND CONTROL SYSTEM [11 pds]

(a) Organisation of vertebrate nervous system (b) Evolution of Cognition in vertebrates (c) Information processing in cerebral cortex (d) Consciousness.

UNIT 2: CELL-CELL INTERACTION AND BIOSIGNALLING [10 pds]

(a) Secreted signalling molecules (b) Hormone receptor locations (c) Signalling in early embryonic stages (d) Signalling in Apoptotics and cancer cells.

UNIT 3: QUANTUM BIOLOGY [10 pds]

(a) Basics of Quantum Biology (b) Quantum effects in Biological System (c) Techniques to study quantum effects (d) Quantum approach in evolutionary study.

UNIT 4: IMMUNE SYSTEM [8 pds]

(a) Antibody diversity (b) Transplantation antigens (c) Isotype Class Switching

UNIT 5: INTELLECTUAL PROPERTY RIGHTS AND RESEARCH ETHICS [11 pds]

(a) IPR Policy (b) Patent filing protocols (c) Value Added Patent Information System (d) Biopiracy; Trademark; Copyrights; Recent (e) Development regarding protection of traditional knowledge-Basmati and Neem (f) Guidelines of Bioethics.

**SUGGESTED READINGS:**

THE QUESTION OF PATENTING: THE KEY TO MEDICAL PROGRESS AND INDUSTRIAL DEVELOPMENT, 1988, IUCN Publication: CONSERVING THE WORLD'S BIOLOGICAL DIVERSITY

Gerhard Kraus, John Wiley VCH: BIOCHEMISTRY OF SIGNAL TRANSDUCTION

Davis and Pati: QUANTUM ASPECT OF LIFE, IMPERIAL COLLEGE PRESS

Masoud Mohseni: QUANTUM EFFECT IN BIOLOGY, CAMBRIDGE PRESS

Lehninger, Nelson cox: PRINCIPLE OF BIOCHEMISTRY

Kendal; principle of neurosciences

Parasitology: A Conceptual Approach by Eric S Loker, Bruce Hofkin Publisher: Garland Science; 1 edition (March 2, 2015)

Medical Parasitology (2010) by D. R. Arora Publisher: CBS; 3 edition (1 December 2010)

Parasitology (Protozoology and Helminthology) (2009) by K.D. Chatterjee Publisher: CBS; 13 edition (1 December 2009)

**Course Number: ZOM806, Course Title: PRACTICAL**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2016-17

Total Credits:9, Periods(55 mts. each)/week: 24(L-3.5+T-0+P/S-0.5),Min.pds./sem.:312

WILD LIFE TECHNIQUES: (a) Assessing influence of light, temp and moisture on animal growth and behaviour (b) Insert diversity, frequency and abundance in soil (c) Nutrient uptake and budget for Food chain assessment (d) Faecal sampling technique (e) Bird bending (f) Telemetry (g) Interpretation of GIS data.

BIOCHEMISTRY: (a) Preparation of acidic and basic Buffer (b) Estimation of sugar using anthrone method (c) Estimation of amino acid using Ninhydrin reagent (d) Estimation of Protein using Folin-reagent (e) Saponification of fat (f) Effect of pH on enzyme activity (g) Effect of time on enzyme activity (h) Effect of Substrate Concentration of enzyme activity (i) Determination of Km and Vmax of enzyme by Michaelis-Menten and Lineweaver- Burk plots.

ANIMAL BEHAVIOUR: (a) Various behavior estimation techniques- scan, focal, one-zero method, time budget (b) Locomotary behavior in fish and ants (c) Feeding behavior in fish, ants and squirrel (d) Circadian rhythm in aquarium fish.

ADVANCED PHYSIOLOGY: (a) Determination of oxygen consumption of an insect in improvised respiration (b) Recording of heart beat during various physical activities by sphygmomanometer (c) Measurement of arterial blood pressure (d) Effect of posture and exercise on blood pressure (e) Study of electrocardiograph (f) To determine metabolic rate of an animal (g) Experiments with 'BIOPAC' (h) Urine tests-protein, sugar, ketone.

RECENT TRENDS IN BIOLOGY: (a) Measurement of conductance in nerves of cockroach

(b) Differential staining of cells in brain

**Course Number: ZOM001, Course Title: BASIC RES. METH., SC.COMPUT.& ANAL.**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:4

**UNIT 1: INTRODUCTION**

Meaning, Nature, Type of Research, Experiment-Laboratory Experiments, Field Experiments, Field Study, Survey Research, Major steps in Research, Problem-Formulation & Kinds, Hypothesis-its kinds, Variables and Controls, Survey of related Literature, Ethical Issues.

**UNIT 2: DATA COLLECTION I**

Sampling-Meaning & needs of sampling, requirement of a good sample, Sampling Techniques-Probability & Non-Probability.

**UNIT 3: DATA COLLECTION II**

Research Tools-Observation, Interviews, Questionnaire, Rating Scales, Content Analysis, Case Study, Schedules.

**UNIT 4: ANALYSIS & INTERPRETATION OF DATA**

Analysis & Interpretation of Data, Establishment of Categories, Coding, Tabulation, Statistical Analysis of Data, Inferring Casual relations.

**UNIT 5: RESEARCH REPORT WRITING**

(a) Format of the synopsis (b) Format of Project/Dissertation (c) Format of Abstract (d) Format of Research Paper.

**SUGGESTED READINGS:**

Karlinger FN: FOUNDATIONS OF BEHAVIOURAL RESEARCH

Sheltz & Others: RESEARCH METHODS IN SOCIAL RELATIONS

Kothari CR: RESEARCH METHODOLOGY-METHODS AND TECHNIQUES

Sharma VM: शोध प्रविधि

Singhal Baijnath: शोध प्रविधि एवं मानक व्यवहारिक कार्य विधि

Chandra Suresh: अनुसंधान स्वरूप एवं प्रक्रिया

**Course No.: ZOM002, Course Title: PRE-DISSERTATION**

Class: M.Sc., Status of Course:Summer Term Course, Approved since session: 2015-16

Total Credits: 4

Pre-dissertation will include preparation and improvement of synopsis in consultation with concerning supervisor.



**Course Number: ZOM901, Course Title: DISSERTATION**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:12

Project work, including submission of dissertation. Every Candidate will submit Dissertation before 30<sup>th</sup> November every year.

**Course Number: ZOM902, Course Title: MOLECULAR TECHNIQUES**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:4, Periods(55 mts. each)/week: 4(L-3.5+T-0+P/S-0.5),Min.pds./sem.:52

**UNIT 1: DNA ANALYSIS AND SYNTHESIS [10 pds]**

(a) DNA isolation and purification from eukaryote and prokaryote, (b) Isolation and purification of Plasmid DNA, (c) Qualitative detection of DNA by electrophoresis, (d) Quantitative assay of DNA, (e) DNA-RNA Hybridization, (f) Chemical Synthesis of DNA; Solid phase automated synthesis of DNA.

**UNIT 2: DNA FINGERPRINTING TOOLS AND TECHNIQUES [10 pds]**

(a) DNA enzymes: Gyases, Restriction Endonucleases, Polymerases, Ligases & Lyases, (b) PCR (c) RFLP, (d) RAPD, (e) AFLP, (f) Southern and Northern blotting, (g) Autoradiography

**UNIT 3: CLONING AND EXPRESSION VECTORS [10 pds]**

(a) Plasmids: Structural and Functional Organization, (b) Replication, (c) Classification, (d) Incompatibility Groups, (e) pBR322 and pUC series of Vectors, (f) Shuttle Vectors, (g)  $\lambda$ , M13 and P2 phage based vectors, (h) Cosmids, phagemids, YAC, BAC.

**UNIT 4: RECOMBINANT DNA TECHNOLOGY [10 pds]**

(a)Transgenesis, Transfection, Transformation, Competence, Electroporation, Microinjection, (b) Site Directed Mutagenesis and RNA Editing, (c) Nucleotide Sequencing Techniques

**UNIT 5: APPLICATIONS [12 pds]**

(a) Genetically Modified Organisms (GMOs), (b) Gene Silencing, (c) Gene therapy, (c) Basic idea of Drug Designing, (d) Cloning and Expression of Human Interferon Gene, (e) Detection of Genetic Disorders (Diagnostics in rDNA Technology)

**SUGGESTED READINGS:**

Sambrook, Russell, Maniatis – MOLECULAR CLONING VOL. 1,2,3.

T. A. Brown – GENE CLONING.

Winnacker, VCH – AN INTRODUCTION TO GENE TECHNOLOGY-FROM GENES TO CLONES.

Primrose, Twyman, Old – PRINCIPLES OF GENE MANIPULATION.

Wilson & Walker – PRINCIPLES AND TECHNIQUES OF BIOCHEMISTRY AND MOLECULAR BIOLOGY

Primrose and Twyman – PRINCIPLES OF GENE MANIPULATION.

**Course Number: ZOM903, Course Title: GENETIC DIVERSITY ASSESSMENTS**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:4, Periods(55 mts. each)/week: 4(L-4+T-0+P/S-0),Min.pds./sem.:52

**UNIT 1: GENETIC VARIATION [10 pds]**

(a) Mathematical models, Allele frequencies and Polymorphism (b) Molecular sequence variations (c) Hardy-Weinberg application (d) Genetic Drift measurement.

**UNIT 2: ACCESSING MOLECULAR DATA ON GENETIC DIVERSITY [10 pds]**

(a) DNA technologies and Genome mapping (b)Ex-situ Conservation (c) DNA libraries and sequence data in conservation (d) DNA libraries and sequence data in assessment (e) Application of other DNA technique

**UNIT 3: APPLICA. & UTILIZATION OF MOLECULAR TECH. IN GENETIC DIVERSITY [12 pds]**

(a) Molecular markers for rapid selection and improvement of crop plant (b) Disease screening (c) Genetic Engineering applications (d) Bioremediation process (e) technologies and tracking (f) Success and achievements in bioremediation.

**UNIT 4: MOLECULAR TECHNOLOGIES IMPACT ON GENETIC DIVERSITY [10 pds]**

GMOs - Gene-transfer to non-target groups; species invasiveness, Measures of minimizing direct impacts, Inventories and monitoring, Risk assessments.

**UNIT 5: TECHNOLOGY AND ETHICS [10 pds]**

Human genome project, Genomics and Proteomics, Bioinformatics, Issues on Environmental Health, Guidelines on Bioethics

**SUGGESTED READING:**

GENETICS :Strickberger. John Wiley and sons. CONCEPTS OF GENETICS : Klug, Cummings, Spencer and Palladino; Pearson

GENETICS :Snustand and Simmons. John Wiley and sons. MODERN GENETIC ANALYSIS: Griffiths, Gelbert, Lewontin, and

Miller. W.H. Freeman GENETICS: Russel, Benjamin Cummings Publ. company

**Course Number: ZOM904, Course Title: ADVANCES IN PARASITOLOGY**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:4, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:52

**UNIT 1: RECENT TECHNIQUES**

[7 pds]

(a) Patch-Clamp technique; its history, development (b) Mechanism and significance in parasitology (c) Membranes of parasites and cryopreservation.

**UNIT 2: HELMINTHES IN LABORATORY ANIMALS**

[8 pds]

(a) Recent trends in Mice, Rats-cestode. (b) Trematode parasitism in snails. (c) Nematodes in birds.

**UNIT 3: MALARIAL PARASITES**

[8 pds]

(a) A case of co-evolution (b) Environmental control strategy (c) Role of fishes and Bacteria and Nematodes.

**UNIT 4: EXPERIMENTAL INFECTIONS**

[8 pds]

(a) Experimental infections and experimental parasitism (b) Epidemics (c) Zoonoses.

**UNIT 5: IONIC EQUILIBRIUM**

[8 pds]

(a) Role of ions in the micro-environment of cestode (b) Cysts. (c) Mosquito larvae and other parasitic transport systems.

**SUGGESTED READINGS:**

INDIAN JOURNAL OF PARASITOLOGY

Wanan & Bewers: Parasitology: A GLOBAL PERSPECTIVE

Bhale Rao: PARASITES OF DOMESTIC ANIMALS

INTERNATIONAL JOURNAL OF PARASITOLOGY

Cheng: SYMBIOSIS

JOURNAL OF TROPICAL MEDICINE & HYGIENE

**Course Number: ZOM905, Course Title: ADVANCED TECHNIQUES IN PARASITOLOGY**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:4, Periods(55 mts. each)/week: 4(L-4+T-0+P/S-0),Min.pds./sem.:52

**UNIT 1: METHODS**

[10 pds]

(a) Methods of scaling (b) Recovery of parasites (c) Methods to obtain fresh materials (d) Computer interfacing and data recording

**UNIT 2: PREPARATION**

[10 pds]

(a) Slide preparation in parasitology (b) Killing, fixing, staining, labelling, smears and whole mount of parasites (c) Special techniques for trematodes, cestode & nematode Larval stages (d) Eggs, Isolation and sedimentation.

**UNIT 3: MOLECULAR TECHNIQUES**

[10 pds]

(a) Molecular markers for parasite identification (a) RAPD (b) RFLP (c) DNA BAR coding of parasites

**UNIT 4: ANALYSIS**

[10 pds]

(a) Analysis of body fluids (b) routine tests in haematology (c) Statistical softwares: SPSS, MATLAB

**UNIT 5: CULTURE OF PARASITE**

[10 pds]

(a) Invitro culture of Protozoan-Plasmodium (b) invitro culture of cestode- Echiococcus (c) invitro culture of Nematode: *C. elegans* (d) *Invitro* culture of trematoda –Fasciola

**SUGGESTED READINGS:**

Cheng, TC: FUNDAMENTAL OF PARASITOLOGY

Chandler, AC: INTRODUCTION TO PARASITOLOGY

Roy Chaudhary: HELMINTHOLOGY

Schmidt, GD: ESSENTIAL OF PARASITOLOGY

Scientific Material from WHO

Bhalerao, GD: HELMINTHES, PARASITES OF THE DOMESTICATED ANIMALS IN INDIA

**Course Number: ZOM906, Course Title: EXPERIMENTAL ENTOMOLOGY**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:4, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:52

**UNIT 1: PROCUREMENT OF INSECTS [11 pds]**

(a) Method of Sampling and Collection (b) Categorization based on taxonomic keys (c) preservation (d) display and Photography.

**UNIT 2: FORMULATION & PESTICIDE APPLICATION [11 pds]**

(a) Types of formulation, additives (synergists) (b) binders and baits (c) encapsulation (d) bioassay (e) simulated field conditions and selection of tools for pesticide application.

**UNIT 3: MICROBIAL EXPERIMENTATION [10 pds]**

(a) Preparation of culture media (b) isolation and identification of entomopathogenic fungi and bacteria (c) Cox postulation (d) extraction and screening of mycotoxins.

**UNIT 4: BIOCHEMICAL EXAMINATION [10 pds]**

(a) Qualitative and quantitative estimation of different enzymes (b) growth hormones and regulators.

**UNIT 5: PESTICIDE RESIDUE [10 pds]**

(a) Collection of pesticides residues and their examination (Qualitative and quantitative methods- Chromatographical and Colorimetric).

**SUGGESTED READINGS:**

Busnne JR: A CRITICAL REVIEW OF THE TECHNIQUES FOR TESTING INSECTICIDE

DG Boucias and JC Pendland: PRINCIPLES OF INSECT PATHOLOGY

Lawrence Lacey: MANNUAL OF TECHNIQUES IN INSECT PATHOLOGY (Biological techniques series)

Metcalf CL et.al.: DESTRUCTIVE AND USEFUL INSECTS: THEIR HABITS AND CONTROL

N Raaman: PHYTOCHEMICAL TECHNIQUES

Pradhan S & Jotwani MG: PRINCIPLES OF BIOASSAY OF INSECTICIDES

**Course Number: ZOM907, Course Title: ENVIRONMENTAL TOXICOLOGY**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:4, Periods(55 mts. each)/week: 4(L-4+T-0+P/S-0),Min.pds./sem.:52

**UNIT 1: ECOTOXICOLOGY [11 pds]**

(a) Air pollution (B) Soil pollution (c) Aquatic pollution

**UNIT 2: ENVIRONMENTAL IMPACT [10 pds]**

(a) Hazardous waste (Industrial wastage ,Leather, paper and its management (Chemical, Hospital) (c) EIA

**UNIT 3: ECOLOGICAL IMPACTS [10 pds]**

(a) Environmental, Biotranformation, Bioremediation, Bioaccumulation (b) Biomagnifications (c) Risk assessment

**UNIT 4: ENVIRONMENTAL POLLUTION AND THEIR TOXICITY [11 pds]**

(a) Metals: Hg, Pb, Zn, Ni, Ar, Cd (b) Agrochemicals: Pesticides, Fertilizers (C) Non-ionizing radiation: (Microwaves, Mobile tower, Mobile phones.

**UNIT 5: WILDLIFE TOXICOLOGY [10 pds]**

(a) Analytical Toxicology (b) Biomonitoring of pollutants (c) International and National Regulations (special reference to Env. Toxicants)

**SUGGESTED READINGS:**

Haytes AS: PRINCIPLES AND METHODS OF TOXICOLOGY

Iron RD & Gibson JE: TOXICOLOGY OF BLOOD

Kimmel & Rudka-Sam: DEVELOPMENT TOXICOLOGY

Buscik D: PRINCIPLE OF GENETIC TOXICOLOGY

**Course Number: ZOM908, Course Title: PESTS MANAGEMENT**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:4, Periods(55 mts. each)/week: 4(L-4+T-0+P/S-0),Min.pds./sem.:52

UNIT 1: INSECT PESTS [11 pds]

(a) Principles and methods of IPM, IPM components (b) biological control agents (insect parasitoid and predators (c) non- insect predators and microbes)

UNIT 2: PEST POPULATION AND CROP LOSS [11 pds]

Measurement of Pest population, Factors affecting pest population, methods for estimating crop losses

UNIT 3: ARACHNIDS [10 pds]

Introduction, General morphology, economic importance of spiders and mites

UNIT 4: CLIMATE CHANGE & PEST DYNAMICS [10 pds]

Introduction, impact of pollution, global warming on crop pests and their natural enemies

UNIT 5: ECONOMIC IMPORTANCE OF INSECTS [10 pds]

Biological indicators, pollinators, biocontrol agents, raisin & dye producer, food & medicine for human beings and application in forensic science.

**SUGGESTED READINGS:**

Atwal AS & Singh B: PEST POPULATION & ASSESSMENT OF CROP LOSSES

Chapman RF: THE INSECT STRUCTURE AND FUNCTION

Gautam R.D.: BIOLOGICAL PEST SUPPRESSION

Imms AD, Richards DW &Daviea RG: GENERAL TEXTBOOK OF ENTOMOLOGY

Melnikov NN: CHEMISTRY OF PESTICIDES

Murphy SD: "PESTICIDES" BASIC SCIENCE OF POISON

**Course Number: ZOM909, Course Title: ADVANCED NEUROBIOLOGY I**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits: 4 Periods(55 mts. each)/week: 4(L-4+T-0+P/S-0),Min.pds./sem.: 52

UNIT-1: NEURONAL TRACTS AND AUTONOMIC NERVOUS SYSTEM: [10 pds]

(a) Somato-sensory system, (b) motor system, (c) sensory system, (d) cerebellum, (e) autonomic nervous system: components, central & peripheral parts, cortical control, distribution and function.

UNIT-2: NEUROTRANSMITTERS AND THEIR RECEPTORS: [10 pds]

(a) small molecule neurotransmitters - Glu, GABA, Gly, ACh, dopamine and serotonin (b) neuropeptides - substance P, opioids, hypothalamic and posterior pituitary hormones (c) hypothalamic and posterior pituitary hormones (c) unconventional "poorly understood" neurotransmitters - ATP and other purines, endocannabinoids, nitric oxide (d) Ionotropic receptor activation substances - nicotinic acetylcholine receptors, AMPA, NMDA, GABA (e) metabotropic receptors - muscarinic acetylcholine receptors, metabotropic glutamate receptors  $\alpha$  and  $\beta$  adrenergic receptors

UNIT-3: LIMBIC SYSTEM AND SLEEP: [12 pds]

(a) Limbic system, (b) emotions (as associative learning and as states of the body, (c) mirror neurons, (d) addiction and mood disorders, (e) Sleep (stages, dreams, brain wave, conversion of neural circuitry during changes in the stages of sleep).

UNIT-4: MOLECULAR BASIS OF NEUROLOGICAL DISEASES: [10 pds]

(a) Parkinson's model, (b) Epilepsy and channelopathies (c) Alzheimer's disease, (d) Schizophrenia, (e) stroke and demyelinating diseases

UNIT 5: TECHNIQUES: [10 pds]

(a) Histology: Nerve cell body- H & E, Thionin, Toluidine blue, Cresyl violet, Golgi; Nissl granules- Nissl stain; Neurofibrils-Bielschowsky; Neuroglia-Cajal gold sublimate, Hortega; Axons-Holm's; Myelin-Weigert, Marchi; Nerve endings-Zin & Morin. (b) Histochemistry for localisation of neurotransmitters, neuromodulators, neuromediators. (c) Immunological techniques with the help of monoclonal antibodies.

**SUGGESTED READINGS**

Kandel et.al: PRINCIPLES OF NEURAL SCIENCE, MCGRAW HILL PUBLN.

Shepherd: NEUROBIOLOGY, OXFORD PRESS

Barr's: THE HUMAN NERVOUS SYSTEM, LIPPINCOT RAVEN PUBLN.

Campbell & Reece: BIOLOGY, PEARSON BENJAMIN CUMMINS PUBLN.

**Course Number: ZOM910, Course Title: ADVANCED NEUROBIOLOGY II**

Class: M.Sc., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits: 4 Periods(55 mts. each)/week: 4(L-4+T-0+P/S-0), Min.pds./sem.: 52

**UNIT-1: NEUROPLASTICITY:**

[8 pds]

(a) Concept of plasticity and long term synaptic plasticity, (b) Characteristics and molecular basis of long-term potentiation and depression (LTP and LTD) (c) Cellular mechanisms for synaptic change (d) Spike- timing dependant plasticity (STDP), (e) Hebb's postulate, (f) Circuit plasticity, (g) Mirror neuron: concept, distribution, function, (h) Role of glial cells.

**UNIT-2: COGNITION:**

[12 pds]

(a)Attention, recognition (including agnosias and prosopagnosia), integration, planning, selection and execution. (b) Memory: different category (declarative and procedural), immediate, working, long term. (c)Language (ability to associate arbitrary symbols with specific meanings, Wernike's area, Broka's area, lateralisation of language. (d) Music and executive functions (role of music training in increasing intelligence quotient of learners and enhancing executive functions; difference in increase of intelligence quotient due to learning music viz. effect of different kinds of music on different types of intelligences including Mozart effect; effect on intelligence quotient / scholastic performance.

**UNIT-3: NEUROSYSTEMS:**

[10 pds]

(a)Visual, (b) Auditory, (c) Olfactory, (d) Reticular formation (e) Vibration & equilibrium).

**UNIT-4: BIOLOGY OF CONSCIOUSNESS:**

[10 pds]

(a)Consciousness states, (b) Different theories of consciousness from the perspective of neurology, psychology and cognitive neuroscience , (c) Systems neuroscience approach to conscious perspective experience, (d) Effect of medication on the human body

**UNIT 5: TECHNIQUES:**

[12 pds]

***Only general principles, video-demonstration and interpretation of data. Comparison and significance of different techniques***

(a) **Marker studies** for tracing neuronal pathway with enzyme Horse radish peroxide (HRP) and some fluorochrome dyes (b) **Cell lineage** studies using fluorescent dyes ; (c) Stem cell culture. (e) **Neuronal implant** studies to replace dead neurons, (f) Cerebro Spinal Fluid (**CSF**) studies. (g) **Evoked potential**, microelectrode recordings of potential changes in individual neuron / nerve fibre. (h) **Scan** studies: CT, MRI, PET, SPECT scans. (g) **Meditation**: Electromagnetic, biochemical studies.(i) Electro Encephalography (EEG), (j) Electro Myography (EMG), (k) Magneto Encephalography (MEG).

**SUGGESTED READINGS:**

Kandel et.al: PRINCIPLES OF NEURAL SCIENCE, MCGRAW HILL PUBLN.

Shepherd: NEUROBIOLOGY, OXFORD PRESS

Barr's: THE HUMAN NERVOUS SYSTEM, LIPPINCOTT RAVEN PUBLN.

Zigmond : FUNDAMENTAL OF NEUROSCIENCES

**Course Number: ZOM951, Course Title: DISSERTATION I**

Class: M.Phil., Status of Course: MAJOR COURSE, Approved since session: 2008-09

Total Credits: 8

Dissertation on any topic as per Faculty expertise.

**Course Number: ZOM952, Course Title: DISSERTATION II**

Class: M.Phil., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits: 16

Dissertation on any topic as per Faculty expertise.

**Course Number: ZOM953, Course Title: SELF STUDY COURSE**

Class: M.Phil., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits: 4

Any topic as per Faculty expertise.

**Course Number: ZOM954, Course Title: ADV. SCIENTIFIC METHODOLOGY & ANALYSIS**

Class: M.Phil., Status of Course: Major Course, Approved since session: 2015-16

Total Credits: 4, Periods(55 mts. each)/week:4(L-4+T-0+P/S-0), Min.pds./sem.:52

**[SAME AS CHM955]**

**UNIT 1**

Matrix algebra, Determinants, System of Linear equations, Eigen Values and Eigen Vectors.

**UNIT 2**

Fundamentals of Statistical Analysis and Inference, Parametric and Non-Parametric Tests, Confidence intervals and Errors, Tests of Association; Correlation and Regression, Fundamentals of Time Series Analysis, Error Analysis and their application to life sciences.

**UNIT 3**

Basic principles of experimental design, randomization structure and analysis of completely randomized, randomized block and Latin-square designs. Factorial experiments. Analysis of 2<sup>n</sup> factorial experiments in randomized blocks.

**UNIT 4**

Part A: Use of Computers and relevant software: Computer and its role in Research, Basics of Computer Operating Systems; Excel: Excel Macros; SPSS/ Open Source Statistical Package. Introduction to Presentation Software. Introduction to Internet Technologies and searching the WWW.

Part B: Mathematical and Logical Reasoning to Cover Part I of UGC NET Syllabus. Literature review, report writing and ethics in research.

**UNIT 5**

Introduction to Soft-computing: Genetic algorithms (GA), and Artificial Neural Networks (ANN). Biological basis for ANNs, ANN Architectures, Learning Methods and Applications; Evolutionary computation, Biological Basis for Evolutionary Computation, GA working principle, Encoding, Fitness Function, Variation Operators, Termination Criteria and Applications.

**SUGGESTED READING:**

David Lay, Linear Algebra and its Applications, Pearson.

Holmes, D., Moody, P. & Dine, D., 2010. Research Methods for the Biosciences (2<sup>nd</sup> edition), Oxford University Press, Oxford.

Bajpai, N., 2010, Business Statistics, Pearson Press.

Russell C. Eberhart and Yuhui Shi, 2011, Computational Intelligence: Concepts to Implementations, Elsevier/Morgan Kaufmann Publishers.

S. Rajsekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, Prentice Hall of India.

Robert R. Sokal and F. James Rohlf, Biometry: The Principles and Practices of Statistics in Biological Research.

Gerald Peter Quinn, Michael J. Keough, Experimental Design and Data Analysis for Biologists.

**Course Number: ZOM955, Course Title: GENE, GENOME & BIOINFORMATICS**

Class: M.Phil., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:4, Periods(55 mts. each)/week: 4(L-4+T-0+P/S-0),Min.pds./sem.:52

**UNIT 1: GENETIC SYSTEMS**

[10 pds]

(a) Microbial genetic systems (b) Life at 110°C, at pH 1 or 5M KCl (c) Oncogenes and Tumor suppressor genes (d) c DNA applications (e) mi RNA and Si RNA target genes

**UNIT 2: PROTEOMICS & TRANSCRIPTOMICS**

[10 pds]

(a) Proteins - Heat Shock proteins (b) Scaffolding (c) Protein - Protein interaction (d) Genomic browsers (e) Chromosomal rRNA operons

**UNIT 3: GENOME FUNCTIONS**

[11 pds]

(a) Technology of sequencing and assembly (b) Orthology predictions (c) Transcription factor binding sites (TFBs) (d) Array technologies and its uses

**UNIT 4: BIOINFORMATICS-GENE DATA MINING**

[11 pds]

(a) Gene bank data base (b) NCBI genome resources (c) Sequence alignment (d) Data mining techniques and tools

**UNIT 5: BIOINFORMATICS-APPLICATIONS**

[10 pds]

(a) Genetic algorithm (b) Phylogenetic analysis-building Trees and Motif (c) Using BLAST for similarity searches and comparing two sequences (d) Working with single gene and annotation work flow (e) Submission gene sequences to database.

**SUGGESTED READINGS**

Sambrook, Russell, Maniatis – Molecular Cloning vol. 1,2,3.

T. A. Brown – Gene Cloning.

Winnacker, VCH – An Introduction to gene Technology-from genes to clones.

Primrose, Twyman, Old – Principles of Gene Manipulation.

Wilson & Walker – Principles and Techniques of Biochemistry and Molecular Biology

Primrose and Twyman – Principles of Gene manipulation.

**Course Number: ZOM956 Course Title: MOLECULAR PARASITOLOGY& VECTOR CTRL**

Class: M.Phil., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:4, Periods(55 mts. each)/week: 4(L-4+T-0+P/S-0),Min.pds./sem.:52

**UNIT 1: INSTRUMENTATION AND TECHNIQUES**

[11 pds]

(a) Confocal Microscopy (b) Real Time-PCR Techniques (c) Cloning techniques of microbes and parasites

**UNIT 2: LARVICIDES CONTROL**

[11 pds]

(a)Vector control Biotechnology (b) Green Larvicides (c)Biological Larvicides (d)Nanoparasitology biology and nanolarvicides

**UNIT 3: DEVELOPMENT AND TESTING**

[10 pds]

(a) Larvicides, (b) Adulticides (c) Insect resistance

**UNIT 4: APPLICATIONS**

[10 pds]

(a) Chitinase Biotechnologies (b) DNA Analysis (c) DNA Fingerprinting of Parasites (d)Microbiology of Fermentation Technology for parasitology

**UNIT 5: VACCINE TECHNOLOGY**

[10 pds]

(a) RNA editing (b) Parasitic immunity (c) Vaccine development (d) Control of diseases – NTD, malaria

**SUGGESTED READINGS:**

AN Clements: BIOLOGY OF MOSQUITOES

AR Walker, A Bouattour, JL Camicas, AE Pena, IE Horak, AA Latif, RG Pegram, PM Preston: TICKS OF DOMESTIC ANIMALS IN AFRICA: A GUIDE TO IDENTIFICATION OF SPECIES

Belding DL: TEXT BOOK OF PARASITOLOGY III EDITION, APPLINTER CENTRUEY CNOFF, NEW YORK

**Course Number: ZOM957, Course Title: RESTORATION ECOLOGY, CONSRV.& MNGT.**

Class: M.Phil., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:4, Periods(55 mts. each)/week: 4(L-4+T-0+P/S-0),Min.pds./sem.:52

UNIT 1: ABIOTIC ENVIRONMENT [11 pds]

(a) Problems affecting vital life support system (b) Remedial measures (c) Habitat loss, Fragmentation and restoration

UNIT 2: CAPACITY BUILDING [10 pds]

(a) Introduction (b) human capacity (c) Infrastructural capacity (d) funding capacity

UNIT 3: MONITORING AND RECENT TRENDS IN RESEARCH

Genetic resource Centers, Zoos, animal rehabilitation centres (b) Gene/sperm banks (c) Care in Captivity(d) Nutrition (e) Environment enrichment.

UNIT 4: ENVIRONMENT EDUCATION AWARENESS AND PARTICIPATION [10 pds]

(a) Conservation efforts within natural system (b) National Parks (c) Sanctuaries (d) Nature reserves (d) Biosphere reserves

UNIT 5: MASS AWARENESS AND LEGISLATIONS [11 pds]

(a) Education and awareness (b) Domestic legislation and conventions (c) Media communication (d) Agencies

**SUGGESTED READINGS:**

WPA-Natraj Publication

Rogers and Panwar manual of PAMS/Protected area Management System

Wildlife management –Rajesh Gopal

Subramanyam&Sambamurty: ECOLOGY

WWF HANDBOOK: WILDLIFE CONSERVATION & MANAGEMENT ACT 1972

**Course Number: ZOM958, Course Title: VECTOR BIOLOGY AND MANAGEMENT**

Class: M.Phil., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:4, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.: 52

UNIT 1: VECTORS [11 pds]

(a) Common vectors (Mosquito, Ticks & mites, Housefly and bed bugs, white flies, aphids and mealy bugs), their life cycle, adaptations and diseases transmission.

UNIT 2: EXPERIMENTAL REARING OF VECTORS [11 pds]

(a) Rearing of mosquito, housefly, ticks & mites, artificial diet.

UNIT 3: VECTOR MONITORING [10 pds]

(a) Population dynamics in relation to pest, natural enemies and weather conditions, maintenance of data, modelling and forecasting.

UNIT 4: MANAGEMENT OF VECTORS [10 pds]

(a) Physical, Chemical, Biological, cultural and legal control.

UNIT 5: PESTICIDES USED IN VECTOR CONTROL [10 pds]

(a) Plant and microbial based pesticides, Synergists (b) Nano-pesticides (c) Phyto-nano-pesticides.

**SUGGESTED READINGS:**

AN Clements: BIOLOGY OF MOSQUITOES

AR Walker, A Bouattour, JL Camicas, AE Pena, IE Horak, AA Latif, RG Pegram, PM Preston: TICKS OF DOMESTIC ANIMALS IN AFRICA: A GUIDE TO IDENTIFICATION OF SPECIES

Belding DL: TEXT BOOK OF PARASITOLOGY III EDITION, APPLETON CENTRUEY CNOFF, NEW YORK

Burton J Bogitsh and Thomas C Cheng: HUMAN PARASITOLOGY ACADENAC PRESS.

G. Geevarghese and A.C. Mishra: *Haemaphysalis* Ticks of India

JB Silver: MOSQUITO ECOLOGY, FIELD SAMPLING METHODS

Marquardt WC, Demaree RS, Gruieve B. 2000: PARASITOLOGY AND VECTOR BIOLOGY, HARCORT AP



**Course Number: ZOM959, Course Title: ANIMAL COGNITION**

Class: M.Phil., Status of Course: MAJOR COURSE, Approved since session: 2015-16

Total Credits:4, Periods(55 mts. each)/week: 3(L-3+T-0+P/S-0),Min.pds./sem.:

**UNIT 1: INTRODUCTION**

(a) Meaning and scope of animal cognition (b) Categorization of objects and stimuli : Lab v/s nature (c) Concepts of same – different (d) Number concepts (e) Spatial concepts

**UNIT 2: LEARNING & MEMORY**

(a) Caching and episodic memory in scrub jays (b) Insightful behaviour (c) Imitative behaviour (d) Bird song : a cognitive process (e) Transitive inference

**UNIT 3: COGNITION IN INVERTEBRATES**

(a) Cognition in ant colonies (b) Flexible behavior in spiders (c) Cognition in honey bees

**UNIT 4: COGNITION IN VERTEBRATES**

(a) Skill development in archer fish (b) Social Cognition in tortoises (c) Cognitive abilities of parrots (c) Event Related Potential and cognition in dolphins (d) Cognition in elephants

**UNIT 5: ANIMAL LANGUAGE**

(a) Language skill development in- Chimpanzees, Bonobos, Parrots, Sea lion (b) intelligence v/s rationality and consciousness

**SUGGESTED READINGS:**

The Cognitive Animal – Empirical and Theoretical Perspectives on Animal Cognition, edited by Bekoff, Allen and Burghardt. MIT Press, 2002

Animal Minds, Beyond Cognition to Consciousness - Donald Griffin. University of Chicago Press. 2001

Cognition, Evolution, and Behavior by Sara J. Shettleworth. Oxford University Press. 2009

Animal Cognition: The Mental Lives of Animals – Clive D.L. Wynne. Palgrave MacMillan, 2002

Animal learning and cognition: An introduction (3rd ed.) - John M. Pearce. Psychology Press, UK. 2008

Animal Thinking: Contemporary Issues in Comparative Cognition - Menzel and Fischer. MIT Press, 2011

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## ADVANCE WORK EXPERIENCE COURSES

### **Course Number: ZOW301, Course Title: CELL BIOTECHNOLOGY III**

Class: B.Sc., Status of Course: Work Exp. Course, Approved since session: 2006-07

Total Credits:2, Periods(55 mts. each)/week: 4(L-0+T-0+P/S-4),Min.pds./sem.:52

#### **Culture Methods**

**Theory:** (a) Culture of specific cell types (b) Three dimensional culture system (c) Measurement of cytotoxicity and viability

**Practical:** (a) Culture techniques-suspension and monolayer (b) Replica plating (c) Demonstration of selective and differential media (d) Evaluation of alcohol effectiveness as a skin antiseptic (e) Checking lactose fermentation bacteria in lactose broth.

### **Course Number: ZOW401, Course Title: CELL BIOTECHNOLOGY IV**

Class: B.Sc., Status of Course: Work Exp. Course, Approved since session: 2006-07

Total Credits:2, Periods(55 mts. each)/week: 4(L-0+T-0+P/S-4),Min.pds./sem.:52

#### **Genetics & Microbiological Methods**

**Theory:** (a) Mutagenicity and Carcinogenicity (b) Virus assay (c) Cell counting.

**Practical:** (a) Chromosome preparation by flame/air drying techniques (b) Chromosome preparation by thumb squash technique (c) Cytotoxicity testing (d) Determination of bacterial growth by turbidity measurements.

### **Course Number: ZOW501, Course Title: CELL BIOTECHNOLOGY V**

Class: B.Sc. Hons., Status of Course: Work Exp. Course, Approved since session: 2006-07

Total Credits:2, Periods(55 mts. each)/week: 4(L-0+T-0+P/S-4),Min.pds./sem.:52

#### **Recombination Methods**

**Theory:** (a) Cloning and selection of specific cell types (b) Monoclonal antibody (c) Somatic cell fusion (d) Transgenic organism.

**Practical:** (a) Genomic DNA extraction (b) Plasmid DNA extraction.

### **Course Number: ZOW601, Course Title: CELL BIOTECHNOLOGY VI**

Class: B.Sc. Hons., Status of Course: Work Exp. Course, Approved since session: 2004-05

Total Credits:2, Periods(55 mts. each)/week: 4(L-0+T-0+P/S-4),Min.pds./sem.:52

#### **Biomathematics & Computer Application**

**Theory:** (a) Measurement of Central tendencies, correlation and test of significance (b) Concept of software packages-spread sheets.

**Practical:** (a) Statistical application to cytometrical data (b) Graphs and documentation preparation (c) Microphotography.

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