



(For the candidates admitted from the academic year 2016-2017 onwards)

Semester	Part	Course	Title	Inst. Hours/Week	Credit	Exam Hours	Marks		Total
							Int	Ext	
I	I	Language Course–I (LC) – Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course - I (ELC)		6	3	3	25	75	100
	III	Core Course–I (CC)	Invertebrata I (Protozoa – Nematoda)	6	5	3	25	75	100
		Core Practical – I (CP)	Invertebrata I & Invertebrata II (P)	3	-	-	-	-	-
		First Allied Course–I (AC)	Botany I	4	4	3	25	75	100
		First Allied Course–II (AP)	Botany (P)	3	-	-	-	-	-
	IV	Value Education	Value Education	2	2	3	25	75	100
Total				30	17				500
II	I	Language Course–II (LC)– Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course–II (ELC)		6	3	3	25	75	100
	III	Core Course–II (CC)	Invertebrata II	6	5	3	25	75	100
		Core Practical – I (CP)	Invertebrata I & Invertebrata II (P)	3	3	3	40	60	100
		First Allied Course–II (AP)	Botany (P)	3	3	3	40	60	100
		First Allied Course–III (AC)	Botany II	4	4	3	25	75	100
	IV	Environmental Studies	Environmental Studies	2	2	3	25	75	100
Total				30	23				700
III	I	Language Course – III (LC)– Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course-III (ELC)		6	3	3	25	75	100
	III	Core Course – III (CC)	Chordata	6	5	3	25	75	100
		Core Practical – II (CP)	Chordata & Cell and Molecular Biology (P)	3	-	-	-	-	-
		Second Allied Course – I (AC)	Chemistry I	4	4	3	25	75	100
		Second Allied Course-II (AP)	Chemistry (P)	3	-	-	-	-	-
	IV	Non Major Elective I-for those who studied Tamil under Part-I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	Public Health and Hygiene	2	2	3	25	75	100
Total				30	17				500

IV	I	Language Course –IV (LC) - Tamil*/Other Languages ** #		6	3	3	25	75	100	
	II	English Language Course – IV (ELC)		6	3	3	25	75	100	
	III	Core Course – IV (CC)	Cell and Molecular Biology		4	4	3	25	75	100
		Core Practical – II (CP)	Chordata & Cell and Molecular Biology (P)		3	3	3	40	60	100
		Second Allied Course-II (AP)	Chemistry (P)		3	3	3	40	60	100
		Second Allied Course - III	Chemistry II		4	4	3	25	75	100
	IV	Non Major Elective II-for those who studied Tamil under Part I a) Basic Tamil for other language students	Ornamental fish farming		2	2	3	25	75	100
		b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme								
		Skill Based Elective - I	Skill Based Elective - I		2	2	3	25	75	100
	Total				30	24				800
V	III	Core Course – V (CC)	Animal Physiology		5	5	3	25	75	100
		Core Course – VI (CC)	Genetics and Evolution		5	5	3	25	75	100
		Core Course – VII (CC)	Microbiology		5	5	3	25	75	100
		Core Practical – III (CP)	Animal physiology, Genetics and Evolution & Microbiology (P)		4	4	3	40	60	100
		Major Based Elective – I	Biotechnology/ Economic Entomology		5	5	3	25	75	100
	IV	Skill Based Elective - II	Skill Based Elective - II		2	2	3	25	75	100
		Skill Based Elective – III	Skill Based Elective – III		2	2	3	25	75	100
		Soft Skills Development	Soft Skills Development		2	2	3	25	75	100
Total				30	30				800	
VI	III	Core Course – VIII (CC)	Environmental Biology		6	6	3	25	75	100
		Core Course – IX (CC)	Developmental Biology		6	6	3	25	75	100
		Core Practical – IV (CP)	Environmental Biology & Developmental Biology (P)		5	5	3	40	60	100
		Major Based Elective II	Biochemistry / Immunology		6	5	3	25	75	100
		Major Based Elective III	Bioinformatics / Biophysics & Biostatistics		6	5	3	25	75	100
	V	Extension Activities	Extension Activities		-	1	-	-	-	-
		Gender Studies	Gender Studies		1	1	3	25	75	100
Total				30	29				600	
Grand Total				180	140				3900	

Language Part – I	-	4
English Part –II	-	4
Core Paper	-	9
Core Practical	-	4
Allied Paper	-	4
Allied Practical	-	2
Non-Major Elective	-	2

Skill Based Elective	-	3
Major Based Elective	-	3
Environmental Studies	-	1
Value Education	-	1
Soft Skill Development	-	1
Gender Studies	-	1
Extension Activities	-	1 (Credit only)

* for those who studied Tamil upto 10th +2 (Regular Stream)

+ Syllabus for other Languages should be on par with Tamil at degree level

those who studied Tamil upto 10th +2 but opt for other languages in degree level under Part I should study special Tamil in Part IV

** Extension Activities shall be out side instruction hours

Non Major Elective I & II – for those who studied Tamil under Part I

a) Basic Tamil I & II for other language students

b) Special Tamil I & II for those who studied Tamil upto 10th or +2 but opt for other languages in degree programme

Note:

	Internal Marks	External Marks
1. Theory	25	75
2. Practical	40	60
3. Separate passing minimum is prescribed for Internal and External marks		

FOR THEORY

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks]

FOR PRACTICAL

The passing minimum for CIA shall be 40% out of 40 marks [i.e. 16 marks]

The passing minimum for University Examinations shall be 40% out of 60 marks [i.e. 24 marks]

CORE COURSE I

INVERTEBRATA I (PROTOZOA – NEMATODA)

Objectives:

To enlighten the students about the diverse forms of Invertebrate animals which belong to 5 major phyla present around us. To help our students to distinguish various Invertebrate animals and to know the evolutionary sequence of them.

UNIT I

Introduction to principles of taxonomy and outline classification of Animal Kingdom. **Phylum Protozoa:** General characters and classification up to class level, giving examples. Detailed Study: Paramecium and Plasmodium - General structure and Life cycle. General Topics: Parasitic Protozoans of Man. Nutrition in Protozoa.

UNIT II

Phylum Porifera: General characters and classification up to class level giving examples. Detailed Study: Ascon - General structure and Life cycle. General Topics: Canal system in sponges, Skeleton in Sponges.

UNIT III

Phylum Coelenterata: General characters and classification up to class level giving examples. Detailed Study: *Obelia* and *Aurelia*. General structure and Life cycle. General Topics: Polymorphism in Coelenterata, Corals & Coral reefs.

UNIT IV

Phylum Platyhelminthes: General characters and classification up to class level with examples. Detailed study: *Fasciola hepatica* and *Taenia solium* - General structure and Life cycle General Topics: Regeneration in Platyhelminthes. Parasitic adaptations in Platyhelminthes.

UNIT V

Phylum Nematoda : General characters and classification up to class level with examples. Detailed Study: *Ascaris* - General structure and Life cycle. General Topics: Nematode parasites: Pathogenicity and Control measures of *Ancylostoma*, *Enterobius*, *Wuchereria* and *Dracanculus*.

Text Books:

1. Ayyar, E.K. and T.N. Ananthakrishnan. 1995. A manual of Zoology. Vol. I (Invertebrata) Part I & II. Viswanathan Pvt. Ltd.,
2. Kotpal, R.L. 1996. Modern TextBook of Zoology Invertebrates. Rastogi Publications, New Delhi.

Reference Books:

1. Agarwal, V.K. 2003. Invertebrate Zoology. S.Chand & Company Ltd., New Delhi.
2. Barnes, R.D. 1982. Invertebrate Zoology. Saunders College, Philadelphia.
3. Barrington, E.J.W. 1979. Invertebrates. Structure and Function. ELBS & Nelson.
4. Jordan, E.L. and Verma, P.S.2009 (Multicolour Revised Edition). Invertebrate Zoology. S. Chand & Company Ltd., New Delhi.
5. Nair, N.C., Leelavathy, L. Soundara Pandian, N., Murugan, T and Arumugam, N. 2009. A Text book of Invertebrates. Saras Publications. Nagerkoil.
6. Rastogi, V.B. 1984. Invertebrate Zoology. Kedar Nath Ram Nath Publications, Meerut.

CORE PRACTICAL I

INVERTEBRATA I & INVERTEBRATA II (P)

Objectives:

To impart training on the techniques of dissecting the Invertebrate animals and to understand the various systems present in their body. To demonstrate the technique of in silico dissection of invertebrate animals. To train the students to discriminate the various external body parts of Invertebrates. To observe the preserved animals in the museum (wet and dry) and to study their characteristic features.

Major Dissections:

Digestive and Nervous systems of Earthworm and Cockroach; Dissection of any one Invertebrate animal's digestive and Nervous system by using Computers.

Minor Dissections:

Mounting of Body setae and Penial setae of Earthworm Mounting of mouth parts of Honey bee and Cockroach, Mounting of Pila – Radula

Spotters: Study of invertebrate forms which belong to different phyla with special reference to the following aspects:

A. Classify giving reasons: *Paramecium*, *Euglena*, *Obelia* (Entire), Sea Anemone, *Aurelia*, *Nereis*, Leech, Prawn, House fly, *Lepas*, *Scolopendra*, Millipede, *Gryllotalpa*, Pila, *Sepia*, *Chiton*, *Murex*, *Xancus*, Star fish, Sea Cucumber

B. Biological Significance: *Paramecium* – Conjugation and Binary fission; Sponge - Gemmule; *Fasciola hepatica*, Tape worm, *Ascaris*, Heteronereis, Trochophore larva, Limulus, Nauplius Larva, Peripatus, Silk moth, Honey bees, Bipinnaria Larva and Tornaria larva.

C. Ecological adaptations: *Physalia*, *Porpita*, *Verella*, *Aphrodite*, Leech, Tape worm and *Teredo*

D. Relate the structure and function: Sponge - Spicules; *Taenia solium* – Scolex; *Nereis*– Parapodium; *Sepia*-Cuttle bone; *Pila* – Radula and Star fish – Pedicellaria.

E. Draw and Label the parts: *Planaria* – T.S.; *Fasciola* – T.S.; Tape Worm – T.S.; *Ascaris* – Male T.S.; *Ascaris* – Female T.S.; Leech – T.S. and *Nereis* – T.S.

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

Text/ Reference Books:

1. Verma, P.S. 2013. A Manual of Practical Zoology of Invertebrates, S. Chand & Company Ltd., New Delhi.
2. Vijayaraman. K and palanivel.K, 1997 Cheimurai Vilangial, chimeera Publications.
3. Amsath, A. 2013. Practical manual in Zoology. MMA Publications, Adirampattinam.

CORE COURSE II

INVERTEBRATA II (ANNELIDA – ECHINODERMATA)

Objectives:

To enlighten the students about the diverse forms of Invertebrate animals which belong to 5 major phyla present around us. To help our students to distinguish various Invertebrate animals and to know the evolutionary sequence of them.

UNIT I

Phylum Annelida: General characters and classification up to class level with examples. Detailed Study: Earthworm and Leech General Topics: Metamerism in annelids, Coelom and Coelomoduct, Adaptive Radiation in Annelida.

UNIT II

Phylum Arthropoda: General characters and classification up to class level with examples. Detailed Study: Prawn and Scorpion General Topics: Crustacean larvae and their significance, Peripatus and its affinities, Economic importance of Insects, Social life in Insects.

UNIT III

Phylum Mollusca: General characters and classification up to class level with examples. Detailed Study: Pila and Fresh water mussel. General Topics: Pearl oyster culture, Torsion in mollusca, Economic importance in mollusca.

UNIT IV

Phylum Echinodermata: General characters and classification up to class level with examples. Detailed Study: Star fish and Sea urchin. General Topic: Larval forms of Echinoderms, Water vascular system in Echinoderms.

UNIT V

Minor phyla: General characters of Minor Phyla with examples. Detailed Study and affinities: Ctenophora, Rotifera, Chaetognatha and Sipunculida

Text Books:

1. Ayyar, E.K. and T.N. Ananthakrishnan. 1995. A manual of Zoology. Vol. I (Invertebrata) Part I & II. S. Viswanathan Pvt. Ltd.,
2. Kotpal, R.L. 1996. Modern TextBook of Zoology Invertebrates. Rastogi Publications, New Delhi.

Reference Books:

1. Agarwal, V.K. 2003. Invertebrate Zoology. S.Chand & Company Ltd., New Delhi.
2. Barnes, R.D. 1982. Invertebrate Zoology. Saunders College, Philadelphia.
3. Barrington, E.J.W. 1979. Invertebrates. Structure and Function. ELBS & Nelson.
4. Jordan, E.L. and Verma, P.S. 2009 Invertebrate Zoology. S. Chand & Company Ltd., New Delhi.
5. Nair, N.C., Leelavathy, L. Soundara Pandian, N., Murugan, T and Arumugam, N. 2009.
6. A Text book of Invertebrates. Saras Publications. Nagerkoil. Rastogi, V.B. 1984. Invertebrate Zoology. Kedar Nath Ram Nath Publications, Meerut.

Core Course III

CHORDATA

Objectives:

To enlighten the students about the diverse forms of Vertebrate animals which belong to 5 major classes present around us. To help our students to distinguish various vertebrate animals and to know the evolutionary sequence of them.

UNIT I

Prochordata: General characters of Prochordata and its classification with examples. Detailed Study: Amphioxus. General Topic: Retrogressive metamorphosis in Ascidian.

Cyclostomata: General characters - Detailed study- *Petromyzon*.

Vertebrata: General characters of Vertebrata and its classification up to class with examples

UNIT II

Class Pisces: General characters and classification up to orders with examples. Detailed study: Shark (excluding endoskeleton). General Topics: Accessory respiratory organs in fishes.

Class Amphibia: General characters and classification up to orders with examples. Detailed study: Frog (excluding endoskeleton). General Topic: Parental care in Amphibia.

UNIT III

Class Reptilia: General characters and classification up to orders with examples. Detailed study: *Calotes* (excluding endoskeleton). General Topics: Identification of poisonous and non-poisonous snakes of South India, Poison apparatus and biting mechanism, Venom and Antivenom.

UNIT IV

Class Aves: General characters and classification up to orders with examples. Detailed Study: Pigeon (excluding endoskeleton) General Topics: Flightless Birds and their distribution, Migration of birds, Flight adaptations in birds.

UNIT V

Class Mammalia: General characters and classification up to orders with examples. Detailed Study: Rabbit (excluding endoskeleton) General Topics: Monotremes and Marsupials, Aquatic Mammals, Dentition in Mammals.

Text Books:

1. Ayyar. E.M., Anantha Krishnan T.N. 1995. Manual of Zoology Vol.II, Part I & II. (Chordata), S. Viswanathan Pvt. Ltd., Chennai.
2. Kotpal, R.L.1998. Modern Text Book of Zoology - Vertebrata, Rastogi and Company, Meerut, India.

Reference Books:

1. Dhami, P.S and Dhami, J.K. 1982. Chordate Zoology. R.Chand & co Publishers, New Delhi.
2. Goodrich, 1958. Structure and development of vertebrates, Vol.I & II. New York.
3. Thangamani, T. and Arumugam, N. 2009. A text book of Chordates. Saras Publications.
4. Jordon E and Verma P.S. 1995. Chordate Zoology elements of animal physiology. S.Chand & Co.New Delhi.
5. Waterman, A.J. 1971. Chordate structure and function. Macmillan Company- New York.

CORE PRACTICAL II

CHORDATA & CELL AND MOLECULAR BIOLOGY (P)

Objectives:

To impart training on the techniques of dissecting the vertebrate animals and to understand the various systems present in their body. To demonstrate the technique of in silico dissection of vertebrate animals. To train the students about the various types of animal cells and molecular structures with their characteristic features and detailed functions.

Virtual Dissections:

Shark / Frog / Rat –Digestive, Arterial, Venous & Reproductive Systems

Mountings: Placoid scales, Cycloid / Ctenoid scales

Spotters:

- | | |
|-----------------|---|
| 1. Prochordates | : Amphioxus, Ascidian and Balanoglossus |
| 2. Pisces | : Shark, Ray, Echeneis, Hippocampus, Exocoetus, Catla |
| 3. Amphibia | : Axolotl larva, Hyla, Salamander, Ichthyophis |
| 4. Reptilia | : <i>Naja naja</i> , Viper, Draco, <i>Chelone mydas</i> |
| 5. Aves | : Pigeon, Parrot, King fisher, owl, quill feather |
| 6. Mammalia | : Bat, Loris, Rabbit |
| 7. Dentition | : Rabbit, Dog & Man |
| 8. Osteology | : Pigeon – Synsacrum Rabbit – Pectoral & Pelvic girdles, Forelimb & Hind limb bones |

Cell and Molecular Biology

1. Onion root tip – squash preparation and study of mitosis
2. Grasshopper testes - squash preparation and study of meiosis
3. Chironomous larva - squash preparation of giant chromosome.

Spotters: Columnar, Ciliated, Squamous epithelium, Cardiac, Striated, Non-striated Muscle cells, Nerve cell, Blood cells of Man and Frog. Compound Microscope, Centrifuge, Micrometer, Camera lucida. Models of DNA, DNA replication, RNA types. Students should be introduced to learning of dissections / anatomy adapting CDS / Web sources.

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

Text/ Reference Books:

1. Verma, P.S. 2013. A Manual of Practical Zoology of Invertebrates, S. Chand & Company Ltd., New Delhi.
2. Vijayaraman. K and palanivel.K, 1997 Cheimurai Vilangial, chimeera Publications.
3. Amsath, A. 2013. Practical manual in Zoology. MMA Publications, Adirampattinam.

NON-MAJOR ELECTIVE I
PUBLIC HEALTH AND HYGIENE

Objectives:

To enlighten the non- major elective students about the general knowledge on their health and hygiene. To create general health awareness the hazardous impacts and remedy.

UNIT I

Scope of Public health and Hygiene – nutrition and health – classification of foods – Nutritional deficiency diseases- Vitamin deficiency diseases.

UNIT II

Environment and Health hazards: Environmental degradation – Pollution – Air, Water, Land and Noise-associated health hazards.

UNIT III

Communicable diseases and their preventive and control measures. Measles, Malaria, Hepatitis, Cholera, Filariasis, HIV /AIDS.

UNIT IV

Non-Communicable diseases and their preventive measures. Genetic diseases, Cancer, Cardio vascular diseases, Chronic respiratory disease, Diabetes, Epilepsy,

UNIT V

Health Education in India – WHO Programmes – Government and Voluntary Organizations and their health services – Precautions, First Aid and awareness on epidemic/sporadic diseases.

Text Books:

1. Park and Park, 1995: Text Book of Preventive and Social Medicine – Banarsidas Bhanot Publ. Jodhpur – India.

Reference Books :

1. Verma, S. 1998 : Medical Zoology, Rastogi publ. – Meerut – India
2. Singh, H.S. and Rastogi, P. 2009 : Parasitology, Rastogi Publ. India.
3. Dubey, R.C and Maheswari, D.K. 2007 : Text Book of Microbiology- S. Chand & Co. Publ. New Delhi – India.

CORE COURSE IV

CELL AND MOLECULAR BIOLOGY

Objectives:

To understand the cell and cellular details with their significance. To train the students about the various types of animal cell structures with their characteristic features and detailed functions. It facilitates to understand the structure and function at molecular level in prokaryote and Eukaryote.

UNIT I

Microscopy – Principles and applications of Light, Phase Contrast, Fluorescent and Electron Microscopes – SEM, TEM. **Micro-technique** – tissue fixation, sectioning and staining. Ultrastructure organization of virus, bacteria and animal cell.

UNIT II

Plasma Membrane: Ultra structure, Unit membrane and fluid mosaic models, Membrane proteins - peripheral and integral proteins- functions of plasma membrane. **Cytoplasm:** structure and composition, physical and biological properties. **Endoplasmic Reticulum:** ultrastructure and functions.

UNIT III

Golgi complex – Morphology, structure, role in secretion and other functions. **Lysosome and Centrosome** – Morphology, chemistry and functions. **Mitochondria** – ultrastructure and functions, **Ribosomes** – ultrastructure and functions.

UNIT IV

Nucleus: ultrastructure of interphase nucleus. **Nucleolus and Chromosome**– structure and functions; Giant chromosomes- Polytene and Lampbrush chromosomes. **Cell divisions:** Mitosis and Meiosis. Cell cycles and its significance.

UNIT V

Molecular structure of DNA. DNA– Replication in prokaryotes and eukaryotes, DNA-repair mechanisms. **RNA** – Types and functions. Genetic code- **Protein synthesis** –Transcription, Translation and post-translational modifications. Cancer Biology, Apoptosis- mechanism of programmed cell death, Stem cells.

Text Books:

1. Verma, P.S. and V.K. Agarwal. 2003. Cytology (Cell Biology and Molecular Biology). S.Chand Company Ltd, New Delhi.
2. Powar, C.B. 1997. Cell Biology. Himalaya Publishing House, Bombay.
3. Kumar, H.D. 2003. Molecular Biology. Vikas Publishing House Pvt. Ltd., New Delhi.

Reference Books:

1. De Robertis, E.D.P. and De Robertis E.M.F. 1995. Cell and Molecular Biology. 8th Edition, B.I. Waverly Pvt., Ltd., New Delhi.
2. Freidfelder, D. 2003. Molecular Biology. Narosa Publishing House, New Delhi.
3. Turner, P.C., Mc Lennan, A.G., Bates, A.D and White, M.R.H. 2001. Molecular Biology. Second Edition. Viva Books Pvt. Ltd., New Delhi.
4. Verma, P.S. and V.K. Agarwal. 1998. Cell Biology. S.Chand Company Ltd., New Delhi.
5. Arumugam, N.2001. Cell Biology. Saras Publications, Nagercoil.
6. David, F. 2003. Molecular Biology. Second Edition. Narosa Publishing House, New Delhi.

NON-MAJOR ELECTIVE II

ORNAMENTAL FISH FARMING

Objectives:

To enlighten the non-major elective students about ornamental fish farming a profitable culture practice. To help Arts students about this self-employment programme.

UNIT I

Importance and scope of ornamental fish culture - Economics. Commercial value and potential trends in ornamental fish farming in the world and in India. Budget required for setting up an Aquarium Fish Farm as a Cottage Industry.

UNIT II

Important freshwater and marine ornamental fishes - Indigenous and exotic species- Guppy, Sword tail, Gold fish, Angel fish, Blue morph, Anemone fish, Butterfly fish, Zebra fish, Koi, Tetra, Molly, Glass fish, Cichlids, Hippocampus and Scat fishes.

UNIT III

Mass production of fancy fishes: Preparations for breeding – breeding behaviour of chosen fishes- molly and fighter fish. Induced breeding. Food and feeding – Preparation and composition of formulated fish feeds. Live feeds: rotifers, tubifex. Live fish transport- Fish handling, packing and forwarding techniques.

UNIT IV

Aquarium design, Construction and preparation: size, shape, substrate, ornamental aquatic plants. Construction and functions of Bio filters, aerators – accessories for fish tanks – hood and light, nets, suction tube.

UNIT V

General Aquarium maintenance – Maintenance of water quality: controlling ammonia build up, pH, feeding regimes. Disease management: Common bacterial, viral, fungal, protozoan and crustacean infections, their treatment and control.

Text Books:

1. Santhanam, R., N. Sugumaran and P. Natarajan. 1987. A manual of Fresh water aquaculture. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Shanmugam, K. 1992. Fishery Biology and Aquaculture. Leo Pathipagam, Madras.

Reference Books:

1. Jameson, J.D. and R.Santhanam (1996). Manual of ornamental fisheries and farming technology. Fisheries College and Research Institute, Thoothukudi.
2. Mitchell Beazley, 1998. The complete guide to tropical aquarium fish care. Read and Consumes Book Ltd., London.
3. Jingran V.G., 1991 : Fish and Fisheries in India – Hindustan Publ. Co. New Delhi – India.
4. Mill Dick, 1993 : Aquarium Fish, DK Publ. Co. Inc. New York – USA.
5. Day, F, 1978 : Fishes of India Vol. I & II, William Danisan & Sons, India. Gupta, S.K and Gupta, P.C. 2006. General and Applied Ichthyology. S.Chand and company Ltd. New Delhi.
6. Mitchell Beazley, 1998. The complete guide to tropical aquarium fish care. Read and Consumes Book Ltd., London.

CORE COURSE V

ANIMAL PHYSIOLOGY

Objectives:

The study of Physiology helps in understanding how the body functions adapts with respect to its external and internal environment, related to nervous integration, sensation, metabolism and reproduction.

UNIT I

Nutrition-Food requirements-Carbohydrates, Proteins, Fats, Minerals, and Vitamins. Digestive-enzymes and their role in digestion – metabolism of Protein, Carbohydrates and Lipids. Absorption and assimilation of digested food materials. Balanced diet, BMR and BMI.

UNIT II

Respiration- Structure of mammalian lungs and gaseous exchange- Transport of Oxygen-Transport of CO₂. Circulation: Structure of mammalian heart and its working mechanism – Heart beat and Cardiac cycle. Myogenic and neurogenic hearts. Properties and Functions of blood - ECG - Blood Pressure - factors contributing to heart problems.

UNIT III

Excretion - Nitrogenous waste material and their formation. Structure and function of mammalian kidney and nephron - mechanism of urine formation. Osmotic and ionic regulation by freshwater and marine animals. Muscles - structure and types of muscles -mechanism of muscle contraction.

UNIT IV

Structure of nerve cell. Conduction of nerve impulse, Structure of synapse, mechanism of synaptic transmission –Neurotransmitters. Bioluminescence – Biological clocks. Receptors: types, Photoreceptor - Structure of Human eye - Physiology of vision, Phonoreceptors – Structure of Human ear- organ of Corti-working mechanism.

UNIT V

Endocrine glands – structure and hormones of Hypothalamus, Adenohypophysis, Neurohypophysis, Pineal gland, Thyroid gland, Parathyroid, Thymus, Adrenal and Pancreas. Endocrine control of mammalian reproduction – Male and female hormones – Hormonal control of Menstrual cycle in humans. Hormones of insects.

Text Books :

1. Rastogi, S.L., 1997. Essential of Animal Physiology. New Age International Publisher, New Delhi.
2. Verma, P.S. and V.K. Agarwal.1992. Animal Physiology. S. Chand and Co. New Delhi.

Reference Books:

1. Mariakuttikan and N.Arumugam, 2002. Animal Physiology. Saras Publication, Nagarcoil.
2. Sambasivaiah, Kamalakararao and Augustine Chellappa 1990. A Text book of Animal Physiology and Ecology, S. Chand & Co., Ltd., New Delhi - 110 055.
3. Parameswaran, Anantakrishnan and Ananta Subramaniam, 1975. Outlines of Animal Physiology, S. Viswanathan Pvt. Ltd.,
4. William S. Hoar, 1976. General and Comparative Physiology, Prentice Hall of India Pvt. Ltd., New Delhi.
5. Wood, D.W., 1983. Principles of Animal Physiology 3rd Ed.,
6. Prosser, C.L. Brown 1985. Comparative Animal Physiology, Satish Book Enterprise, Agra - 282 003.

CORE COURSE VI

GENETICS AND EVOLUTION

Objectives:

Giving a basic overview of genes, mutations, sex determination and patterns of inheritance. An understanding of the chromosomal inheritance and expression of human genetic characters and disorders. To understand the evolution of life.

UNIT I

Mendel's principles and applications. Linkage and crossing over -chromosome theory of linkage, kinds of linkage, linkage groups, types of crossing over, mechanism of meiotic crossing over, kinds of crossing over, theories about the mechanism of crossing over, cytological detection of crossing over, significance of crossing over. Chromosome mapping - Gene mapping.

UNIT II

Chromosomal variation in Number & Structure – Euploidy, Non-disjunction & Aneuploidy. Chromosomal deletions & duplications, inversions & translocations. Gene mutations. Mutagens. Human Cyto-Genetics - human traits – Human karyotype, Banding techniques, classification, Genetic diseases (gout, hypercholesterolemia, cystic fibrosis, phenylketonuria, hemophilia, and muscular dystrophy), syndromes (Down, Klinefelter, and Turner), and congenital anomalies.

UNIT III

Molecular genetics: Structures and replication of DNA. Types and structure of RNA. Organization and functions of genetic materials- Chromatin, nuclear and mitochondrial genome. Gene paradox, Repetitive DNA, Satellite DNA, Overlapping genes, Split genes, Pseudogenes. Fine structure of gene – cistron, recon and muton - Gene expression and regulation in prokaryotes – Operon model – Lac and Trp Operon – Gene regulation in Eukaryotes. Gene amplification.

UNIT IV

Chemical origin of life; Evidences – Morphological, Embryological, Biochemical and Paleontological evidences. Fossil and Fossilization, Dating of Fossils. Lamarck, Darwin and De Veries Theories of Evolution and their modern concepts.

UNIT V

Mimicry and animal colouration; Speciation and Species concept; Isolating mechanisms; Hardy Weinberg Principle: Gene pool and Gene frequency. Evolution of horse; Evolution of man.

Text Books :

1. Verma P .S. and Agarwal, V.K. 1997 – Genetics S. Chand & Co., New Delhi.
2. Goodenough, U.1997. Genetics. Saunders Coelege Publishing International, NewYork.

Reference Books:

1. Kumar, H.D. 1998. Molecular Biology and Biotechnology. Vikas publishing House,New Delhi
2. Lewin, B. 1998. Gene VI . Wiley Eastern Ltd., New Delhi.
3. Rothwell, N.V.1979. Human Genetics. Prentice Hall of India, New Delhi.
4. Gupta P.K. 1995-96 Genetics, Rastogi publication, Shivaji Road, Meerut 250 002.
5. Strickberger, M.W. 2002 Genetics (3rd edition). Prentice Hall of India, New Delhi.
6. Friefelder. D. 1997. Microbial Genetics; Narosa Publishing, New Delhi.
7. Arumugam, N. 1989. Organic Evolution –. Saras publication, Nagercoil.

CORE COURSE VII

MICROBIOLOGY

Objective :

Microbiology emphasis the infectious diseases that are of great actual or potential importance to humans. To provide students with the latest information in scientific microbiological methods.

UNIT I

History and Scope of microbiology- Classification of microbes. Structure of *a bacterium*. Bacterial respiration and reproduction – economic importance of bacteria. Classification of viruses- physical and chemical structures of viruses on the basis of capsid symmetry - enveloped (Herpes virus), helical (TMV) and icosahedral (Polyoma viruses), complex (Bacteriophage) and Virion.

UNIT II

Concept of Sterilization - Physical and Chemical methods of sterilization. Stains and staining techniques. Bacterial nutrition and Growth- Nutritional types. Growth factors, Types of culture - culture media- Isolation of pure culture –Colony morphology and growth- Growth curve and Growth kinetics.

UNIT III

Microbiological analysis of water purity- Microorganisms in fresh water and marine water. Microorganisms of different soils - interactions with the atmosphere. Microorganisms in extreme environments- Thermophilic, Methanogenic and Halophilic. Photosynthetic bacteria, Cyanobacteria some Archaea who live in extreme conditions like cold, and space.

UNIT IV

Food borne infections and intoxications - Clostridium, Salmonella, and Staphylococcus –microtoxins in food with reference to Aspergillus species- Quality assurance- microbiological quality standards of food, government regulatory practices and policies- FDA, EPA.

UNIT V

Morphological characteristics, Pathogenesis, laboratory diagnosis and treatment of any five disease causing Bacteria, Virus and Fungus.

Text Books:

1. Prescott L.M., John. P. Harvey, Donald A, Klain. Microbiology second edition –W.M.C. Brown Publications.
2. Dubey R.C, D.U. Maheshwari 2005. A Text book of Microbiology, S.Chand and company Ltd, New Delhi.
3. Rao, A.S. 2001. Introduction to Microbiology. Prentice Hall of India Private Limited, New Delhi.

Reference Books:

1. Pelczar, M.J., Chan, E.S., Kreig, N.R. 1993. Microbiology (Fifth edition). Tata McGraw-Hill Publishing Company Ltd., New Delhi.
2. Purohit, S.S. 2005. Microbiology Fundamentals and applications (Sixth Edition). Student edition, Jodhpur.
3. Raman Rao, P.V. 2005. Essentials of Microbiology. CBS Publishers and Distributors, New Delhi.
4. Malacinski, M.G. 2006. Essentials of Microbiology Narosa Publishing House, New Delhi.
5. Narayanan, L.M., Selvaraj, A.M and N.Arumugam. 1999. Microbiology Saras Publication, Nagercoil .
6. Ananthanarayanan, R. and Jayaraman Paniker, C.K. 1990. Text Book of Microbiology. Orient Longman Ltd.,

CORE PRACTICAL III

ANIMAL PHYSIOLOGY, GENETICS AND EVOLUTION & MICROBIOLOGY (P)

Objectives:

To impart training on the techniques of physiological concepts in vertebrate animals and to understand molecular structures, genetical importance and evolutionary significance. To train the students about bacterial cells and culture techniques.

Animal Physiology

1. Qualitative and quantitative tests for proteins,
2. Qualitative tests for carbohydrates and fats
3. Human salivary amylase activity in relation to Temperature and pH.
4. Identification of Nitrogenous waste products
5. Enumeration of RBCs/WBCs by haemocytometer

Spotters: Haemoglobinometer, Kymograph, Sphygmomanometer.
Models of Amino acids, Haemoglobin, ATP, Steroids

GENETICS:

Recording of Mendelian traits in Man, Blood grouping of man, Pedigree Analysis. Models: Monohybrid and Dihybrid crosses. Karyotypes of normal male and female. Klinefelter's syndrome, Turner's syndrome and Down's syndrome. Drosophila- Male and female identification, Genetic importance, Mutants (Wing, body colour, eye colour). Models for DNA, RNA, tRNA Structure and DNA replication.

Evolution:

Spotters: Protective coloration -Leaf insects, Stick insects, Chameleon, Hippocampus, Pepper moth. Mimicry: Monarch and Viceroy butterfly. Quantum evolution; Bat, Pteropus

Microbiology

1. Demonstration of sterilization procedure for culture media and equipment.
2. Preparation of culture media for microbes, serial dilution techniques (in groups)
3. Distribution of microbes in water (demonstration and observations.)
4. Fixing and gram staining of bacteria
5. Hanging drop preparation of *Lactobacillus*.

Spotters: Laminar Air flow, Autoclave, Petri-dish, Inoculation loop.

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

MAJOR-BASED ELECTIVE I (A)

BIOTECHNOLOGY

Objectives:

To enlighten our students on various aspects of biotechnology and its beneficial products. To encourage the students to take biotechnology as their career as it provide ample scope for bright feature.

UNIT I

Biotechnology –Definition, Scope and Importance – Applications of Biotechnology. Genetic Engineering and Gene Cloning: Tools of Genetic Engineering: Enzymes - Gene cloning vectors - pBR 322 Plasmid, Ti plasmid, pSV plasmid and simian virus 40. Preparation of desired DNA; *In vitro* construction of rDNA.

UNIT II

Gene Transfer Mechanisms: Bacterial Conjugation, Transformation, Transfection, Transduction, Microinjection, Electroporation, Microprojectile, Shot Gun method, Ultrasonication, Liposome fusion, Microlaser. Selection (Screening) of Recombinants: Immunochemical Method and Colony Hybridization - Gene cloning in prokaryotes - Gene library and cDNA library.

UNIT III

Genetic Engineering for Human Welfare: Production of Insulin, Somatotropin (HGH), Human Interferons, Vaccine and their applications; Transgenic animals and their uses. Animal Biotechnology: Requirements for Animal cell culture – Maintenance and storage of Cell lines -Methods for Cryopreservation - Cell Bank – Animal Bioreactors and their uses.

UNIT IV

Molecular markers and their applications: Restriction Fragment Length Polymorphism(RFLP) – Random Amplified Polymorphic DNA (RAPD) – Minisatellites or Variable Number of Tandem Repeats (VNTRs) – Microsatellites (SSRs); PCR (Amplification of DNA) – Applications of PCR Technology. DNA sequencing methods: Sanger's method and Automatic DNA sequencing; DNA Finger printing – Applications of DNA finger printing.

UNIT V

Environmental Biotechnology: Waste treatment-anaerobic and aerobic treatment. Microorganisms in Pollution control – Bioremediation, Biological Bleaching, Biomass Production, Bio-fuels and Bio-prospecting.

Text Books:

1. Dubey, R.C. 2007. A Text book of Biotechnology. S.Chand and Company Ltd, New Delhi.
2. Gupta, P.K.2004. Biotechnology and Genomics (1st Edition) Rastogi Publications, Meerut.

Reference Books:

1. Kumerasan, V.2009. Biotechnology (Revised Edition), Saras Publications, Kanyakumari.
2. Ignacimuthu, S.J.2002. Basic Biotechnology. Tata McGraw – Hill Publishing Company, Ltd., New Delhi.
3. Ignacimuthu, S.J.2008. Biotechnology – An Introduction. Narosa Publishing House New Delhi.
4. Arora, P.M.2003. Biotechnology. I Edition. Himalaya Publishing House, Mumbai.
5. Gupta, P.K.2001. Elements of Biotechnology and Genomics (I Edition) Rastogi Publications, Meerut.
6. Das, H.K. 2005. Text book of Biotechnology (Second edition). Wiley Dreamtech India (P) Ltd., New Delhi.

MAJOR-BASED ELECTIVE I (B)

ECONOMIC ENTOMOLOGY

Objectives:

To enlighten the students on beneficial and harmful insects, their biology, their nature of damage and their management measures. To teach our students about pests which attack our crops and their management measures.

UNIT I

Insect Pests: Definition - Classification- Primary and Secondary pests – Major and Minor pests – Pests of Paddy, Sugarcane, Cotton – Their Biology, Nature of damage and management methods (Any four Major pests for each crop) - Pest outbreak - Pest resurgence - Pests of stored products and their Management methods.

UNIT II

Principles of insect control: Prophylactic measures – An overview of cultural, mechanical, physical, biological and chemical methods. Pesticides – classification, types of pesticide formulation, mode of action, toxicity. - Non-conventional methods of Insect Management – Insect Growth Regulators (IGRs), Repellents, Antifeedents, Pheromones, Chemosterilants, Irradiation, Quarantine methods– Botanical Pesticides and their use in management of insect pests of crops

UNIT III

Integrated Pest Management (IPM): Definition and Integration of methods. Potential components of IPM and its application. Insect plant interactions. Pest – Predator Complex - Ecological balance – Economic Threshold Levels (ETLs)

UNIT IV

Beneficial insects: Economic importance of honey bee; silk worm and lac insect - Pollinators, soil builders and scavengers. Biological control agents of Insect Pests – Pathogens, Parasites and Predators – Utilization of Bio-control agents in managing insect pests.

UNIT V

Insects and Diseases: Biology of insect vectors *i.e.*, Housefly, Mosquito, Flea and Cockroaches. Mode of transmission pathogens and epidemiology of typhoid fever, dengue, plague.

Text Books:

1. David, B.V.2001. Elements of Economic Entomology. Popular Book Depot, Chennai.
2. Fenemore, P.G. and Prakash, A. 2006. Applied Entomology. New Age International (P) Limited Publishers, New Delhi.

Reference Books:

1. Chapman, R. F. 1988. The Insects Structure and function. Cambridge University Press, U.K.
2. Kumar, A. and Nigam, P.M. 2003. Economic and Applied Entomology. Emkay Publications, Delhi.
3. Pedigo, L.P.2003. Entomology and pest management. Pearson Education (Singapore) Pvt. Ltd., Delhi.
4. Prakash, I and Mathur, R.P.1987. Management of Rodent Pests. ICAR, New Delhi.
5. Singh, R. and Sachan, G.C. 2004. Elements of Entomology. Rastogi Publications, Meerut.
6. Fitzwater, W.D. and Prakash, I. 1989. Handbook of vertebrate pest control. ICAR, New Delhi.
7. Ambrose, D.P. 2004.General Entomology. Kalyan Publishers, West Bengal.
8. Rathinasamy, T.K.1986. Medical Entomology. S Viswanathan and Co., Madras, India.

CORE COURSE VIII
ENVIRONMENTAL BIOLOGY

Objective:

Environmental Biology is designed to provide fundamental ecological principles that provides in-depth understanding of our natural world, the scientific basis for understanding how environmental systems work, the environmental issues, environmental problems, effects and solutions.

UNIT I

Definition – Branches of ecology; Environment: Atmosphere (Air), Hydrosphere (Water), Lithosphere (Soil); Abiotic factors: Temperature and light – Effects of light and temperature on animals. Biotic factors: Animal association – symbiosis, Commensalism, Mutualism, Antagonism, Antibiosis, Parasitism, Predators and Competition.

UNIT II

Ecosystem; Natural ecosystem and Man-made ecosystems - Trophic levels, Energy flow, Ecological pyramids and Productivity - Food chain and Food Web. Principles and concepts of Biogeochemical cycles- carbon, oxygen, nitrogen, phosphate and sulphur. Laws of limiting factors. Habitat Ecology: Fresh Water, Marine Water and Terrestrial habitat.

UNIT III

Community Ecology: Types of Communities; Characteristics of Community – Stratification - Community interdependence – Ecotone - Edge effect; Ecological Niche – Ecological succession. **Population ecology:** Population Size and Density, Natality, Mortality, Age Structure, Biotic Potential, Population Dynamics, Emigration and Immigration; Regulation of Population Size.

UNIT IV

Environmental Pollution: Air, Water, Land, Noise, Thermal and Radiation. EIA, GIS, Global warming and Biomagnification. Biological indicators and their role in environmental monitoring - Environmental conservation and management.

UNIT V

Energy Crisis: Conventional Sources of Energy-Coal, Oil and Natural Gas, Thermal Power, Nuclear power- Non-Conventional sources of Energy – Solar, Wind, Tidal, Wind and Bioenergy. Terrestrial resources, forest and agriculture, aquatic resources and their conservation. Wildlife conservation - Sanctuaries and National parks.

Text Books:

1. Sharma, P.D. 2010 (Tenth Edition) Ecology and Environment, Rastogi Publications, Meerut.
2. Verma P.S. and V.K. Agarwal, 2007. Environmental Biology. S. Chand and Co., New Delhi.

Reference Books:

1. Clarke, G.L. 1954 – Elements of Ecology, John Wiley & Sons. N.Y.
2. Odum E.P.1971. Fundamentals of ecology. W.B. Saunders Co., Philadelphia.
3. Kendeigh, S.C., 1961 – Animal Ecology, Prentice Hall.
4. S.S. Purohit, D.H. Shanmi and A.K. Agarwal, 2004 – Environmental Sciences : A New Approach, Agrobix, Jodhpur.
5. Arumugam, N.2009. Concepts of ecology. Saras publications, Nagarkoil.
6. Verma, P.S and V.K. Agarwal. 2007. Cell biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand and Company Ltd. New Delhi.
7. Claude, F., Christiane, F., Paul, M. and Jean, D. 1998. Ecology Science and Practice. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
8. Rastogi, V.B. and M.S. Jayaraj. 1997. Animal ecology and distribution of animals. Kedarnath, Ramnath.

CORE COURSE IX

DEVELOPMENTAL BIOLOGY

Objectives:

Developmental Biology is an experimental science, which provides understanding of the processes of early embryonic development, to analyze the mechanisms of development by experimental manipulation of developing embryos and to review current developments in the field of embryology.

UNIT I

Gametogenesis: Spermatogenesis – Cells in seminiferous tubules, Spermiogenesis, structure and types of sperm. Oogenesis – Growth of oocyte, vitellogenesis, organization of egg cytoplasm. Polarity and symmetry – Maturation of egg, egg envelopes - Types of eggs.

UNIT II

Fertilization: External and Internal fertilization, sperm – egg interaction, physiological changes in the organization of egg cytoplasm - Theories of fertilization. Cleavage – Patterns of cleavage – radial, spiral and bilateral; Types – meroblastic, holoblastic and superficial - Factors affecting cleavage - Chemodifferentiation.

UNIT III

Blastulation – Types of blastula. Fate maps. Presumptive organ forming areas in Frog and Chick. Gastrulation in Frog and Chick - Morphogenetic movements - Development of brain and eye in Frog. Developmental stages of Chick embryo up to 96 hours and organogenesis.

UNIT IV

Foetal membranes in Chick and Mammals - Placentation in Mammals- types and physiology. Organizer concept and embryonic induction. Regeneration in Planarians and Amphibians. Metamorphosis in Amphibians.

UNIT V

Precautions and health care during Human Pregnancy and Gestation-infertility. Artificial Insemination – Concept of test-tube baby - Birth control methods - Factors involved in Teratogenesis.

Text Books:

1. Beril., N. J.1974. Developmental Biology. Tata Mc Graw-Hill Publishing Company Ltd. New Delhi.
2. Berry.A.K.2007. An Introduction to Embryology, Emkay Publications, New Delhi-51.

Reference Books:

1. Arumugam.N. 1998. Developmental Biology, Saras Publications,
2. Balinsky, B.I. 1981. An Introduction to Embryology. W.B. Saunders Company. Philadelphia.
3. S.Banerjee, Development Biology, Dominant Publishers, New Delhi
4. Verma, P.S. And Agarwal V.K. 2005. Chordate Embryology (Developmental Biology)
S. Chand&Company Ltd., New Delhi.
5. Veer balarastogi, Developmental biology, Kedarnath Ram nath publishers, meerut.
6. Rastogi, V.B and Jayaraj, M.S. 2002. Developmental Biology Kedar Nath Ram Nath, Meerut.
7. Twymann, R.M. 2003. Developmental Biology. Viva Books Private Ltd., New Delhi.

CORE PRACTICAL IV

ENVIRONMENTAL BIOLOGY & DEVELOPMENTAL BIOLOGY (P)

Objectives:

To provide fundamental ecological principles that provides in-depth understanding of our natural world, the scientific basis for understanding how environmental systems work. Developmental Biology provides understanding of the processes of early embryonic development and developing embryos

Environmental Biology

1. Estimation of Dissolved Oxygen in water samples.
2. Estimation of Salinity in water samples.
3. Estimation of Calcium in water samples.
4. Intertidal fauna- sandy, muddy and rocky shore.
5. Examination of marine planktons.
6. Observation of pH and salinity variations in different soil samples.
7. Estimation of LC₅₀ (Demonstration in groups using different toxicants)
8. Estimation of toxicants (metals, organophosphorus) in industrial effluents.

Spotters:

Animal association, pH meter, Secchi disc, maximum and minimum thermometer, Anemometer, Barometer, Hygrometer.

Developmental Biology

Frog /Bull – sperm motility,
Blastoderm mounting in Chick (demonstration only)

Spotters:

Sperm, T.S. of Mammalian ovary.
Frog: Egg, cleavage, blastula, Yolk plug and tadpole stages
Chick: Egg, Developmental stages - 24 hrs, 48hrs, 72 hrs and 96 hrs.
Sheep: Placenta

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

MAJOR-BASED ELECTIVE II (A)

BIOCHEMISTRY

Objectives:

The objective of the Biochemistry course is to provide a basic approach to biochemistry. It provides the structure and function of bio molecules and its importance.

UNIT I

Biochemistry: Definition – Scope of biochemistry, Organic compounds – Classification of organic compounds -Carbohydrates, Proteins, Lipids and Nucleic acids. pH – Definition, measurement, regulation and importance of pH. Vitamins: water soluble and fat soluble vitamins, occurrence, functions and deficiency diseases.

UNIT II

Metabolism of Carbohydrate: Glycolysis, TCA cycle, HMP shunt pathway, Glycogenesis and glycogenolysis. Protein: General pathway of amino acid metabolism – deamination, transamination and decarboxylation. Urea cycle. Glycine and phenylalanine metabolism. Lipid : Beta-oxidation, biosynthesis of saturated fatty acids- Palmitic acid, Nucleic acids: metabolism of purine and pyrimidine nucleotides. Ketogenesis

UNIT III

Enzymes: Definition, nomenclature and classification of enzymes- structure, properties and functions of enzymes and coenzymes. Mechanism of enzyme action- active site, Lock and Key model, induced fit hypothesis. Mechanism of enzyme catalysis, enzyme-substrate complex formation, Allosteric enzymes.

UNIT IV

Free energy and entropy changes in biological system, coupling of endergonic and exergonic processes. High energy phosphates and their role in redox reaction. Phosphagens-ATP as an energy molecule. Synthesis of ATP.

UNIT V

Hormones - classification and types- general structure of hormone - Organ specific hormones - Mechanism of hormonal action and regulation- Receptors of hormones - G-protein.

Text Books:

1. Lehninger L. Albert, David. L. Nelson, Michael M. Cox. (1993), Principles Of Biochemistry, CBS Publishers and Distributors, Delhi.
2. Rastogi, S.C. 1998. Biochemistry. Tata McGraw Hill Publishing Company Ltd, New Delhi.

Reference Books:

1. Singh, S.P. 2004. A Text Book of Biochemistry. Third Edition. CBS Publishers, New Delhi.
2. Satyanarayana, U. 2005. Biochemistry. Arunabha Sen, books and Allied (P) Ltd., Kolkatta.
3. Asokan, P. 2006. Analytical Biochemistry. Chinna Publications, Melvisharam.
4. Jain, J.L. 2004. Fundamentals of Biochemistry. S.Chand and Company Ltd. New Delhi.
5. Stryer, L. (1988), Biochemistry, W.H. Freeman And Company, New York.
6. Cooper, T.G. (1977), The Tools Of Biochemistry, Wiley Interscience Publication, New York.
7. Smith Et Al., (1985), Principles of Biochemistry, Mcgraw Hill (Mammalian Biochemistry).

MAJOR-BASED ELECTIVE II (B)

IMMUNOLOGY

Objectives:

Immunology course emphasizes the function of immune system, structure and function of immunoglobulin and immunological techniques.

UNIT I

History and Scope of Immunology. Types of immunity- Innate and Acquired. Humoral and cell mediated immunity. Organs of the immune system: Primary and Secondary lymphoid organs, Lymphatic system. Cells of the immune system: B and T lymphocytes, dendritic cells, Macrophages other non-lymphoid cells,

UNIT II

Antigens and Antibody- Structure, properties, functions and types- Theories of antibody production, Antigen-Antibody interaction - Immunoglobulins: structure, properties, classification and functions - Complements: Classical and alternative pathways and its biological consequences- Cytokines: cytokine related diseases

UNIT III

Hypersensitivity - Types of hypersensitivity - Major Histocompatibility Complex (MHC) and its significance. Role of MHC in immunity. - Transplantation immunology- MLR, HLA Typing - Bone marrow transplantation, Organ transplants. Mechanism of allograft rejection.

UNIT IV

Diseases and immune response - Viral - Bacterial diseases - Parasitic infections - Tumour immunology. Immune deficiency diseases - AIDS. Autoimmune diseases - examples, concept and mechanisms. Cancer and the immune system - Identification of B and T epitopes for vaccine development. Monoclonal antibodies and their applications.

UNIT V

Immunotechniques: detection of molecules using ELISA, RIA, Western blot, Immunoprecipitation, flow cytometry and Immunofluorescence microscopy, *in situ* localization - FISH and GISH.

Text Books:

1. Rao, C.V. 2006. Immunology. Narosa Publishing House, New Delhi.
2. Kannan, I. 2007. Immunology. MJP Publishers, Chennai.

Reference books:

1. Gupta S.K. (1999) Immunology, Narosa Publishing House, New Delhi.
2. Ivan Roitt, 1994. Essential Immunology (8th Edition) Blackwell Scientific Publication.
3. Kuby, Goldsby R.A. Kindt T.I. and Osborne B.A. (2000) Immunology IV edn. WH Freeman Co. NY.
4. Shetty, N. 2006. Immunology. New Age International (P) Limited, Publishers. New Delhi.
5. Shastri, N.V. 2005. Principles of Immunology. Himalaya Publishing House, Delhi.
6. Fatima, D. and Arumugam, N. 2001. Immunology. Saras Publications, KanyaKumari.
7. Annadurai, B. 2009. A Textbook of Immunology and Immunotechnology. S.Chand & Company Ltd., New Delhi.

MAJOR-BASED ELECTIVE III (A)

BIOINFORMATICS

Objective:

To enlighten our students on various aspects of bioinformatics and its significance. To encourage the students to take bioinformatics as their career as it provide ample scope for bright feature.

UNIT I

Computers and Internet in Biochemical Research: Types of Modern Computers – Basics of Internet – Usenets – File Transfer Protocol (FTP) – Hyper Text Markup Language (HTML) and HTTP – Browsers – Homepage – Uniform Resource Locators (URLs) – Hyperlinks – Web addresses – Search engines – Web applications – IP addresses – Internet Service Providers (ISPs) – Programmes in Bioinformatics.

UNIT II

Bioinformatics: Definition – Components of Bioinformatics – Importance and Applications of Bioinformatics; Biological Macromolecules: Genes/DNA: Definition – Evolution of gene concept – Genes and Genomes – Proteins - Amino acids –Genomics: Definition - Structure and organization of Prokaryotic and Eukaryotic Genomes - Human Genome Project (HGP) and its applications; Proteomics: Definition - Protein Structure Prediction Analysis.

UNIT III

Biological Databases: Sequence databases: Primary and Secondary databases – Nucleic acid sequence databases: NCBI, DDBJ and EMBL; Structure of Nucleotide sequence databases: GenBank format – RNA databases; Protein sequence databases: SWISS-PROT, TrEMBL, PIR, UniProt; Structure of Protein Sequence Databases: SWISS-PROT format; Annotated, Redundant and Non-redundant databases; Protein structural databases: PDB, MMDB, FSSP, SCOP, CATH.

UNIT IV

Bioinformatics Tools: BLAST, FASTA, Clustal W, PFAM, SCANPS, RasMol and PHYLIP; Sequence Alignment: Optimal, Global and Local alignments; Pair wise Sequence Alignment: Dot Matrix, Dynamic Programming; Multiple Sequence Alignment: Definition, Uses of Multiple sequence Alignment; Phylogenetic analysis: Phylogenetic Tree, Structure and Construction of a Phylogenetic Tree – Phenetic Methods - Motif databases.

UNIT V

Homology, Analogy, Orthology and Paralogy: Definitions – Comparison of Homology, Analogy, Orthology and Paralogy; Bioinformatics in the Pharmaceutical Industry: Drug Discovery – General Approaches to Discovery of new drugs – Lead discovery – Lead Modification – Clinical trials.

Text Books:

1. Murthy, C.S.V. 2004. Bioinformatics. Himalaya Publishing House. Delhi.
2. Sundaralingam, R. and V.Kumaresan. 2008. Bioinformatics. Saras Publication. Nagercoil.
3. Sundararajan, S and Balaji, R. 2003. Introduction to Bioinformatics. Himalaya Publishing House, Delhi.

Reference Books:

1. Campbell, A.M and Heyer, L.J. 2004. Discovering Genomics, Proteomics and Bioinformatics. Pearson Education. Delhi
2. Lesk, A.M. 2007. Introduction to Bioinformatics (Second edition). Oxford University press, New Delhi.
3. Attwood, T.K and Parry-Smith, D.J. 2001. Introduction to Bioinformatics. Pearson Education, Delhi.
4. Bal, H.P. 2007. Bioinformatics Principle and applications. Tata McGraw-Hill Publishing Ltd., New Delhi.
5. Krane, D.E and Raymer, M.L. 2006. Fundamental Concepts of Bioinformatics. Pearson Education, USA.
6. Gladis HelenHepsyba, S. and Hemalatha, C.R. 2009. Basic Bioinformatics, MJP Publishers, Chennai.
7. Lohar, P.S. 2009. Bioinformatics, MJP Publishers, Chennai.
8. Westhead, D.R., Parish, J.H and Twyman, R.M. 2003. Bioinformatics. Viva Books Private Ltd., New Delhi.
9. Smith H, J, Smith & William. 1988. Introduction to the Principles of Drug Design, 2nd ed, Wright London.

MAJOR-BASED ELECTIVE III (B)

BIOPHYSICS & BIOSTATISTICS

Objectives:

The objective of Biostatistics is to emphasize basic idea about the Biostatistics and its application. The Biophysics course is to emphasize the principle and biological applications of Microscope, chromatograph, electroporesis and spectroscope.

UNIT I

Scope of Biophysics in Biology- structure and properties of atoms and molecules- chemical bonds – types – molecular interactions – Colloids- description, and properties. Thermodynamic principles – Membrane biophysics – diffusion, active transport. Tyndall effect, Surface tension, Brownian movement, filtration, osmosis, dialysis.

UNIT II

Biophysical instruments: Introduction- Principles-, description and applications of pH meter, analytical and ultracentrifuge, colorimeter, visible spectroscopy, electrophoresis, chromatography and Micrometry.

UNIT III

Biostatistics: Collection of Data – Types - Classification and tabulation of data - Presentation of data: Bar diagram and its types, Pie diagram, Histogram, Frequency polygon, Frequency curve and Ogives - Types of variables: Continuous and discontinuous variables, Qualitative and quantitative variables.

UNIT IV

Measures of Central tendency: Mean, Median and Mode - Uses and calculation of Mean, Median and Mode. Measures of dispersion: Range and Standard deviation calculations and uses. Co-efficient of variation and Standard Error.

UNIT V

Correlation analysis: Types and methods of studying correlation – Scatter diagram, Karl Pearson's co-efficient of correlation and Rank correlation. Regression analysis based on biological data. Testing of hypothesis: Chi-square test, Student *t* test – ANOVA: one way and two way analysis.

Text Books:

1. Daniel, M. 1992 – Basic Biophysics and Biologists, Wiley International, New Delhi.
2. Gupta S.P. Statistical Methods, Sultan Chand & Sons Publishers, New Delhi
3. Palanichamy S, and Manoharan M, Statistical Methods for Biologists, Palani Paramount Publications, Palani

Reference Books:

1. Das, D. 1996 – Biophysics and Biological Chemistry, Academic Publishers, Calcutta.
2. Bailey, N.T.J (1997) Statistical methods in Biology, III Ed., Cam. University Press, N.Y.
3. Ramakrishnan 2007 Biostatistics, Saras Publications, Periyavilai, Nagaercoil
4. Khan & Khanum 1994 Fundamental of Bostatistics, Ukaaz Publications, Hyderabad
5. Snadecor, G.W. and W.G.Cochran (1967) – Statistical methods, Oxford & IBH Publishing, New Delhi.
6. Sokal, R and James, F (1973), Introduction to Biostatistics, W.H. Freeman and Company Ltd., Tokyo, Japan.
7. Zar, J.H. (1974) – Biostatistical analysis – Prentice Hall Inc., New Jersey, USA.
