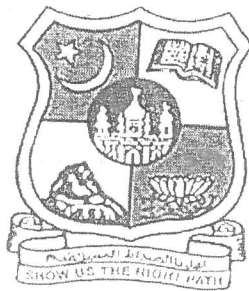


MSc Zoology

**POST GRADUATE
DEPARTMENT OF ZOOLOGY**



**Course Pattern
(2014 – 15 onwards)**

✓
**UG, PG, M. Phil., and COP
ZOOLOGY**

JAMAL MOHAMED COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI - 20
PG & RESEARCH DEPARTMENT OF ZOOLOGY
PG COURSE PATTERN (2014 – 2015 ONWARDS)

59
3/9/14 67

SEM	SUB CODE	COURSE	SUBJECT TITLE	HRS / WEEK	CREDIT	CIA Mark	SE MARK	TOTAL MARK
I	14PZO 1C1	CORE I	Biology of Invertebrates & Chordates	6	5	40	60	100
	14PZO 1C2	CORE II	Environmental Biology & Resource Management	6	5	40	60	100
	14PZO 1C3	CORE III	Cell and Molecular Biology	6	5	40	60	100
	14PZO 1C4/P	CORE IV	Biology of Invertebrates , Chordates, Environmental Biology, Resource Management & Cell and Molecular Biology Practical	6	5	40	60	100
	14PZO 1CE1	CORE BASED ELECTIVE I	Biophysics and Radiation Biology	6	5	40	60	100
TOTAL				30	25	200	300	500
II	14PZO 2C5	CORE V	Microbiology	6	5	40	60	100
	14PZO 2C6	CORE VI	Animal Physiology	6	5	40	60	100
	14PZO 2C7	CORE VII	Genetics	6	5	40	60	100
	14PZO 2C8/P	CORE VIII	Microbiology, Animal Physiology & Genetics Practical	6	5	40	60	100
	14PZO 2CE2	CORE BASED ELECTIVE II	Biotechnology	6	5	40	60	100
TOTAL				30	25	200	300	500
III	14PZO 3C9	CORE IX	Developmental Biology, Evolution & Paleontology	6	5	40	60	100
	14PZO 3C10	CORE X	Biochemistry	6	5	40	60	100
	14PZO 3C11	CORE XI	Immunology	6	5	40	60	100
	14PZO 3C12/P	CORE XII	Developmental Biology, Evolution, & Paleontology , Biochemistry & Immunology Practical	6	5	40	60	100
	14PZO 3CE3	CORE BASED ELECTIVE III	Biostatistics and Bioinformatics	6	5	40	60	100
	14PZO3EC1	Extra Credit-1	Comprehensive Examination in Zoology	-	5*	-	100*	100*
TOTAL				30	25	200	300	500
IV	14PZO 4C13	CORE XIII	General and Applied Entomology	6	5	40	60	100
	14PZO 4C14/P	CORE XIV	General and Applied Entomology Practical	6	5	40	60	100
	14PZO 3EC2	Extra Credit-2	Applied Zoology	-	5*	-	100*	100*
	14PZO 4PW	PROJECT WORK		18	5	40	60	100
TOTAL				30	15	120	180	300
GRAND TOTAL				120	90	720	1080	1800

* Not Considered for Grand Total and CGPA

CORE BASED ELECTIVE

I Semester CBE I Biophysics and Radiation Biology

II Semester CBE I Biotechnology

III Semester CBE I Biostatistics and Bioinformatics

M.Sc., (Zoology)
SEMESTER I : CORE I

BIOLOGY OF INVERTEBRATES & CHORDATES

Sub Code: 14 PZO 1C1
Hours/Week: 6
Credits: 5

Max Marks: 100
Internal Marks: 40
External Marks: 60

Objectives:

To impart the significance of Invertebrate and Chordate organization and their evolving adaptations in organ systems. Also to highlight the importance of minor phyla.

BIOLOGY OF INVERTEBRATES

UNIT I

18 Hours

Symmetry in Animal organization - Significance of Coelom and Metamerism – # Evolution of Metamerism # - Sedentary life in Invertebrates - Locomotion in Annelids, and Molluscs - Nutrition in Polychaetes, Molluscs and Echinoderms.

UNIT II

18 Hours

Respiration in Arthropods and Molluscs – # Excretory organs in Invertebrates # – Nervous system in Arthropods and Echinoderms –Reproduction in Invertebrate forms.

UNIT III

18 Hours

Larval life of Invertebrates – Minor Phyla: Classification and types, Mesozoa, Rotifera, # Phoronida #, Chaetognatha.

BIOLOGY OF CHORDATES

UNIT IV

18 Hours

Integumentary system in Invertebrates – Dermal and Epidermal derivatives of Vertebrates - Digestive system – Stomach in Mammals – Circulatory system of Chordates – # Heart in Vertebrates #.

UNIT V

18 Hours

Respiration in Fishes – Pulmonary Respiration in Tetrapods – # Types of kidney # - Reproductive system – Accessory Reproductive Glands – Appendicular Skeleton in Vertebrates.

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Text Books

1. Barnes, R.D. Invertebrate Zoology, IV Ed., Holt Saunders – International Edition. 1982.
2. Barrington, E.J.W. Invertebrate Structure and Function, II Ed., ELBS and Nelson. 1979.
3. Hyman, G.H., The Invertebrates, Vols. I to VII, Mc Graw Hill Book Co. Inc. New York.
4. Kent. G.C. Comparative Anatomy of the Vertebrates, McGraw Hill Book Co., Inc., New York. 1976.
5. Malcolm Jollie, Chordate Morphology Reinhold Publishing Corporation, New York. 1962.

UNIT I TB1 Chapter 1- 3-6, 8-10. TB 2 Chapter 29

UNIT II TB 1 Chapter 11-13, 15,16.

UNIT III TB1 Chapter 19,20. TB 3 Chapter XIII, XVI, XIX

UNIT IV TB4 Chapter 5,10,12 TB 5 Chapter 8,9,11

UNIT V TB 4 Chapter 8,11,13 TB 5 Chapter 9,10

REFERENCES

1. Kotpal, R.L., Minor Phyla., Rastogi Publication, Meerut. 2002.
2. Vasantika Kashyap. Life of Invertebrates, Vikas Publishing House Pvt. Ltd., New Delhi. 1997.
3. Waterman, A.J. Chordate Structure and Function, The Macmillan Company. 1971.

SELF STUDY

1. Evolution of Metamerism
2. Excretory organs in Invertebrates
3. Phoronida
4. Heart in Vertebrates
5. Types of kidney

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ENVIRONMENTAL BIOLOGY AND RESOURCE MANAGEMENT

Sub Code: 14PZO1C2
Hours/Week: 6
Credits: 5

Max Marks: 100
Internal Marks: 40
External Marks: 60

Objectives:

To understand the concept of prediction, prospecting, promotion, preservation and vision about restoration and resuscitation of dwindling natural resources.

To inculcate knowledge about natural resources, their conservation and sustainability and to transfer knowledge on various emerging environmental problems and to create environmental awareness.

Unit: I CONCEPTS IN ECOLOGY

18 Hours

The Ecosystem: Concept of the Ecosystem and Ecosystem Management – Trophic Structure of the Ecosystem – Ecosystem Cybernetics – Classification of Ecosystems.

Basic Types of Biogeochemical Cycles – Nutrient Cycling in the Tropics. Limiting and Regulatory Factors: Concept of Limiting Factors – Anthropogenic Stress as a Limiting Factor for Industrial Societies. Community Ecology: Biodiversity. # Unsustainable to sustainable development #.

Unit: II NATURAL RESOURCES

18 Hours

a. Forest resources: Use and over exploitation, deforestation, timber extraction – mining, dams & forests.

b. Water resources: Use and over exploitation of ground water – surface water – conflicts over water. # Dams - Benefits & Problems #.

c. Energy resources: Growing energy needs – Renewable and Non-renewable energy sources – use of alternate energy sources.

Unit: III SOCIAL ISSUES & ENVIRONMENT

18 Hours

Urban problems related to energy – rain water harvesting - environmental ethics, issues – possible solutions – Climate change – Global Warming – Acid rain – Ozone depletion – consumerism & waste products – Environmental protection Act – # Forest conservation Act # – Issues involved in enforcement of environmental legislation.

Unit: IV HUMAN POPULATION & ENVIRONMENT

18 Hours

Population growth – population explosion – Family welfare programmes. Environment and Human health – Human rights – # Value education # – Women & child welfare – Role of IT in environmental and human health.

Unit: V DISASTER MANAGEMENT

18 Hours

Flood warning system – # earthquakes #, Droughts, Famines and Heat waves – Cyclones - Wild fires – Land slides – Disaster Management Information System (DMIS)- A guideline for disaster management.



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Text books

1. Odum, E.P. Fundamentals of Ecology, W.B. Saunder's Co. Philadelphia. 1971.
2. Sharma, P.D. Ecology and Environment VII edition, Rastogi Publication.2005.

Unit I	: Chapter-2,4,5,7
Unit II	: Chapter- 12
Unit III	: Chapter- 9
Unit IV	: Chapter-20
Unit V	: Chapter- 16, 22

Reference Books:

1. Clarke, G.L. Elements of Ecology. John Wiley & Sons, New York. 1954.
2. Kendeigh, S.C. Animal Ecology. Prentice Hall. 1961.
3. N.Arumugam. Concepts of ecology. Saras publication. 114/35G. A.R.P.Comp road .Periyevilar, Kottar(post). Nagargovil. 1983.
4. Odum, E.P. and Barrett, G.W. Fundamentals of Ecology. Thomson Brooks/ Cole (EWP)5th Ed. 2005.
5. Rastogi, V.B. and M.S. Jayaraj Animal Ecology and distribution of animals, Kedarnath Ramnath. 1989,
6. Southwick, C.H. Ecology and the quality of Environment. D.Vas Nostrand Co. 1976.
7. Verma, P.S. and V.K. Agarwal, Principles of Ecology. S. Chand & Co. New Delhi. 1996.

SELF STUDY

1. Unsustainable to sustainable development
2. Dams benefits & problems
3. Forest conservation Act
4. Value education
5. Earthquakes

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CELL AND MOLECULAR BIOLOGY

Sub Code: 14PZO1C3
Hours/Week: 6
Credits: 5

Max Marks: 100
Internal Marks: 40
External Marks: 60

Objective:

To study the interrelationship and interdependence of different cell organelles and their structure and function.
To impart comprehensive knowledge on molecular mechanisms of cellular events and their control.

Unit: I CELL STRUCTURE AND CELL MEMBRANES 18 Hours

Structure of Prokaryotic and Eukaryotic cells-Nuclear envelope-Nuclear Protein-Nuclear pore complex-Nucleolus- # Cell membranes #- Types of transport-membrane transport proteins – Active transport by ATP powered pumps -“Intra cellular ion environment and membrane electrical potential”.

Unit: II ENDOPLASMIC RETICULUM AND PROTEIN PROCESSING 18 Hours

Structure and types of endoplasmic reticulum – synthesis of membrane and secretory protein. Import of proteins in to endoplasmic reticulum – “Post translational modification and glycosylation in endoplasmic reticulum”, Golgi sorting – # Molecular mechanism of vesicular traffic #.

Unit: III MITOCHONDRIA AND RIBOSOME 18 Hours

Ultra structure and isolation of mitochondria – Mitochondrial membranes – Mitochondrial genome – # Transport of protein into mitochondria # – Inheritance of mitochondria.

Ribosome- ultra structure – Chemical composition and organization – high resolution structure – function – “Ribosome as a ribozyme” – Protein synthesis.

Unit: IV CELL SIGNALLING 18 Hours

Definition – Cell surface receptors – Types – G protein coupled receptors – Ion channel receptors – “Tyrosine linked receptors with intimacy enzymatic activity” – MAP kinase pathway – # Second messengers # – Signaling from plasma membrane to nucleus.

Unit: V CELL DIVISION AND CONTROL & CANCER BIOLOGY 18 Hours

Mitosis and meiosis – Central cell cycle control system – Cell cyclic check points – “cyclin and cyclin dependent kinases” – Cell division control in mammalian cells – Cancer: Oncogenes - Types – # Characteristics of cancer cells # – Control & prevention.



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TEXT BOOKS:

1. Verma P.S and Agarwal V.K.Cytology, Chand & Co.Ltd. Delhi. 2009.
2. De Robertis, E.D.P. and De Robertis, E.M.F. Cell and Molecular Biology, VIII Ed. Lea and Febiger, Philadelphia. 1987.

REFERENCE BOOKS:

- 1) Geofferey M. Cooper and Robert E. Hausman. The Cell – A Molecular approach. 3rd Edition. Asm Press, Washington D.C. USA. 2004.
- 2) Alberts *et al.*, Molecular biology of the Cell . 4th Edition, Garland Science, a member of the Taylor and Francis group, New York, USA. 2002.

SELF STUDY

1. Cell membranes
2. Molecular mechanism of vesicular traffic
3. Transport of protein into mitochondria
4. Second messengers
5. Characteristics of cancer cells

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M.Sc., (Zoology)-PRACTICAL -I
SEMESTER I : CORE IV

**BIOLOGY OF INVERTEBRATES & CHORDATES,
ENVIRONMENTAL BIOLOGY & RESOURCE MANAGEMENT,
CELL AND MOLECULAR BIOLOGY - PRACTICAL**

Sub Code: 14 PZO1C4/P
Hours/Week: 6
Credits: 5

Max Marks: 100
Internal Marks: 40
External Marks: 60

BIOLOGY OF INVERTEBRATES & CHORDATES

a. TAXONOMY

20 Invertebrates – Identifying features upto Class level

20 Vertebrates – Identifying features upto Order level

b. MOUNTING

Scales of Teleost Fish (Ctenoid, Cycloid types) , Feathers (Ultra structure), Soil Nematodes

c. SPOTTERS

Invertebrate Larval forms, Rotifera, Phoronida, Chaetognatha.

CELL AND MOLECULAR BIOLOGY

Micrometry

Human Buccal smear

Cockroach: Haemolymph smear

Mounting of Sarcomere, Columnar epithelial cells, Ciliated epithelial cells.

Isolation of Nuclei from Animal cells.

Isolation of DNA from Animal tissue.

Isolation of Plasmid from Bacteria (Demo)

Gel electrophoresis of DNA samples (Demo)

ENVIRONMENTAL BIOLOGY & RESOURCE MANAGEMENT

Fauna of different Marine Habitat –Sandy, Muddy and Rocky shores

Pond study (report), Forest study report

Analysis of water samples for Chlorides, Silicates, Calcium, Total hardness,

Phosphates, Nitrates, Water Quality Index.

Qualitative and Quantitative estimation of Plankton (Marine sample)

BIOPHYSICS AND RADIATION BIOLOGY

Sub Code: 14PZO 1CE1
Hours/Week: 6
Credits: 5

Max Marks: 100
Internal Marks: 40
External Marks: 60

Objectives:

- To acquire knowledge on basic principles and applications of analytical tools in biological sciences.
- To study the sources, types, effects and application of radio isotopes.

Unit: I **18 Hours**
 Thermodynamic principles in biology – # Concept of free energy #– Energy rich bonds –Biological energy transducers – Oxidation, Reduction and Redox potential. Chromatography: Thin layer, Affinity, Gas, HPLC. Principles & application of Electrophoresis – Ultracentrifugation.

Unit: II **18 Hours**
 Microscopy - Principles and applications of Light, Phase contrast, Fluorescent, Scanning and Transmission Electron Microscopy. Principles of X-ray diffraction - # Fluorescence # –UV- NMR and ESR Spectroscopy.

Unit: III **18 Hours**
 Scope of Radiation Biology – Sources of Natural Radiation: Terrestrial and cosmic sources. Man made radiation: Medical (occupational and diagnostic) - # Types of radiation (Alpha, Beta & Gamma) # - Properties of Radiation (external emitters and internal emitters) – Radiation Units (Becquerel, RAD, Gray& Curie).

Unit: IV **18 Hours**
 Biological effects of Radiation - Cellular level – Organ system level – Genetic effects (aberrations) – Radiation sickness – Syndromes – # Cancer induction # - Dosimetric study.

Unit: V **18 Hours**
 Application of Radio Isotopes in Biology: Tracer Technology – Metabolic and Biochemical Pathways. Application in Agriculture and Industry: Genetic improvement of crop plant – Insect, Pest and Disease Management - # Food Preservation # .Application in Health Care: Diagnostic Techniques – Radio Pharmaceuticals Radiation Oncology, Radioactive wastes: Sources and Management - Nuclear Energy Programme in India.



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Text Books:

1. N. Gurumani, Research Methodology, for biological Sciences.MJP Publishers, 2007.
2. Sood, D.D. Reddy, A.V.R. and Ramamoorthy, N. Fundamentals of Radiochemistry, Indian Association of Nuclear Chemists and Allied Scientists, Radiochemistry Division, Mumbai. 2000.
3. Arun, B. Arun, S., Bhongirwar, D.R., Food Preservation By Irradiation. Indian Association for Radiation Protection. BARC, Trombay, Mumbai. 2001.
4. M. Eisenbud, T. Gesell, Environmental Radio activity. From Natural, Industrial, and Military Sources. Academic Press. 1997.

Unit I: Chapter 12 (T.B.-1)

Unit II: Chapter 9 (T.B.-1)

Unit III: Chapter 17(T.B.-2)

Unit IV: Chapter 2 (T.B.-4), Chapter 19 (T.B.-2)

Unit V: Chapter 1-4 (T.B. -3), Chapter 11(T.B.-4), Chapter 15, 16(T.B.-2)

REFERENCE BOOKS:

1. Sha, V.C. Elements of Radiation Biology, Todays & Tomorrows Printers & Publishers, New Delhi. 1985.
2. Merril Eisenbud Environmental Radioactivity, Academic Press, California. 1997.
3. Sharma, B.K. Environmental Chemistry, Goel Publishing House, Meerut. 1990
4. Grosh, D.S. Biological Effects of Radiation, Blaisdell Publishing Co. 1965.
5. Bascq, Z.M. and Alexander, P. Fundamentals of Radiobiology. 1961.
6. Wolf, G. Isotopes in Biology, Academic Press, New York. 1964.
7. Use of Radioisotopes in Biology BRNS, BRIT-DAE, Mumbai. 1989
8. Rao, P.S. Guest Editor, Nuclear Agriculture and Biotechnology, IANCAS Bulletin 15 (1). 1999.
9. Sharma, A.K. Guest Editor Preservation of Food by Ionising Radiation, IANCAS Bulletin, 14(1). 1998.
10. Sood, D.D. Reddy, A.V.R. Iyer, S.R.K. Gangadharan, S and Gursharan Singh, Applications of Radioisotopes and Radiation in Industrial Development, NAARRIM, Mumbai. 1998.
11. Lele, R.D. Principles and Practice of Nuclear Medicine, Arnold-Heinemann, New Delhi. 1984.
12. Pillai, M.R.A. Bhandarkar, S.D. Radioimmunoassay: Principles and Practice, 3rd Edition, BARC, Mumbai. 1998.
13. Kowalsky, R.J and Perry, J.R. Radiopharmaceuticals in Nuclear Medicine Practice, Appletons Lange. 1987.
14. Ramamoorthy. N, Shivarudrappa. V, Bhelose, A.A. Radiopharmaceuticals and Hospital Radiopharmacy Practices, Eds. BRNS, BRIT-DAE, Mumbai. .2000.

SELF STUDY

1. Concept of free energy
2. Fluorescence
3. Types of radiation
4. Cancer induction
5. Food Preservation

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M.Sc., (Zoology)
Semester II: CORE V

MICROBIOLOGY

Sub Code: 14PZO2C5
Hours/Week: 6
Credits: 5

Max Marks: 100
Internal Marks: 40
External Marks: 60

Objective:

To understand the interaction of microorganisms with their environment and the practical consequences of these interactions.

To impart knowledge on the basic principles of food, industrial and environmental microbiology.

Unit: I INTRODUCTION

18 Hours

General features and Classification of Bacteria, Virus, Yeast, Actinomycetes and Fungi. Structure and life cycle of Bacteria - DNA Virus (T4 phage) - RNA Virus (HIV). # Morphological shapes of bacteria and viruses # Bacterial growth: Growth curve- nutritional requirements Microbial culture – Types of Culture media : Preparation. Gram's staining: # Gram positive and Gram negative cell walls #

Unit: II FOOD MICROBIOLOGY

18 Hours

Microbiology of food – Growth of microorganism in foods – # Food spoilage # – food poisoning – food infection – food preservation – Microbiology of fermented food – Detection of food borne pathogens.

Unit: III INDUSTRIAL MICROBIOLOGY

18 Hours

Choosing microorganism for Industrial Microbiology – Bioreactors. Types. Major products of Industrial Microbiology : Antibiotics – #Organic acids# – Biopolymers – Biosurfactants – Bioconservation process and Biofuels.

Unit: IV MEDICAL MICROBIOLOGY

18Hours

Microbial diseases : Protozoan diseases – Plasmodium, Entamoeba. Fungal diseases : Mycotoxicosis and Aspergillosis. Bacterial diseases : Tuberculosis (TB) and Tetanus. Water borne diseases : Cholera – Typhoid.# STD and Contact diseases# - gonorrhea and syphilis. Viral diseases: polio – hepatitis B – AIDS – Causative agents, Mode of transmission, Symptoms, Prevention & Control.

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Unit: V ENVIRONMENTAL MICROBIOLOGY

18Hours

Biodegradation using microbial communities – leaching of metals – hydrocarbon degradation in water and soil. Waste as a resource – #organic compost# – vermi composting. Sewage Treatment – Biofertilizers: symbiotic and asymbiotic nitrogen fixation.

Text Books:

- T.B.1. Dubey R.C and Maheswari D.K. Text book of Microbiology, S. Chand and Company Ltd, New Delhi. 2009.
- T.B.2. Pelczar, Chan and Krieg. Microbiology, Tata Mc Graw Hill Pub. Co. Ltd. 1993.
- T.B.3. Ananthanarayanan, R and Jayaram Panicker, C.K. Text Book of Microbiology, Orient Longman, Chennai and Hyderabad. 2000.

Books for Reference:

- 1. Sulia, S.B & Santhanam, S. General Microbiology , Oxford and IBH. 2001.
- 2. Thomas, C.G.A. Medical Microbiology, ELBS Publications. 1988.
- 3. Powar, C.B. and Diginawala. H. F. General Microbiology - Vol. I & II.Himalaya Publishing House, Bombay. 1987.
- 4. Sharma, P.D. Microbiology - Rastogi Publications, Meerut. 1993.

SELF STUDY

- 1. Morphological shapes of bacteria and viruses
- 2. Food Spoilage
- 3. Organic acids
- 4. STD and Contact diseases
- 5. Organic Compost



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ANIMAL PHYSIOLOGY

Sub Code: 14 PZO 2C6
Hours/Week: 6
Credits: 5

Max Marks: 100
Internal Marks: 40
External Marks: 60

Objectives:

To learn the Physical and Chemical properties of living matter and to understand the co-ordinated functions of various organs and organ systems. Also to learn about the hormonal regulations and their defects in Man.

UNIT: I

15Hours

Homeostatic mechanisms: Thermoregulation: Temperature compensation in Poikilotherms & Homeotherms - Tolerance to high temperature, cold and freezing - # Physiology of hibernation and aestivation # - Osmotic and ionic regulation: Response to hyperosmotic and hypoosmotic media with reference to crustaceans and fishes. Adaptation to Pressure, High altitude - Buoyancy.

UNIT: II

15Hours

Excretion: Ammonia toxicity – Detoxification pathways. Excretion in different habitats - Nervous co-ordination: Ionic basis of excitability – Resting Membrane Potential. Electrogenesis - Propagation of Action Potential – Interneuron Transmission – Electrical synapse – Chemical synapses – Neurotransmitters. # Animal electricity: Electric organs – production of electric discharge – Functional significance #.

UNIT: III

15Hours

Receptor Mechanism: Mechano reception, # Muscle receptors, Pressure receptors # – Gravity receptor – Phonoreception: Tango receptors - Photoreception: Retinal pigments – Photochemistry of vision.

UNIT IV

15Hours

Bioluminescence: Occurrence – physical aspects – chemistry of light production – functional significance. Animal behavior: Biological clock – # Endogenous rhythm # – Circadian rhythm – Circannual and lunar periodicity – Physiological basis of learning and memory.

UNIT V

15Hours

Endocrine system: Pituitary – Thyroid – Pancreas – Adrenal. # Hormones produced and their functions #. Mammalian reproductive physiology.

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14/11/15

22,

TEXT BOOKS:

1. A.C. Guyton and J.E. Hall, Textbook of Medical Physiology, Tenth Edition, Harcourt Publishers International Company, 2001
2. R. Nagabhushanam, M.S. Kodarkar, R. Sarojini, Textbook of Animal Physiology. Second Edition, Oxford & IBH Publishing Co. PVT. LTD. 2002

Unit I – Chapter 7, 8T.B.-2

Unit II – Chapter 45, 5 T.B.-1

Unit III – Chapter 50, 52, 53, 55T.B.-1

Unit IV – Chapter 11, 13, 19T.B.-2

Unit V-Chapter74-80T.B.-1

REFERENCE BOOKS:

1. Beck, Human Design, Harcourt Brace Joronorich Inc. 1971.
2. Dawson, H. General Physiology, Little Brown Co. Boston. . 1964.
3. Echert, R. and Randall, D. Animal Physiology, CBS Publishers and Distributors. 1987.
4. F.N. Animal function, Principles and Adaptation, Macmillan Co., London. 1971.

SELF STUDY

1. Physiology of hibernation and aestivation
2. Animal electricity
3. Muscle receptors, Pressure receptors
4. Endogenous rhythm
5. Hormones produced and their functions



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90

M.Sc., (Zoology)
Semester II : CORE VII

GENETICS

Sub Code: 14 PZO 2C7
Hours/Week: 6
Credits: 5

Max Marks: 100
Internal Marks: 40
External Marks: 60

Objectives:

To provide a deeper meaning and conceptual frame work to heredity and to establish comprehensive knowledge of diversified application of genetics in human welfare.

Unit: I

18 Hours

Gene interaction and types: Epistasis, Additivity, Modifiers, Lethality. Linkage – linkage in human beings. Somatic cell hybridization Mechanism of crossing over – Gene mapping in chromosome. # Structure of gene – cistron, muton, recon, intron, and exon – over lapping genes #.

Unit: II

18 Hours

Gene families – RNA Splicing – Cis-trans splicing – tRNA processes – # DNA recombination at the molecular level – Role of Rec A and Rec B, C and D enzymes #. Gene regulation: The Operon Concept *lac* operon *trp* operon and *ara* operon system in bacteria – Lytic cascade and lysogeny regulation in Lambda phage – Gene regulation in eukaryotes: Short term regulation and Long term regulation.

Unit: III

18 Hours

Bacteria: Genetic material – Parasexual processes in bacteria: Transformation, conjugation, sexduction, and transduction – Mapping of bacterial chromosomes – Biology of plasmids – # Transposing – types and mechanism of transposition #. Phages Genetic material – recombination in phages.

Unit: IV

18 Hours

Chromosomal aberrations – DNA Damage and repair mechanisms – Molecular basis of mutations. Carcinogens: Genetic basis of cancer: Oncogenes and cancer, Oncoproteins and their role. Genes in populations - # Hardy–Weinberg principle and gene frequency # – Factors affecting Hardy–Weinberg equilibrium.

Unit: V

18 Hours

Inborn errors of metabolism: Phenylketonuria, Alkaptonuria, Albinism, Lesch-Nyhan syndrome, ADA deficiency, Galactosemia, G6PD deficiency, Tay Sach's disease, and Gaucher's disease. Human karyotype: preparation and analysis - chromosomal syndromes in man. Detecting genetic diseases – Genetic counselling, prenatal diagnosis, Genetic diseases - Treating genetic diseases - Altering genetic traits # Human Genome Project – Features, methods and future prospects #.

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Dr,
15/11/14

Text Book:

T.B.-1 P.S. Verma and V.K. Agarwal, Genetics, Ninth Revised edition, S. Chand & Company Ltd. Publishers, 2009.

T.B.-2 M.W. Strickberger, Genetics, Third Edition, Third Edition, Prentice-Hall of India Private Limited, 2004.

Unit I – Chapter 11, 17, 29 **T.B.-2**

Unit II – Chapter 37, 38, 43, 45 **T.B.-1**

Unit III – Chapter 19, 20 **T.B.-2**

Unit IV – Chapter 22, 24 **T.B.-2**

Chapter 50 **T.B.-1**

Unit V – Chapter 51, 4, 59 **T.B.-1**

Reference Books:

1. Benjamin Levin. Genes VIII, Oxford University Press, New York. 2005.
2. Daniel L. Hartl. Genetics, III Ed., Jones Bartlett Publishers. Boston. 1996.
3. David Friefelder. Microbial Genetics, Narosa Publishing House, New Delhi. 1998.
4. Elaine Johansen Mange and Arthur P. Mange., Basic Human Genetics, Sinour Associates, Inc., Sunderland, Massachusetts. 1994.
5. Jenkins, J. B. Human Genetics, The Benjamin Cummings Publishing Co. 1983.
6. John D. Hawkins. Gene Structure and Expression, III Ed., Cambridge University Press. 1996.
7. Robert H. Tamarin. Principles of Genetics, WCB Publishers. 1996.
8. Strickberger Monnroe, W., Genetics, Prentice Hall of India Pvt. Ltd., New Delhi. 1996.
9. Ursula Goodenough. Genetics, Saunders College Publishing Co., London. 1984.
10. Watson J D *et. al.*, Molecular Biology of Gene, IV Ed., The Benjamin Publishing Company Inc., UK. . 1987.

SELF STUDY

1. Structure of gene
2. DNA recombination at the molecular level – Role of Rec A and Rec B, C & D enzymes
3. Transposing – types and mechanism of transposition
4. Hardy–Weinberg principle and gene frequency
5. Human Genome Project



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**MICROBIOLOGY, ANIMAL PHYSIOLOGY, GENETICS AND
MICROTECHNIQUE - PRACTICAL**

Sub Code: 14PZO 2C8/P
Hours/Week: 6
Credits: 5

Max Marks: 100
Internal Marks: 40
External Marks: 60

MICROBIOLOGY

Sterilization techniques
Preparation of culture media
Motility of bacteria
Pure culture techniques
Gram staining and differential staining
Hydrolysis of starch
Hydrolysis of gelatine
Bio chemical tests – Indole and Methyl red test

Equipments in Microbiology

- Inoculation loop
- Autoclave
- Laminar flow hood
- Spotters related to theory

ANIMAL PHYSIOLOGY

Quantitative estimation of Amylase activity
Quantitative estimation of Ammonia and Urea
Rate of Salt loss and Salt gain in fish using different experimental media
Estimation of Blood Chlorides
Rate of oxygen consumption in experimental fish

GENETICS

Drosophila culture – Identification of mutants and sexes
ABO Blood groups & Rh - Genetic significance
Human Karyotyping and Pedigree analysis
Hardy-Weinberg Law and Calculation of gene frequency - Co-dominance and multiple alleles.

MICROTECHNIQUE

Preparation of permanent serial sections of tissues (10 slides) and embryos (10 slides) of Frog and Chick respectively. Preparation of tissue sections for histochemical tests.

Educational Tour

Visit to R & D labs and different natural habitats related to the above subjects and submission of report is compulsory.

Record work

A record of laboratory work shall be submitted at the time of Practical examination.

M.Sc., (Zoology)
SEMESTER II : CORE BASED ELECTIVE II

BIOTECHNOLOGY

Sub Code: 14 PZO 2CE2
Hours/Week: 6
Credits: 5

Max Marks: 100
Internal Marks: 40
External Marks: 60

Objective:

To study the potential benefits of biotechnology in human, animal and plant health.
Also to understand the application of biotechnology in industries and agriculture and environment production.

UNIT I

18 Hours

rDNA Technology in Animal Based Systems: Isolation of Genes - Methods of introduction of genes - Gene fragments and amplification - Cloning Vectors - # Expression vectors # - Genome Analysis - Human Genome Project - Transgenic Animals and Applications.

UNIT II

18 Hours

Animal cell culture technology: Methods involved and applications - Cell lines - Stem cell culture and preservation - Cell culture based processes and products: Hormones, # Enzymes #, Regulatory molecules and Therapeutics.

UNIT III

18 Hours

Industrial Biotechnology: Fermentation - Types of fermentation - Fermenter designs - Upstream and Downstream processing - Product recovery and Purification - Production of alcohol, enzymes, vitamins, # Single cell proteins # - Improvement of inoculum source to enhance production.

UNIT IV

18 Hours

Medical Biotechnology: Production of Monoclonal Antibodies - Production of insulin, growth hormone, interferon, recombinant vaccines, subunit vaccines and live vaccines Diagnosis of genetic disorders by RFLP, PCR, OLR assay and Western blotting - Treatment of cancer - Bone marrow transplantation - # GVH diseases # - Gene therapy : *Ex vivo* and *In vivo*. Embryonic stem cell methods.

UNIT V

18 Hours

Bioremediation : Bioreduction, bioabsorption, Biobleaching of heavy metals and ores: Cadmium, Lead, Mercury, Uranium, Gold. Waste water Treatment: Biological Treatment System - # Activated sludge method #, Percolating filters - Effluent Treatment schemes for Dairy, Distillery, Tannery, Dye and Paper Industry.

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TEXT BOOKS

1. Babiuk, L.A., John, P. Phillips and Murray, Animal Biotechnology, Pergamon Press, Oxford (1989).
2. GorDard and Lucassen, E. *In vitro* culture of Animal Cells, Butterworth – Heinemann Publications.1993.
3. Higgins, I.J., Best, D.J. and Jones, J. Biotechnology – Principles and Applications. Blackwell Scientific Publications, Oxford, London, Edinburgh. 1988.
4. Old, R. W and Primrose, S B. Principles of Gene Manipulation, Blackwell Scientific Publications. 1989.
5. Mc Neil and Harvey L.M. Fermentation, Blackwell Scientific Publications. 1990.


REFERENCE BOOKS

6. Brown, C.M., Campbell, I. and Priest, F.G. Introduction to Biotechnology. Blackwell Scientific Publications, U.K(1988).
7. KeshavTrehan. Biotechnology, New Age International Pvt. Ltd. Publishers, New Delhi. 1996.
8. Marx, J.L. A Revolution in Biotechnology, Cambridge University Press. 1989.
9. Primrose, S. B. Modern Biotechnology. Blackwell Scientific Publications, Oxford, London. 1989.
10. Prentis , S. Biotechnology New Industrial Revolution, Orbis, London. 1985.
11. Smith John, E. Biotechnology. Edward Arnold, London. 1988.
12. Watson, J.D. *et al.*, Recombinant DNA. Scientific American Books, W. H Freeman and Company, New York.

SELF STUDY

1. Expression vectors
2. Enzymes
3. Single cell proteins
4. GVH diseases
5. Activated sludge method

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M.Sc., (Zoology)
Semester III: COREIX

DEVELOPMENTAL BIOLOGY AND EVOLUTION & PALEONTOLOGY

Sub Code: 14PZO3C9
Hours/Week: 6
Credits: 5

Max Marks: 100
Internal Marks: 40
External Marks: 60

Objective:

To elucidate the segmental changes in organization of embryo and to highlight cell interactions and role of gene in development.

To discern the evolutionary principles and the role of fossil study to support evolutionary concepts.

Unit: I

18 Hours

Developmental pattern among Metazoans – Gametogenesis: Structure of Mammalian gametes .Fertilization : Biochemical event. Cleavage (patterns & types) – Gastrulation: Germ layer formation. Organogenesis. Growth and differentiation. Genetic regulations of early embryonic development. # Embryonic induction #. Organizers: Spemann and Mengold experiments Functions of organizer – Induction Regional specification types.

Unit: II

18 Hours

Cell differentiation and Stem cells – Control of transcription involving tissue specific transcription regulators – # Artificial Reproductive Technology # (ART) - Super ovulation, ICSI, GIFT- Artificial insemination – In vitro fertilization – Human development – Placentation –Birth control and its need.

Unit: III

18 Hours

Influence of hormones on growth and metamorphosis of Insects and Amphibians – Formation of limb bud in Amphibia – # Specification of the limb fields # – Induction of early limb bud – Cell death and the formation of digits and joints. Regenerative ability of various Invertebrates and Vertebrates – Mechanism of regeneration – Blastema formation – Factors affecting regeneration.

Unit: IV

18 Hours

Evolutionary developmental biology- # Unity of types and conditions of existence # – Hox genes and atavism – Homologous pathway of development – A new evolutionary synthesis explaining bio diversity – Adaptive radiation - Causes and types.

Unit: V

18 Hours

Evolution of population: From races to species, Adaptation pattern - # Behavioral adaptations and strategies #, Sexual competition and selection. Isolating mechanisms- Mode of speciation.

Evolution of man: Biological & cultural – Future evolution.

Fossil study : Formation, Types, Dating, Significance, Salient features of living fossils –

Fossils of Tiruchirappalli and Ariyalur - Extinct animals.

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Text books:

1. Gilbert, S.F. Developmental Biology, II Edn. Sinamer Associates Inc. Publishers Sanderland, Massachusetts, USA. 1995.
2. Strickberger, M.W. Evolution . Jones and Barlett Pub. Inc., London. 1996.

Unit I	: Chapter-3
Unit II	: Chapter- 37&44
Unit III	: Chapter- 23 & 35
Unit IV	: Chapter-32 & 33
Unit V	: Chapter- 36 & 41

REFERENCE BOOKS:

1. Balinsky, B.L. An introduction to Embryology V Ed. Saunders Co. Philadelphia. 1981.
2. Berrill, N.J. Developmental Biology, Tata McGraw Hill, New Delhi. 1986.
3. Browder, L.N. Developmental Biology, Saunders co., Philadelphia. 1980.
4. N. Arumugam. Organic evolution, 10th Revised edition Saras publication. 114/35. ARP comb road. Periyavilai kottai. Nagercoil. 2013.
5. Saunders, A.W. Developmental Biology, Patterns, principles, problems. Macmillan publishing Co., New York. 1982.
6. Stevan, B and Oppenheimer. Introduction to Embryonic development, Alley and Bern. 1980.
7. Sharma, B.K. and Kaur, H. Environmental chemistry Goel Pub. House, Meerut. 1997.
8. Tacconi, L Biodiversity and Ecological Economics Participation, values and resource management. Earthscan Pub. Ltd. London. 2000.
9. Castri, F.D. and Younes, T. Biodiversity: Science and development. CAB Int, Wallingford, U.K. 1996.
10. Dobzhansky, T., Ayala, F.J., Stebbins, G.L. and Valentine, J.W. Evolution. Surjeet Pub. and Co., New York. 1975.

SELF STUDY

1. Embryonic induction. Organizers
2. Artificial Reproductive Technology
3. Specification of the limb fields
4. Unity of types and conditions of existence
5. Behavioral adaptations and strategies

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BIOCHEMISTRY

Sub Code: 14PZO3C10
Hours/Week: 6
Credits: 5

Max Marks: 100
Internal Marks: 40
External Marks: 60

Objective:

To provide a concise and unifying approach of knowledge-sharing of the structure, function and interaction of biomolecules & bioprocesses at molecular and metabolic levels.

Unit: I STUDY OF BIOMOLECULES

18 Hours

Structure, Properties Analytical tests and Functional significance of: Carbohydrates (mono, di and poly saccharides) – Lipids (fatty acids, triglycerids and steroids) – Proteins (amino acid classification) & # Protein configuration # .

Unit: II NUCLEIC ACID AND ENZYMES

18 Hours

Nucleic acid : Molecular structure , Chemistry, Types and Properties of DNA and RNA- Biosynthesis of Purines and Pyrimidine – # DNA damage and repair #.

Enzymes : Types, Kinetics and Mechanism of Action – Enzyme inhibition – Coenzymes (NAD, FAD) and Cofactors.

Unit: III VITAMINS AND HORMONES

18 Hours

Vitamins: Types Occurrence, Classification, Structure, Properties and Deficiency symptoms.

Animal hormones: Classification, Salient features, Properties and Function: Pituitary, Thyroid, Parathyroid, Adrenal, Reproductive, Placental, Thymus, Pineal and Gastrointestinal.

Brief study on plant hormones – Prostaglandins – # Pigments, Alkaloids & Camp #.

Unit: IV CELL RESPIRATION AND CARBOHYDRATE METABOLISM 18 Hours

Cell Respiration and Biological Oxidations : Introduction, Salient features, Theories, Pathway and Energetics.

Oxidative Decarboxylation – Krebs cycle – # Electron Transport System # – Oxidative Phosphorylation.

Carbohydrate Metabolism: Types, Phases – Intermediary Metabolism - Energetics of Glucose Metabolism – HMP Shunt – Hormonal control of Carbohydrate Metabolism.



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Unit: V PROTEIN AND LIPID METABOLISM**18 Hours**

Protein Metabolism; Oxidative deamination – Transamination – Decarboxylation – Transmethylation. Ornithine cycle – Catabolism of ketogenic and glucogenic aminoacids.

Lipid Metabolism: Metabolism of tryglycerides, glycerol, fatty acid - # Theories of fatty acid oxidation # – Ketosis – Hormonal regulation of lipid metabolism.

Text book:

- 1, Lehninger, L. Biochemistry W.H. Freeman & Co. 1990.
2. Stryer, L. Biochemistry. Wiley International. 1992.

Unit I T1 : Chapter-7 & 8
 Unit II T1 : Chapter- 10 & 12
 Unit III T2 : Chapter-13-18 & 20
 Unit IV T2 : Chapter-22 & 23
 Unit V T2 : Chapter- 24 & 25

Reference:

1. Frankton J.S. & S. Simmonds, G. General and R.H. Dol. Outlines of Biochemistry John Wiley & Sons. 1987.
2. Baldwin, E. An introduction to comparative Biochemistry, CUP, London. 1964.
3. Beck. Human Design, Harcourt Brace Jorrorich Inc. 1971.
4. Giese, A.C. Cell Physiology and Biochemistry, Prentice Hall. 1979.
5. Narayanan, L.M., Nallasingam, K, Arumugam, N, Fathima, D., Pillai, R.P.M., Kumar, S.P. Biochemistry- Saras publication. Nagercoil. 2003.

SELF STUDY

1. Protein configuration
2. DNA damage and repair
3. Pigments, Alkaloids & Camp
4. Electron Transport System
5. Theories of fatty acid oxidation

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M.Sc., (Zoology)
Semester III: CORE XI

IMMUNOLOGY

Sub Code: 14PZO3C11
Hours/Week: 5
Credits: 6

Max Marks: 100
Internal Marks: 40
External Marks: 60

Objective:

To learn about Immune system and Defense mechanism with latest information pertaining to MHC and HLA. Also to familiarize the modern laboratory techniques applicable to the diagnosis and monitoring of diseases involving the immune system.

Unit: I INTRODUCTION

15 Hours

Scope of Immunology – Types of Immunity: Innate and acquired. Lymphoid organs: Functional features – Primary and Secondary – Structure and function. # Cells of immune system #: lymphocytes and types.

Unit: II ANTIGEN, ANTIBODY AND COMPLEMENT

15 Hours

Antigen: Definition, Types and Characteristic features of Immunoglobulin. # Antigenic determinants # - Structure and Function

Antibody: Definition, Types, Structure and Function

Complement: Definition, Salient features – complement activation - classical and alternative pathway.

Unit: III IMMUNE ACTIONS AND EFFECTOR MECHANISM

15 Hours

Immune response: Hormonal immune response - Cell mediated immune response.

Cytokines: Properties – General structure – Function – # Cytokine Receptors # – Cytokine related disease.

Unit: IV DISEASES AND IMMUNE RESPONSE

15 Hours

Hypersensitivity – Definition – Types I to IV and Immune Manifestations – Auto Immune Diseases – Immuno deficiency diseases – types – Tumor immunology – Immune response to tumor – Transplantation immunology – Allograft rejection – types and mechanism – # Major Histocompatibility Complex (MHC) #.

Unit: V IMMUNOLOGICAL TEST

15 Hours

Precipitation test: Immunodiffusion - Immuno electrophoresis – VDRL

Agglutination test: Vidal test - Immunofluorescence - # ELISA # – Hybridoma technology – Radio Immuno Assay (RIA) – Blotting techniques (Southern, Northern and Western).



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Text Book:

Chakravarthy, A.K., (1993) Immunology, Tata McGraw Hill Publishing Company, New Delhi.

Reference Books:

1. Roitt, (3rd Edition) Immunology, Crover Medical Publishing Company, London
2. Barret, J. T. (1983) Text Book of Immunology (5th Edition), The C.V. Mosly Company.
3. Richard, H.M. (1992), Immunology(2nd Edition), Williams and Wilkins, Baltimore Maryland.
4. Hidemann, W.H. (1980) Essentials of Immunology, Elsevier Science Publishing Co. Inc.
5. Weinn. D.M. and Steward, L. (1993), Immunology, Singapore Publishers Private Limited.

SELF STUDY

1. Cells of immune system
2. Antigenic determinants
3. Cytokine Receptors
4. Major Histocompatibility Complex
5. ELISA

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M.Sc., (Zoology)
Semester III: CORE XII

**DEVELOPMENTAL BIOLOGY, EVOLUTION & PALEONTOLOGY,
BIOCHEMISTRY AND IMMUNOLOGY - PRACTICAL**

Sub Code: 14PZ03C12/P
Hours/Week: 6
Credits: 5

Max Marks: 100
Internal Marks: 40
External Marks: 60

Developmental Biology

Preparation of sperm suspension of frog/bull and observation of spermatozoa.
Observation of live spermatozoa & study of motility rate of frog / bull semen.
Effects of thyroxin or iodine on metamorphosis of frog. Vaginal smear preparation of rat/mouse to study the stages of estrous cycle. Induced ovulation in fish.

Evolution & Paleontology

Fossil study : Colouration and Mimicry. Nautiloid, Ammonoid, Belemnoid.

Biochemistry

Preparation of solutions: Percentage, Molarity, Normality.
Buffer preparation – Determination of pH using pH meter.
Quantitative estimation of: Protein, Aminoacid, Carbohydrate and Lipids in tissue samples.

Immunology

Lymphoid organs- Primary and Secondary.
Immunodiffusion - Immunoelectrophoresis (Demo) – ELISA.
Blotting techniques. Blood Cross Matching (Compatibility test for ABO Blood Grouping).

Educational Tour

Visit to R & D labs and different natural habitats related to the subjects maintained above and submission of Tour Report is compulsory.

Observation Record.

A record of lab work should be maintained and submitted at the time of Practical Examination for valuation.

BIostatISTICS AND BIOINFORMATICS

Sub Code: 14 PZO3CE3
Hours/Week: 6
Credits: 5

Max Marks: 100
Internal Marks: 40
External Marks: 60

Objective:

To provide mathematical foundation to build analytical skills so as to enable learners be competent in varied applications of computer in biological sciences and to impart knowledge on molecular database.

Unit: I

18 Hours

Population – Sample and sampling. Variables in biology :Types. Primary and Secondary data – Classification. Diagrams and Graphs – Need & usefulness. Mean – Median – Mode – # Standard Deviation # – Standard Error.

Unit: II

18 Hours

Probability –Addition and Multiplication laws- Binomial and Normal distribution – Skewers and Kurtosis. Correlation: Types – #Karl Pearsons Coefficient Rank Correlation#.

Unit: III

18 Hours

Regression equation – # Regression line # – Hypothesis testing - Student 't' test – Confidence limits -Chi-square test, F – test : ANOVA: Principle - One way & Two way – Application. Use of Computers & Softwares (stat. packages) in Biostatics studies .

Unit: IV

18 Hours

Bioinformatics: Scope. Bimolecular Structure of Proteins and Nucleic acids. – Protein Database - Primary Database – Protein Sequence Database – Nucleotide Database – Secondary Database – Primary structure in Database – Domine and Modif Database – Gene Expression Database – # Metabolic pathway Database # – Specialized Database – Nucleic acid Database – GENE BANK –EMBL.

Unit: V

18 Hours

Sequence Alignments : Need – Pairs wise Sequence Alignments – Local Sequence Alignments – # Global Sequence Alignments # – Multiple Sequence Alignments - Bioinformatics tools – TASTA, BLASTA, CLUSTAL, RASMOL, MMDB – Algorithms - .Molecular phylogenetic analysis.



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Text Books

1. Arora, P.N. Biostatistics . Himalaya Publishing House. 1998.
2. Subramanian, C. A Text book of Bioinformatics, Dominant Publishers and Distributors. New Delhi, India. 2004.

REFERENCE BOOKS:

1. Sokal, R.J. and Rohlf, S.J. Introduction to Biostatistics, W.H. Freeman, London. 1981.
2. Ramakrishnan, P. Biostatistics, Saras Publications, Nagercoil. 1996.
3. Irfan Ali Khan and Atiya Khanum. Fundamentals of Bioinformatics. Ukaaz Publications Hyderabad, AP, India. 2003.
4. Murthy, C.S.V. Bioinformatics. Himalaya Publishing House. Mumbai, Delhi, Nagpur, Bangalore, Hyderabad, India. 2003.
5. Mittal, C. 2003. Fundamentals of Information Technology, Praghati Prakasam, Meerut.
6. ZAR, J. H. Biostatistical Analysis. Pearson Education Pvt. Ltd. Singapore.2004.

SELF STUDY

1. Standard Deviation
2. Karl Pearsons Coefficient Rank Correlation
3. Regression line
4. Metabolic pathway Database
5. Global Sequence Alignments

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SEMESTER III: EXTRA CREDIT - I
COMPREHENSIVE EXAMINATION IN ZOOLOGY

Course Code : 14PZO3EC1

Hours/Week : -

Credit : 5*

Max Marks : 100*

Internal Marks : --

External Marks : 100*

Objective:

To study the basic concepts of animal structure and function. To Provide on understanding of the cellular and molecular basis of life and appropriate foundation for a career in molecular biology and genetics.

UNIT I

Classification of Invertebrata upto phyla with diagnostic features and examples. Cockroach : External morphology, mouth parts, digestive system, respiratory system, circulatory system, nervous system and reproductive system
General characters of Chordates - Classification of vertebrata upto classes with suitable examples.

Frog: External features, digestive system, respiratory system, circulatory system, nervous system and urino-genital system.

UNIT II

Physiology of digestion and absorption, respiration, transport of oxygen and carbon-dioxide, structure of kidney and nephron, urine formation in man.

Composition and functions of blood of man - Types of muscle - Structure of neuron - Nerve impulse conduction. Physiology of vision in man.

Functions of Pituitary and Islets of Langerhans. Human Reproductive Systems – Menstrual cycle.

UNIT III

Stem cells: Sources, types and their use in human welfare.

Modern concept of gene, split gene, genetic regulation, genetic code.

Mendel's laws of inheritance, recombination, linkage, multiple alleles, genetics of blood groups, pedigree analysis, hereditary diseases in man. Mutations and mutagenesis.

Theories of evolution; Natural selection, role of mutation in evolution, evolutionary patterns; molecular drive, mimicry, variation, isolation and speciation.

UNIT IV

Structure and function of cell and its organelles (Nucleus, Plasma membrane, Mitochondria, Golgi bodies, Endoplasmic reticulum, Ribosomes and Lysosomes). Cell division (mitosis and meiosis), mitotic spindle and mitotic apparatus, Chromosome movement, Chromosome type: polytene and lampbrush, organization of chromatin, heterochromatin, cell cycle regulation.

Nucleic acid topology, DNA motif, DNA replication, transcription, RNA processing, translation, protein foldings and transport.

UNIT V

Apiculture, sericulture, lac culture, carp culture, pearl culture, prawn culture, vermiculture.

Major infectious and communicable diseases (malaria, filaria, tuberculosis, cholera and AIDS) their vectors, pathogens and prevention.

Pests of sugar cane (two each), oil seed and rice .Transgenesis.

Books for Reference:

1. Barrington, E.J.W. Invertebrate Structure and Function, II Ed., ELBS and Nelson. 1979.
2. Kent. G.C. Comparative Anatomy of the Vertebrates, McGraw Hill Book Co., Inc., New York. 1976.
3. R. Nagabhushanam, M.S. Kodarkar, R. Sarojini, Textbook of Animal Physiology. Second Edition, Oxford & IBH Publishing CO. PVT. LTD. 2002
4. M.W. Strickberger, Genetics, Third Edition, Third Edition, Prentice-Hall of India Private Limited, 2004.
5. De Robertis, E.D. P. and De Robertis, E.M.F. Cell and Molecular Biology, VIII Ed. Lea and Febiger, Philadelphia. 1987.
6. Tomer & Bhatnager, Text books of applied zoology. Emkay publication, Delhi. 2000.

GENERAL AND APPLIED ENTOMOLOGY

Sub Code: 14PZO 4C13
Hours/Week: 6
Credits: 5

Max Marks: 100
Internal Marks: 40
External Marks: 60

Objective:

To impart a thorough knowledge on Insects, their taxonomy, biology and their interrelationship with environment. Also to provide students the opportunities to understand Insect Pest Management Techniques.

Unit: I INSECT TAXONOMY AND MORPHOLOGY

18 Hours

Taxonomy: Basics of insect classification. Classification upto super families – Key characteristics with common South Indian examples.

Morphology: Head: segmentation and sutures. Wings: venation – Appendages in Apterygotes – # Genitalia #.

Unit: II INSECT PHYSIOLOGY: DIGESTION, RESPIRATION AND CIRCULATION

18 Hours

Physiology: Integumentary system – structure and chemistry – physiology of moulting.

Digestive system: Structure of alimentary canal and physiology of digestion

Respiration: Aerial respiration – aquatic respiration – respiration in endoparasites.

Circulatory system: Structure of heart, mechanism of haemolymph circulation – Haemolymph and its composition – # A study of haemocytes and their functions #.

Unit: III INSECT EXCRETION, NERVOUS, REPRODUCTIVE AND ENDOCRINE SYSTEMS

18 Hours

Excretory system: Malpighian tubules and their functions – Salt and water balance - Detoxification.

Nervous system: Structure – Neurotransmitters – structure and function of compound eye – stridulatory organ.

Reproductive system: Male and female systems – types of ovarioles – vitellogenesis – mating - oviposition – viviparity – # Accessory reproductive glands # – their secretions and functions.

Endocrine system: Endocrine control of moulting and metamorphosis – role of hormones in male and female reproduction. Neuroendocrine system of insects .

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Unit: IV INSECT ECONOMIC IMPORTANCE

18 Hours

Economic importance of insects Biology of: Honeybee, Silk moth and Lac insectS.
Culture Methods – Appliances used and Problems related to these cultures.

Biology, Damage caused and Control Methods of any 5 Insect Pests of Agricultural importance – Pests of paddy, sugarcane, cotton, groundnut, coconut, - Bhendi and brinjal – # Pests of Stored Products #.

Medical and veterinary entomology: Arthropods as vector of Human diseases – Biology of House fly, Mosquito, Flea, Louse and Sandfly – control methods.

Unit: V INSECT PEST MANAGEMENT

18 Hours

Principles of Insect control : Prophylatic measures – Cultural, Mechanical, Physical methods

Biological control: Parasites, Predators and Microbial agents.

Chemical methods: Pesticides - Classification –Types of formulations – Mode of action – toxicity - Insecticide resistance to environmental safety .

Non-conventional methods: Use of Insect Growth Regulators (IGR), Repellents, Antifeedants, Pheromones and Chemosterilants - # Integrated Pest Management (IPM) # – Integration of methods – Potential Components – Need for IPM and uses.

Text book

1. Chapman, R.F. The insects: Structure and Function, Hodder and Broughton Ltd., Kent, U.S.A. .1992.
2. Nalina Sundari, M.S., and R. santhi. Entomology, MJP Publisher, Chennai. 2006.

Reference Books

1. Mani, M.S., General Entomology, Oxford and IBH publishing Co., New Delhi. 1982.
2. Snodgrass, R.E. Principles of Insect Morphology, McGraw Hill and Co., New York. 1985.
3. Nayar, K.K., Ananthkrishnan, T.N., and David, M. General and applied Entomology, Tata McGraw Hill Pub. Co., Ltd., New York. 1995.
4. Vasantharaj David, B. Elements of Economic Entomology, Popular Book Depot., Chennai – 15. 2001.
5. Nayar, K.K. et al. Economic Entomology and Applied Entomology, Oxford and IBH Publishing co., New Delhi. 1983.
6. Nayar, K.K., T.N. Ananthkrishnanj and David B.V. General and Applied Entomology, Tata McGraw Hill Publications, New Delhi. 1986.
7. Rathinaswamy, T.K. Medical Entomology, S. Viswanathan and Co., Madras. 1986.

SELF STUDY

1. Genitalia
2. A study of haemocytes and their functions
3. Accessory reproductive glands
4. Pests of Stored Products
5. Integrated Pest Management

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M.Sc., (Zoology)
Semester IV: CORE XIV

GENERAL AND APPLIED ENTOMOLOGY - PRACTICAL

Sub Code: 14 PZO4C14 P
Hours/Week: 6
Credits: 5

Max Marks: 100
Internal Marks: 40
External Marks: 60

I. Collection and Identification of Insects, their parts and stages

1. Collection and preservation of insects.
2. Identification of insects belonging to important orders and super families using Dichotomous key.
3. Identification of beneficial insects, predators and parasites (relevant to biological Control).
4. Identification of harmful insects (two examples for each of the plants mentioned in theory).
5. Identification of household pests, mosquitoes and fleas
6. Study of types of larvae and pupae.
7. Study of types of antennae, legs, wing, mouth parts and external genitalia.

II. Mounting and Dissections

1. Mounting of mouth parts of bedbug, mosquito, honey bee and house fly
2. Dissections of digestive system, nervous system and reproductive systems of Grasshopper, Chrysocoris, Mylabris, House fly, Silk worm moth and Honey bee.
3. Dissection of Neuroendocrine system of cockroach.
4. Dissection of silk gland of silk worm.

III. Experiments

1. Estimation of Insects respiratory rate using respirometer.
2. Experiment on the role of cuticular lipids in preventing transpiration.
3. Experiment on the functioning of Malpighian tubules (in vitro study)
4. Insect haemolymph – total and differential counts of haemochyts.

Field visits

Visits to Sericulture units, Crop research stations, Farms and IPM Centers to have a firsthand knowledge on culture techniques and problems.

Record work

A record of laboratory work and collection of insects (including insects of economic importance) shall be submitted for the practical examination.

SEMESTER IV: CORE - XIV
BIO NANOTECHNOLOGY

Course Code: 14PZO4C14

Hours/Week : 6

Credit : 5

Max Marks : 100

Internal Marks : 40

External Marks : 60

Objectives:

To impart basic fundamental knowledge on Nanoscience Technology and its biomedical application keeping abreast the various recent developments in Nanobiotechnology.

UNIT – I: FUNDAMENTALS AND OVERVIEW OF NANOSCIENCE

Definitions and Nanoscale architecture & Properties – Classification based on dimensionality – Quantum Dots, Wells and Wires – Carbon based nano materials (buckyballs, nanotubes and graphene) – Metal based nano materials (nanogold, nanosilver and metal oxides) - Nanocomposites – Nanopolymers – Nanoglasses – Nano ceramics – Biological nanomaterials.

UNIT – II: NANO BIOMATERIALS

Natural and artificial (Microbial Nanoparticles production- Viral Nanoparticles production, Plant and diatoms Nanoparticles production)- DNA, peptide, Protein, enzyme based manufacturing: Nano particles with biosystems - Natural biocomposite :spider silk: Bone :shells – Biosensors:using Nano materials with bio systems(Plant and animal cell, DNA, microtubules).

UNIT – III: BIOMEDICAL APPLICATIONS

Nano medicine :Bio- Pharmaceuticals, biological implants, Genetic testing – imaging – nanoparticles probe; Microfabricated drug delivery systems: microneedles- micropumps- microvalves-implantable microchips. Nanoparticles in Drug delivery:sustained / controlled/ targeted - Nanotechnology in Diagnostics applications - Nanomaterials in cancer treatment – Tumor detection and targeting in vivo, Gene Therapy using nanoparticles – Nanocapsules preparation.

UNIT – IV: NANOTECHNOLOGY AND ENVIRONMENT

Application of nanotechnology in Green Energy, Sustaining Natural Resources, Global climate changes, Microbial Nanoparticle Production in Biomineralization. Nanotechnology and Energy Production: Fuel Cells — applications in power and transportation

UNIT – V: NANO TOXICOLOGY

Nanomaterials in Environment - Toxicology of Airborne and Manufactured Nanomaterials in Environment - Nanoparticles and Living Organisms: Portals of entry and target tissues- Mechanisms and Health Effects - Risk assessment – Ethical – Legal and Social Implications – Future Prospects.

Text Books

Nanotechnology by Mark Ratner and Daniel Ratner, Pearson Education.

Nanomaterials by A.K. Bandyopadhyay; New Age International Publishers

Books for References

Hari Singh Nalwa, “*Nanostructured Materials and Nanotechnology*”, Academic Press, 2002

Yuliang Zhao and Hari Singh Nalwa, “*Nanotoxicology: Interactions of Nanomaterials with Biological Systems*”, American Scientific Publishers, 2007

“*Nanotoxicology - Interactions of Nanomaterials with Biological Systems*”,

Ed Yuliang Zhao and Hari Singh Nalwa, June 2006

Springer handbook of nanotechnology by Bharat Bhushan

MEMS and nanotechnology – Based sensors and devices communication,

Medical and Aerospace applications - A.R.Jha.

SEMESTER IV: CORE - XIV
BIO NANOTECHNOLOGY

Course Code: 14PZO4644

Hours/Week : 6

Credit : 5

Max Marks : 100

Internal Marks : 40

External Marks : 60

Objectives:

To impart basic fundamental knowledge on Nanoscience Technology and its biomedical application keeping abreast the various recent developments in Nanobiotechnology.

UNIT – I: FUNDAMENTALS AND OVERVIEW OF NANOSCIENCE

Definitions and Nanoscale architecture & Properties – Classification based on dimensionality – Quantum Dots, Wells and Wires – Carbon based nano materials (buckyballs, nanotubes and graphene) – Metal based nano materials (nanogold, nanosilver and metal oxides) - Nanocomposites – Nanopolymers – Nanoglasses – Nano ceramics – Biological nanomaterials.

UNIT – II: NANO BIOMATERIALS

Natural and artificial (Microbial Nanoparticles production- Viral Nanoparticles production, Plant and diatoms Nanoparticles production)- DNA, peptide, Protein, enzyme based manufacturing: Nano particles with biosystems - Natural biocomposite :spider silk: Bone :shells – Biosensors:using Nano materials with bio systems(Plant and animal cell, DNA, microtubules).

UNIT – III: BIOMEDICAL APPLICATIONS

Nano medicine :Bio- Pharmaceuticals, biological implants, Genetic testing – imaging – nanoparticles probe; Microfabricated drug delivery systems: microneedles- micropumps- microvalves-implantable microchips. Nanoparticles in Drug delivery:sustained / controlled/ targeted - Nanotechnology in Diagnostics applications - Nanomaterials in cancer treatment – Tumor detection and targeting in vivo, Gene Therapy using nanoparticles – Nanocapsules preparation.

UNIT – IV: NANOTECHNOLOGY AND ENVIRONMENT

Application of nanotechnology in Green Energy, Sustaining Natural Resources, Global climate changes, Microbial Nanoparticle Production in Biomineralization. Nanotechnology and Energy Production: Fuel Cells — applications in power and transportation

UNIT – V: NANO TOXICOLOGY

Nanomaterials in Environment - Toxicology of Airborne and Manufactured Nanomaterials in Environment - Nanoparticles and Living Organisms: Portals of entry and target tissues- Mechanisms and Health Effects - Risk assessment – Ethical – Legal and Social Implications – Future Prospects.

Text Books

Nanotechnology by Mark Ratner and Daniel Ratner, Pearson Education.

Nanomaterials by A.K. Bandyopadhyay; New Age International Publishers

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Hari Singh Nalwa, "Nanostructured Materials and Nanotechnology", Academic Press, 2002

Yuliang Zhao and Hari Singh Nalwa, "Nanotoxicology: Interactions of Nanomaterials with Biological Systems, American Scientific Publishers, 2007

"Nanotoxicology - Interactions of Nanomaterials with Biological Systems", Ed Yuliang Zhao and Hari Singh Nalwa, June 2006

Springer handbook of nanotechnology by Bharat Bhushan

MEMS and nanotechnology – Based sensors and devices communication, Medical and Aerospace applications - A.R.Jha.

SEMESTER IV: CORE BASED ELECTIVE - IV

AQUACULTURE BIOTECHNOLOGY

Course Code: 14PZO4CE4

Hours/Week : 6

Credit : 5

Max Marks : 100

Internal Marks : 40

External Marks : 60

Objectives:

- To understand the Improved Techniques in Seed production and Fish Health Management
- To acquaint with the techniques in Biotechnology as applied to Aquaculture Industry for enhancing self employment potentials

Unit – I Aquaculture Basics & Farm Management:

Aquaculture – Blue Revolution in India – Coastal & Freshwater Aquaculture – Farm Engineering and equipments – Site selection – Farm layout & Construction – Role of Aeration in culture system – Management of Culture ponds – Fertilization – Predator & weed management.

Unit – II Aquaculture for sustainable Environment:

Sewage fed fish culture – Sewage treatment – Sewage cum Fish culture in India – Recent development in Integrated fish farming – Animal husbandry cum Fish culture – Paddy cum Pisciculture- Fish culture in cages & pens – Race-way fish culture – Culture of Air breathing fishes.

Unit – III Seed Production Techniques:

Brooder care management – Bund breeding- Hypophysation – In-vitro fertilization – Application of Synthetic Hormone- Transport of fish seed and brooders – Hatchery operations of Fin and Shell Fishes- Edible and Pearl Oysters.

Unit- IV Nutrition and Health Management:

Culture of fish feed organisms: Diatoms - Cladocerans – Rotifers – Artemia – Tubifex. Artificial feed formulation and management- Probiotics in formulated feed.

Bacterial, Viral & Fungal diseases - Nutritional deficiency diseases - Ectoparasites and Endoparasites - Principles of Fish Health Management- Fish vaccines and Antibiotics.



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Unit- V Aquaculture Biotechnology and Economics

Genetic improvement of stock – Selective and diversified breeding – Hybridization – Transgenic fishes (Antifreeze & Green fluorescent proteins). Chromosomal manipulation- Ploidy in Fishes- Gynogenesis and Androgenesis in Fishes- Production of Monosex and Sterile fishes- Cryopreservation of gametes.

Aquaculture Economics – Fish Marketing and Presevation- Governmental involvement in enhancing fish production and marketing – Role of MPEDA, CMFRI, CIBA, and NABARD.

Text books:

Agarwal, S.C. A Hand Book of Fish Farming . Narendra Publishing House, New Delhi. 3rd Edition, 1994.

Chakrabarthi, M.N. Biology, Culture and Production of Indian major carps, Narendra Publishing House, New Delhi. 2nd Edition, 1998.

Books for Reference

Hall, C.B. Ponds and fish culture . Agrobotanical Publishers India. 1999.

Jhingran, V.G. Fish and fisheries of India , Hindustan Publishing Co., New Delhi. 1997.

Santhanam, R. Fisheris Science: Daya publication House. New Delhi. 1990.

General and Applied Ichthyology (Fish and fisheries). S.K. Gupta., P.K. Gupta. S. Chand & company LTD, Ram Nagar, New Delhi Edition – 2006.

Aquaculture, N. Arumugam., Saras publication, 114/35 G, A.R.P Camp road, Periyavilai, Kottar P.O. Nagercoil, Kanyakumari Dist. Second edition- 2010.

Fish and Fisheries. Santosh Kumar and Manju Tembhre., New central book Agency (P) LTD, London, January- 2010.



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M.Sc., (Zoology)
Semester IV: Extra Credit II

APPLIED ZOOLOGY

Sub Code: 14PZO3EC2
Hours/Week:
Credits: 5

Max Marks: 100
Internal Marks: 40
External Marks: 60

Objective:

To present basic information on applied zoology such as culturing beneficial and productive animal forms and to keep off harmful parasites that are detrimental to man and his livestock.

Unit: I

18 Hours

Protozoan parasites : Entamoeba, Lishmania and Trypanosoma: Distribution - #pathogen study# – Morphology - Life history – Pathogenicity – Diagnosis – Treatment and Prevention & Control.

Unit: II

18Hours

Aquaculture – Aquaculture production – Aquaculture in India – Fish culture – Technique of culture : Induced Spawning - Maintenance of Nursery ponds - Requirements for carp culture ponds – Rearing ponds – Prawn culture – Seed collection – Culture practice – Grow out pond - # Types of prawn farms of India # – Breeding methods and spawning– Diseases & Treatment.

Unit: III

18Hours

Apiculture – Honey bee life history – Species of honey bee – Bee hive – Modern method of apiculture - Tools for proper care and maintenance of bee hives – # Benefits of modern apiculture # – Chemical composition of honey and bee wax – Diseases of bees – Bee keeping in India.

Unit: IV

18Hours

Sericulture – Species of silk worm – Types of silk – Uses of silk - Biology of Bombyx mori. Methodology of sericulture : Collection of eggs , Incubation of eggs , rearing of larvae – # Recovery and Reelings of Cocoon # – Diseases of silkworm.

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Unit: V**18Hours**

Dairy Farming – Breeds of cattle – Drags breeds – Dairy breeds – Dual purpose breeds – Important traits for breeding – # Milk and milk spoilage # – Pasteurization – Uses of dairy products.

Text books

1. Tomer & Bhatnager, Text books of applied zoology. Emkay publication, Delhi. 2000.

Unit I T1 : Chapter-1
 Unit II T1 : Chapter- 2
 Unit III T2 : Chapter- 2
 Unit IV T2 : Chapter- 3
 Unit V T2 : Chapter- 3

Reference:

1. B.Vasantharaj David & T.Kumaraswami, Elements of economic entomology. 2000.

SELF STUDY

1. Pathogen study
2. Types of prawn farms of India
3. Benefits of modern apiculture
4. Recovery and reelings of cocoon
5. Milk and milk spoilage

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