VIVEKANANDA COLLEGE

(Residential & Autonomous – A Gurukula Institute of Life-Training)

(Affiliated to Madurai Kamaraj University)

(Re-accredited with 'A' Grade [CGPA 3.57 out of 4.00] by NAAC)

TIRUVEDAKAM WEST

MADURAI DISTRICT – 625 234

DEPARTMENT OF ZOOLOGY

M.Sc. ZOOLOGY

SYLLABUS

Choice Based Credit System

(For those who joined in June 2014 and after)

M.Sc., ZOOLOGY

(Choice Based Credit System)

SCHEME OF EXAMINIATION
(For those who joined in June 2014 and after)

FIRST SEMESTER

Part	Study Component	Subject Code	Title Of The Paper	Hours	Credit	Sessional Marks	Summative Marks	Total
III	Core	31CT11	Biological Chemistry	6	4	25	75	100
	Core	31CT12	Cell and Molecular Biology	6	4	25	75	100
	Core	31CT13	Microbiology	6	4	25	75	100
	Core	31CP14	Practical – I	6	3	40	60	100
	Elective	31EP11	Bioinformatics	6	5	25	75	100
			TOTAL	**30**	**20**			

SECOND SEMESTER

Part	Study Component	Subject Code	Title Of The Paper	Hours	Credit	Sessional Marks	Summative Marks	Total
III	Core	31CT21	Immunology	6	4	25	75	100
	Core	31CT22	Bio-statistics	6	4	25	75	100
	Core	31CT23	Developmental Biology	6	4	25	75	100
	Core	31CP24	Practical – II	6	3	40	60	100
	Elective	31EP21	Evolution	6	5	25	75	100
			TOTAL	**30**	**20**			

THIRD SEMESTER

Part	Study Component	Subject Code	Title Of The Paper	Hours	Credit	Sessional Marks	Summative Marks	Total
III	Core	31CT31	Genetics	6	4	25	75	100
	Core	31CT32	Physiology	6	4	25	75	100
	Core	31CT33	Principles of Biotechnology	6	4	25	75	100
	Core	31CP34	Practical – III	6	3	40	60	100
	NME	31NE31	Applied Biology	6	5	25	75	100
			TOTAL	**30**	**20**			

FOURTH SEMESTER

Part	Study Component	Subject Code	Title Of The Paper	Hours	Credit	Sessional Marks	Summative Marks	Total
III	Core	31CT41	Applied Biotechnology	6	5	25	75	100
	Core	31CT42	Environmental Biology	6	5	25	75	100
	Elective	31EP41	Bio-farming technology	6	5	25	75	100
	Core	31CP44	Practical – IV	6	3	40	60	100
	Core	31PV45	Project & Viva	6	12	20	80	100
			TOTAL	**30**	**30**			
			TOTAL NUMBER OF HOURS	**120**				
			TOTAL NUMBER OF CREDIT		**90**			

M.Sc. Zoology

CBCS – Distribution of credits

(For those who joined in June 2014 and after)

Study Component	SEMESTER				Total Credit
	I	II	III	IV	
Core Subject	15	15	15	25	**70**
Elective Subject	5	5	5	5	**20**
TOTAL	**20**	**20**	**20**	**30**	**90**

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DEPARTMENT OF PG ZOOLOGY

M.Sc. Zoology - CBCS SYLLABUS – SEMESTER – I

(For those who joined in June 2014 and After)

Core Subject Theory		
Subject Title **: Biological Chemistry**		
Subject Code: **31CT11**	Hours per week: **6**	Credit: **4**
Sessional Marks: **25**	Summative Marks: **75**	Total Marks: **100**

6 hrs/week 72 hrs

Objectives

- Structure of biomolecules
- Structure, chemistry and metabolic importance of minerals and vitamins
- Metabolism and metabolic disorders of the macromolecules
- Metabolic role of hormones

Unit I: Bio - molecular chemistry 15 Hours

a) Carbohydrate, Protein, Lipid – Classes, structure, properties
b) Enzyme – classes, mechanism of action, kinetics, Isoenzymes.
c) Vitamins, Mineral and Pigments – chemistry and metabolic importance.
d) Hormones – Classes, mechanism of action, Messenger system, metabolic role.

Unit II: Carbohydrate metabolism 15 Hours

a) Glycolysis, TCA cycle, Glycogenolysis, Glycogenesis, Gluconeogenesis and Intermediary metabolism.
b) HMP shunt and metabolic integration.
c) Metabolism of uronic acid and polysaccharides
d) Metabolism of Fructose and Galactose

Unit III: Protein metabolism

a) Transamination, Transdeamination, Deamination Transmethylation, Transcarboxylation and Ornithine cycle
b) Metabolism of Glutamate Family of amino acids
c) Metabolism of Aspartate Family of amino acids
d) Metabolism of Pyruvate Family of amino acids 15 hrs

Unit IV: Lipid Metabolism

a) Fatty acids – Biosynthesis and oxidation
b) Metabolism of Phospholipids and ketone bodies
c) Metabolism of cholesterol and steroid hormones
d) Metabolism of Arachidonates (Prostoglandins) 15 hrs

Unit V: Nucleic Acid Metabolism

a) Biosynthesis and catabolism of purines
b) Biosynthesis and catabolism of pyrimidines
c) Biosynthesis and catabolism of nucleotide co-enzymes
d) Various classes of DNA and RNA – structures and significances 12 hrs

TEXT BOOKS

- Ambika Shanmugam 2003. Fundamentals of Biochemistry, MMC, Chennai
- Satyanarayana and Chakrapani, 2006. Biochemistry, Books and Allied (P) Ltd., Kolkata

REFERENCE BOOKS

- A. L Lehninger, 1990. Principles of Biochemistry. CBS publishers & distributors pvt Ltd. International edition, New York.
- Geoffrey Zubay 1989. Biochemistry 2nd edition. Maxwell-Macmillan
- Harold and Harper et al 1977. Review of Physiological Chemistry. The kottari's book
- Voet .D and Voet G Judith 1990. Biochemistry. John Wiley and sons New York
- M.N.Chatterjee and Rana Shinde – A Text book of Medical Biochemistry (2005), JP bro, New Delhi
- Mathews et al., 2000, Biochemistry, Pearson Education Pvt. Ltd. New Delhi.
- Abraham Mazur and Benjamin Harrow 1971. Text Book of Biochemistry, W.B Saunders Company, Philadelphia.

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DEPARTMENT OF PG ZOOLOGY

M.Sc. Zoology - CBCS SYLLABUS – SEMESTER – I

(For those who joined in June 2014and After)

Core Subject Theory		
Subject Title **: CELL AND MOLECULAR BIOLOGY**		
Subject Code: **31CT12**	Hours per week: **6**	Credit: **4**
Sessional Marks: **25**	Summative Marks: **75**	Total Marks: **100**

6Hrs/ Week (72 Hours)

Objectives

- Understand structure and functions of cell organelles, mitotic apparatus, cell cycle and the characteristics of cancer cells.

- Acquire the knowledge on replication of DNA, mechanism of protein synthesis and the principles of gene regulation.

Unit – I. Structure and function of the cell surface and Mitochondria.

a) Molecular dynamics of cell membrane – Composition – Molecular models – Liposome - Unit membrane - Fluid mosaic model – Cell permeability – Transport mechanisms – Differentiation- Cell recognition and inter cellular communication.
b) Molecular organization of mitochondria and transduction of energy – Bioenergetics – Krebs cycle – Respiratory chain – Oxidative phosphorylation –Chemiosmotic hypothesis.

-15 hours

Unit – II Protein sorting, secretion and endocytosis.

a) The Endoplasmic reticulum and Golgi complex – Structure and molecular constituents – Movements of proteins through ER and Golgi complex – The mechanisms of sorting and distributing proteins – Signal hypothesis
b) Lysosomes – Enzymes – Functions - Endocytosis and autophagy. -15 hours

Unit – III. The Nucleus - cell cycle and cell division

a) The molecular organization of interphase nucleus – Nuclear envelop –Chromatin-Chromosome-Nucleolus – r RNA Synthesis.
b) Cell cycle-phases of cell cycle – Cell cycle regulations - Cell aging and cell death.
c) Cell division – Mitosis and meiosis – General description (self study) - Mitotic apparatus.
d) Cancer Biology- Types of cancer – Characteristics, causes, carcinogens - Diagnosis and treatment - 15 hours

UNIT – IV a. Fundamentals of molecular biology

The genetic material –DNA and RNA – experimental evidences.
Nucleic acids: The basic units and their arrangements – bonds - Watson and crick model – Different forms of DNA – denaturation and renaturation – Molecular hybridization – Structure of RNA – Restriction mapping – RFLP.

b. DNA replication and genetic code

Replication and synthesis of DNA – Meselson and Stahl's experiment –Bacterial DNA replication – Role of enzymes in DNA replication.
Genetic code – Deciphering the code – Properties of genetic code – Coding dictionary.
-15 hours

UNIT – V a. Protein synthesis

Transcription in prokaryotes and eukaryotes – Synthesis of mRNA —splicing mechanisms.
Translation – Role of ribosome – Activation of tRNA – Stages of polypeptide synthesis– Inhibitors of protein synthesis.

b. Regulation of gene activity

Principles of gene regulation – regulatory genes
Lac operon – Arabinose operon - Trp operon
Gene regulation in Eukaryotes. -12 hours

TEXT BOOK

Cell and Molecular Biology 2005. E.D.P.DeRobertis and E.M.F.DeRobertis, 8th Edition, B.I Publications PVT.Ltd.India.

REFERENCE BOOKS

- Cell Biology 2010 Gerald Karp, John Wiley&Sons, Pvt.Ltd. Singapore.
- Cell and Molecular Biology 2010 P.K.Guptha, Rastogi Publications, Meerut, India.
- Molecular Biology 2010 Craig & Co –authors, Oxford University Press, UK.
- Fundamentals of Molecular Biology 2009 Jayanta K.Pal and Saroj S.Ghaskadbi, Oxford University Press, NewDelhi.
- Molecular Biology of the Cell 2008 Bruce Alberts& Co-authors, Garland Science, NewYork.
- Cell and Molecular Biology 2004 PJ Russel &Co-authors, Cengage learning, Pvt.Ltd, NewDelhi.

M.Sc. Zoology CBCS SYLLABUS – SEMESTER – I

(For those who joined in June 2014 and After)

Core Subject Theory		
Subject Title **: MICROBIOLOGY**		
Subject Code: **31CT13**	Hours per week: **6**	Credit: **4**
Sessional Marks: **25**	Summative Marks: **75**	Total Marks: **100**

6 Hour/Week 72 hrs

Objectives

- Understand basic aspects, classification, and culture of microbes
- Role of microbes in selected human diseases
- Applications of microbes in industries and environment

Unit-I. Principles of microbial classification and Microbial morphology.

a) Discovering the microbial world –Koch's postulates-five kingdom concepts-recent status of classification-Bergy's manual of systematic bacteriology-distinctive characteristics of the major groups of micro organisms-bacteria, fungi, algae, virus and protozoa.

b) Comparison of prokaryotic and Eukaryotic microorganisms, gross morphological and ultra structure of typical prokaryotic cell-morphology of bacteria, fungi, algae and protozoa. Endosymbiotic theory of microbial evolution. 15 hours

Unit –II. Nutritional requirements, culture/ cultivation, of microorganisms.

a) Nutrients-nutritional requirements of microbes-nutritional classification of micro organisms.

b) Culture-culture media-types of culture media- maintenance of culture.

c) Physical condition for activation of microorganisms- reproduction and growth of microorganisms- batch culture, synchronus and continuous growth of bacterial culture-synchronus growth methods of quantification of microorganisms. 15 hours

Unit-III. Microorganism and diseases- Classification- Pharmaceutical microbiology.

a) Normal flora of the healthy human host-effect of normal flora on the human host. General concepts of pathogen city and principles of epidemiology-host parasite interaction-antibiotics-natural and synthetic antiviral drugs-other chemotherapeutic agents.

b) Infectious disease of man.

i) Bacterial-Tuberculosis, Leprosy, Meningities.

ii) Viral-Hepatitis, Polio and Rabies.

iii) Fungal-Candidia albicans,Aspergillus and Dermatophytes. 15 hours

Unit- IV. Environmental microbiology.

A) Soil micro organisms-the Rhizosphere and the phyllosphere-Factors influencing soil microbial population-interaction among the soil micro organisms-the role of micro organisms in recycling nitrogen,carbon,sulphur and phosphorous.

b) Aquatic micro organisms-factors influencing aquatic microbial population-distribution of micro organism in aquatic environment and their role in aquatic environment.

c) Microbiology of potable water and waste water-biological treatement of waste and pollutants. 15 hours

Unit-V. Food and Industrial microbiology

a) Food as medium-microbial examination of foods-microorganisms found in fresh foods-spoilage of food-food preservation-food poisoning-food products by micro organisms.

b) Microbial processes, production and optimization. Fermentation: fermenter design, types, kinetics, and bioprocess monitoring - Down stream processing and strain improvement - Production, recovery, stability and formulation of bacterial and fungal enzymes 12 hours

Text Book

- Microbiology an Application Based Approach 2010, Michael J.Pelczar, JR. Ecschan, Noel R Krieg. Tata McGraw Hill Education Private Ltd, NewDelhi

Reference books

- Microbiology An introduction 2011, -G.J.Tortara *et al*., Addison Wisely, Newyork.
- Microbial Technology 2012, R.Puvanakrishnan *et al.*, MJP Publishers, Chennai
- A text book of Basic and Applied Microbiology 2009, K.R. Aneja *et al.*, New Age International Publishers, New Delhi.
- Microbiology 2008, Willey *et al.*, Mc Graw Hill, BostonN.S. Subba Rao,fourth edition. Oxford and IBH. Pub. New Delhi.

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M.Sc. Zoology CBCS SYLLABUS – SEMESTER – I

(For those who joined in June 2014 and After)

Core Subject Practical		
Subject Title **: PRACTICAL - I**		
Subject Code: **31CP14**	Hours per week: **6**	Credit: **3**
Sessional Marks: 40	Summative Marks: **60**	Total Marks: **100**

2 Hours/Week

Objectives

- Quantification of Glycogen, protein and cholesterol
- Experiments to know about the enzyme activities
- Principle, uses of microscopy and preparation of permanent slides of animal tissues

BIOLOGICAL CHEMISTRY

1. Estimation of sugar by Folin- Wu method.
2. Isolation and estimation of glycogen from Goat liver by Anthrone method.
3. Estimation of protein by Lowry's method.
4. Estimation of cholesterol in blood serum (colorimetric).
5. Estimation of ascorbic acid by Titrimetric method.
6. Effect of Temperature on enzyme action (Colorimetric method).

CELL AND MOLECULAR BIOLOGY *2 Hours/Week*

1. Principles and application of phase contrast and electron microscopy
2. Micrometry- Measurements of cells using Ocular and Stage micrometer
3. Microtome technique – Fixation, sectioning and staining – preparation of permanent slides of animal tissues–
4. Observation of succinic acid dehydrogenase activity in liver homogenate
5. Spotters**:** a) Semi conservative model, b) transcription steps, c) Translation steps, d) tRNA and e) Lac operon

MICROBIOLOGY *2 Hours/Week*

Objectives:

- Introducing basic aspects of microbiology
- Microbial culture preparation and culture techniques
- Introducing microbial specific staining procedures
- Isolation and characterization of certain biochemical characters

1) Simple staining of Bacteria(Direct and negative).
2) Differential staining of Bacteria(Gram's stain and acid fast).
3) Preparation and sterilization of culture medium(nutrient agar)
4) Determining number of microbes – quantitative plating techniques- spread plate & pour plate methods.
5) Turbidometric estimation of bacterial growth.
6) Effect of temperature and pH on bacterial growth,
7) Bacteriological examination of Raw and Pasteurized milk.
8) Degradation (Fermentation) of Starch by bacteria.
9) Testing the sensitivity of bacteria to the antibiotics.

Spotters:

a. Laminar flow hood
b. Autoclave
c. Colony counter
d. Anerobic jar
e. Colony morphology –Identification
f. Millipore filter apparatus
g. Counting chamber
h. Culture systems-Continuous, batch and syncyhronous.
i. Nif gene cluster

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DEPARTMENT OF PG ZOOLOGY

M.Sc. Zoology CBCS SYLLABUS – SEMESTER – I

(For those who joined in June 2014 and After)

Elective Subject Theory		
Subject Title **: Bioinformatics**		
Subject Code: **31EP11**	Hours per week: **6**	Credit: **5**
Sessional Marks: **25**	Summative Marks: **75**	Total Marks: **100**

6hrs/week 72hrs

Objectives:

- Introduction to basic aspects and functioning of computers
- Role of computers in the study of biology
- Introduction, Applications and need for Bioinformatics

Unit I: Introduction to computers

a) History, generations of computers;
b) Classifications of computer-main frame, mini, micro and super computer.
c) Popular software packages- Ms word, Ms power point
d) Ms Excel- Work sheet and statistical applications 15hrs

Unit II: System software

a) Internet- Modem- TCP/IP protocols -on line services - commercial organization-Education, web browsers and portals.
b) Creation of web pages using HTML- web page chart
c) Electronic mail – Creation and management, data storage using email
d) Virus- . Booting virus -EXE.virus and antivirus 15hrs

Unit III: Databases

a) Bioinformatics – Branches- Databases- classification- Data type, Maintainer status, data access, Data source, Data Design and Organism
b) NCBI – Tools and database, Sequence submission, Sequence retrieval, BLAST- Types
c) EMBL - Sequence retrieval- Resources- sequence analysis tools
d) DDBJ – Resources, Mass submission 15hrs

Unit IV: Sequence analysis

a) Sequence alignment- Concept- Scoring matrices- PAM , BLOSUM
b) Sequence pairing – BLAST, multiple sequence alignment
c) Gene prediction – Methods and Gene prediction Difficulties
d) Molecular phylogeny – Mechanism- Phylogenetic markers, representation- Roots, OUT, Distance scale, internal branch, CLADE, Horizontal branch, Cladogram, Dendrogram, Unrooted and rooted trees, Methods of phylogenetic analysis- Maximum like hood method, Distance method. 15hrs

Unit V: Proteomics

a) Protein structure and modeling- Confirmation parameters of secondary structures, Secondary structure types- Secondary structure prediction – Soft wares – Their limitations.
b) Methods of protein modeling – Homology, Abinto and Threading – Model refinement – Estimation of errors
c) Comparative modeling – Swiss model
d) Evaluation – Spdb`v and Ramachandran Plot. Internal evaluation, External evaluation 12hrs

Text books

- A first course in Computers Based on Windows XP and office XP 2007, Sanjay Saxena, Vikas Publishing House Pvt. Ltd. Nodia
- Bioinformatics Principle and application 2009, Zhumur Ghosh and Bibekanana Mallick, Oxford University press.

REFERENCE BOOKS

- Bioinformatics 2010, BG.Curran *et al.*, CBS Publishers & distributions Pvt Ltd, New Delhi
- Introduction to Bioinformatics 2002, S. Sundararajan *et al.*, Himalaya Publishing House, Mumbai
- Bioinformatics 2009, Prakash, S. Lohar, MJP Publishers, Chennai
- Computer Fundamentals 4th edition 2007, P.K.Sinha et al., BPB Publication

- Molecular Modeling and Drug Designing 2008, K.Anand Solomon MJP, Chennai

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DEPARTMENT OF PG ZOOLOGY

M.Sc. Zoology CBCS SYLLABUS – SEMESTER – III

(For those who joined in June 2014 and After)

Core Subject Theory		
Subject Title **: Genetics**		
Subject Code: **31CT31**	Hours per week: **6**	Credit: **4**
Sessional Marks: **25**	Summative Marks: **75**	Total Marks: **100**

6hrs/week 72 hrs

Objectives

- Basic understanding of classical, mendelian and modern concept of gene
- Prokaryotic genetics the mechanism of gene transfer and their significances
- Mutation, types of repair mechanism and the evolutionary significances
- Focuses on genetic basic of cancer, Human genome project and its implications

UNIT I*: Gene concept and molecular basis of heredity*

a) Classical gene concept – Mendelian concept –Deviation of Mendelian concept - Chromosomal map

b) Modern gene concept –Fine structure of gene-Cistron –Recon –Muton.

c).Gene isolation and restriction mapping 15 Hrs

UNIT II: Microbial genetics

a) Essential genetics of haploid organisms and gene transfer mechanism-Genetic notation, Conventions and Terminology.

b) Plasmids-types-detection –isolation – replication –transfer and uses.

c) Bacterial transformation – discovery-detection –competence-molecular mechanism. Bacterial conjugation – insertion of "f" into the *E coli* chromosome –Hfr transfer, genetic Recombination of F plasmids , mechanism of chromosomal transfer. 15 Hrs

UNIT III: Viral genetics

a) Genetic organisation of viruses.

b) Transduction – DNA transfer- specialized and generalized transduction.

c) Bacteriophage - lambda phage-lambda DNA and its genetic structure – lytic life cycle-early and late genes-DNA replication-concatamer-assembly and lysis of cell, Transposable elements. 15 Hrs

UNIT IV:Mutation, DNA repair and recombination

a) Mutation-types –molecular mechanism –deletion – addition –substitution-spontaneous mutation –mutation rates-origin of spontaneous mutation- tautomeric and frame shift mutation- suppressor mutation.

b) DNA repair –photoreactivation,, exision repair, mismatch repairs , SOS repair.

c) Genetic recombination –breakage and reunion-heteroduplex DNA –simple and double stranded breaks- isolation and recombination intermediates-Inter allelic recombination-specialised recombination at specific sites. 15 Hrs

UNIT V: Human Genetics

a)Pedigree analysis, congenital malformations, diagnosis and genetic counselling.

b)Genetic basis of human cancer, detection of oncogenes, cellular function of oncoproteins and diagnosis.

c)The Human genome project and its implications 15 Hrs

Text Books

- Human Genetics 2010, Gardner. A & Davies. T, Viva Books, New Delhi.
- Molecular Biology- Principles of Genome Functioning, 2010, N.L.Graig *et al.*,, Oxford University Press

REFERENCE BOOKS

- David Friefelder (1990)Microbial genetics Narosa Pub. House, New Delhi.
- Hartl and Jones (1998) Genetics–Principles and analysis Jones and Bart latt , Pub.
- Watson JD *et al* (1987) Molecular biology of Gene I & II
- David T Suzuki *et al* (1986) An introduction to genetics analysis W. H.Freeman and Co. Lewin . B Gene VIII. Oxford Press, Oxford.
- Cossman. J (1990) Molecular genetics in cancer diagnosis Elsevier, New York.
- Genomes by T.A. Brown, 2006 Garland science New York .

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DEPARTMENT OF PG ZOOLOGY

M.Sc. Zoology CBCS SYLLABUS – SEMESTER – III

(For those who joined in June 2014 and After)

Core Subject Theory		
Subject Title **: Physiology and Instrumentation**		
Subject Code: **31CT32**	Hours per week: **6**	Credit: **4**
Sessional Marks: **25**	Summative Marks: **75**	Total Marks: **100**

6hrs/week 72hrs

Objectives

- Metabolic and respiratory responses
- Mechanism and physiology of vision
- Mechanics of muscles
- Systems concepts, principles and applications of biotechniques

Unit I:

a. **The exchange of gases**-respiratory organs and their ventilation – transport of gases

b**. Metabolic and respiratory responses** –rate of metabolism – oxygen as limiting factor in the environment – effects of hydrostatic pressure – buoyancy.

c. **Osmotic and ionic regulation -** maintaining water and electrolyte balance – hormones and the regulation of water and electrolytes

d. **Endocrine regulation of reproduction -** invertebrate hormones of reproduction **-** vertebrate controls.

Unit II:

*a)*Photo biology (Vision and Bioluminescence)

b)Physics and physiology of receptors

c) Bioelectricity and Neuro biophysics

d) Physiology of heat therapy, physio-therapy, photo-therapy, magneto-

therapy and mega voltage therapy 15hrs

Unit III:

a) Mechanics of Muscle and animal movements

b) Mechanics of pulmonary ventilation and counter current mechanism

c) Haemodynamics and cardiac cycle.

d) Conformation of protein and transition kinetics 15hrs

Unit IV:

a) Biocybernetics-biofeedback servo mechanism- Biological optima

b) Systems –open and closed models-black and white box concept-Insulin control system.

c) Homeostasis- Thermodynamics in the biological system.

d) Cryobiology and Thermobiology of suspended animation-Biophysical rhythms- biological clock.

15hrs

Unit V:

a) Microscopy-Phase contrast, Electron, Fluorescence, Polarising, Dark field and Atomic force.

b) Chromatography – Ion exchange, Affinity, Gas liquid, Liquid and HPLC

c) Electrophoresis – Gel electrophoresis, Capillary and Immuno electrophoresis

d) Spectroscopy – UV and visible spectroscopy, Flame photometry, ORD, CD, NMR, ESR and AAS

12hrs

Text books

- Bioinstrumentation (2006) – L. Veerakumari, MJP Publications
- General and comparative physiology (2004) William S. Hoar Prentice Hall

Reference books

- Introduction to Biomedical equipment technology-Carr &Brown (1993) Addison Wisely, Longman.
- Practical Clinical Biochemistry- Harold varley (2003).CBS Pu. and Distributors.
- Human Anatomy and Physiology (2006) E.N. Marieb ,Pearson Edu.
- Animal Function: Principles and Adaptations, Malcolm S. Gordon et al.(1968), Amerind Publishing company Pvt. Lt. New Delhi.
- Comparative Animal Physiology, Prosser C.L and Brown F.A. 1962. W.B. Saunders Company Ltd. London.

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DEPARTMENT OF PG ZOOLOGY

M.Sc. Zoology CBCS SYLLABUS – SEMESTER – III

(For those who joined in June 2014 and After)

Core Subject Theory		
Subject Title **: Principles of Biotechnology**		
Subject Code: **31CT33**	Hours per week: **6**	Credit: **4**
Sessional Marks: **25**	Summative Marks: **75**	Total Marks: **100**

6hrs/week 72hrs

Objectives

- Current status, basic aspects and molecular tools for Biotechnology
- Exposure to essential techniques for the study of Biotechnology

UNIT I: Principles of Biotechnology

Present status and scope of biotechnology - current scenario of Indian Biotechnology

- Biosafety- Guidelines for DNA research activity
- Patents and IPR (Proprietary and patent rights) - WTO-GATT & TRIPS -

▪ Bioethics - Social and Ethical issues- risk management. 15hrs

UNIT-II: Molecular Tools– I

• Restriction endonucleases: types and mode of action

• Nucleases: exo- and endo-nucleases (DNAses, RNAses)

• DNA-ligases and DNA modifying enzymes.

• DNA and RNA markers 15hrs

UNIT-III: Molecular Tools -II

• Cloning and expression vectors: Plasmids, Cosmids, Artificial chromosomes, Shuttle vectors and Phagemids

• Ti and Ri plasmids: General features and mechanism of DNA transfer,

• Vectors in human gene therapy (viral and non viral vectors)

• Identification of Recombinant DNA (Direct and indirect methods) 15hrs

UNIT-IV: Techniques

• Restriction mapping of DNA fragments

• Nucleic acid blotting techniques: Southern, Northern, Dot and Western blotting

• DNA sequencing:principles and methods

• Polymerase chain reaction: Principle and applications / Micro array 15hrs

UNIT-V: Gene Cloning and Gene Libraries

• Methods of gene transfer:

• cDNA synthesis and genomic libraries

• Gene cloning strategies

• Screening strategies: Screening by DNA hybridization and colony hybridization. 12hrs

Text Books

- Biotechnology 2010, Satyanarayana, Books and Allied Pvt Ltd, Kolkata
- Principles of Biotechnology 2007, A.J. Nair, Lakshmi Publications Pvt Ltd, Bangalore

Reference Books

- Text Books of Biotechnology,H.K.Das 2007,Wiley Precise text books.
- Molecular BiotechnologyPrinciples and practices Channarayappa, 2006, University Press.
- Biotechnology,U.Satyanarayana, (2008)Books and Allied, Kolkatta

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DEPARTMENT OF PG ZOOLOGY

M.Sc. Zoology CBCS SYLLABUS – SEMESTER – III

(For those who joined in June 2014 and After)

Core Subject Practical		
Subject Title **: Practical – III**		
Subject Code: **31CP34**	Hours per week: **6**	Credit: **3**
Sessional Marks: **40**	Summative Marks: **60**	Total Marks: **100**

GENETICS *2hrs/week*

Objectives

- Behavior of blood group genes in human population and gene transfer mechanism
- Diagnosis of genetic defects/disorders in human by using molecular markers
- Information about Human Genome Project (HGT)

1) Genes in population- A survey of blood group alleles in a population.

2) DNA extraction (demonstration).

3) Antibiotic sensitivity test in *E.coli*. (demonstration).

4) Observation of Human Genome project through internet

5) Culture of *Drosophila* and observation of variations

6) Spotters:

a) Griffith experiment on recombination.

b) Frame shift mutation.

c) Photo reactivation.

d) Excision repair.

e) Molecular mechanism of recombination.

f) Bacterial conjugation.

g) Transduction.

h) Transposons.

i) Structure of lambda phage DNA.

j) Microarray.

k) PCR.

l) RFLP.

Physiology and Instrumentation 2hrs/week

Objectives

- Understand the physiological mechanism of Osmoregulation and Thermoregulation in test animals.
- Biomolecules in human blood and urine samples
- Working principle of biomedical instruments in a clinical laboratory.

1.Crystal studies in blood & urine (any 3 of the following)

A) Haemin B) uric/urate C) Osazone D) calcium oxalate E) leucine/tyrosine

2.Osmoregulation in earth worm

3.Thermo regulation / water loss analysis in Frog/Slug/Earthworm.

4.Effects of UV/IR radiations on earthworm or silkworm or slug or frog

5. Demonstration of photosynthesis

6.Demonstration of Plasmolysis

7.Volumetric analysis of pulmonary ventilation.

8.Study of vision tests.

9.Study of hearing tests.

10.Observation of circulation in wings of insects.

11. Study of architecture and functional importance (spotter)

a) Photoreceptor b) Phono receptor c)Tango receptor d) Olfactory receptor

e)Thermo receptor f) proprioceptor g) Chemo receptor h) Buccal receptor

i) Mechano receptor j) Thigmo receptor

12) Visit to a hospital laboratory for the observation of

ECG, EMG, EEG, ERG, EOG, SCAN, LASER and Auto analyser

PRINCIPLES of BIOTECHNOLOGY 2hrs/week

Objectives:

- To know the isolation techniques of plasmid and genomic DNA from prokaryotes.
- To demonstrate the cell/enzyme immobilization by using sodium alginate beads.
- To demonstrate the electrophoretic techniques.

1) Isolation of *E .coli* plasmids (cloning vector) (demonstration only)

2) Isolation of chromosomal DNA from Streptococcus (demonstration only)

3) Demonstration of Immobilisation technique (any one enzyme and measurement of its activity)

4) Techniques

a)Typical cloning b) Callus culture c) Hybridization d) Blotting techniques

5) Instruments

a) PCR b) Electrophoresis c) UV-Illuminator

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DEPARTMENT OF PG ZOOLOGY

II M.Sc. Chemistry and II M.Com (Biotechnology) CBCS SYLLABUS

(For those who joined in June 2014 and After)

Core Subject Theory		
Subject Title **: Applied Biology**		
Subject Code: **31NE31**	Hours per week: **6**	Credit: **5**
Sessional Marks: **25**	Summative Marks: **75**	Total Marks: **100**

6hrs/week 72hrs

Objectives

- Improving the quality of human life and protecting them from dangerous diseases
- Raise disease resistant high yielding varieties of crops
- Development of gene therapy
- Conservation and management of natural resources

Unit I Sustainable development 15 hrs

Water management, soil management, pest management, energy management live stock management and human resource management

Unit II Food Biotechnology 15 hrs

Biotechnology in Agriculture – Plant tissue culture – food products- fermentation – single cell protein

Unit III Animal biotechnology 15 hrs

Biotechnology in animal husbandry – Embryo transfer – hybridization – growth hormones – Treatment of animal diseases

Unit IV Medical Biotechnology 15 hrs

Biotechnology in medicine and public health – vaccines – human genome project – gene therapy

Unit V Society and biotechnology 12 hrs

Biotechnology-Risks and Ethics in Medicine, Agriculture, Animal, Environment and Human

Text Books

- Biotechnology, 2014, Kumaresan, Saras Publications

Reference Books

- A Text Book of Environmental Studies – 2004, G.R.Chatwal and Harish Sharma, Himalaya Publishing House
- Biotechnology –An Introduction,2012, – S.Ignacimuthu- Narosa Publication house
- Biotechnology in agriculture –1991, M.S. Swaminathan – MacMillan India Ltd.

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DEPARTMENT OF PG ZOOLOGY

M.Sc. Zoology (Biotechnology) CBCS SYLLABUS – SEMESTER – IV
(For those who joined in June 2014 and After)

Core Subject Theory		
Subject Title **: Applied Biotechnology**		
Subject Code: **31CT41**	Hours per week: **6**	Credit: **5**
Sessional Marks: **25**	Summative Marks: **75**	Total Marks: **100**

Objectives

- Explore the knowledge of biotechnology in medicine, agriculture, veterinary and environmental sciences
- Concept of transgenesis, manipulation and strategies of gene transfer among animals
- echnique to achieve the improvement in quality and quantity of agricultural products
- Knowledge of nano science technology and their applications

Unit I: Human Biotechnology

- Molecular Medicine- Molecular analysis of human diseases
- Gene therapy, molecular diagnostics
- Tissue engineering- Types of biomaterials and their applications
- Advances in drug targeting and therapy-virulence factors as drug targets

Unit II: Animal Biotechnology

- Manipulation of reproduction in animals - Artificial Insemination, Embryo transfer, *In vitro* fertilization. Embryo cloning.
- Transgenic methods - Retro viral vector- Microinjection- Electroporation
- Engineered embryonic stem cells
- Cloning by nuclear transfer- YAC- transgenesis

Unit III: Plant Biotechnology

- Techniques of plant cell and tissue culture and their application
- Genetic engineering in plants, germplasm storage and GM food
- Bioinsecticides – Types and applications
- Biofertilizers - Types and applications

Unit-IV Nanobiotechnology

- Scope - Properties of nanoparticles
- Strategies for nanoparticle synthesis (Physical, Chemical and Biological)
- Characteristics of nanoparticles
- Applications of nanobiotechnology in medicine – drug designing

Unit V: Environmental Biotechnology

- Sewage and waste: Principles of conventional and modern treatment methods
- Solid waste management
- Bioremediation technologies: Principles involved in bioconversion, biotransformation, biodegradation, biodeterioration, biorecovery, biomining, releaching and oil recovery.
- Bioenergy: Bioenergy Park, Biodiesel and Biogas production

Text Books

- Biotechnology 2010, Satyanarayana, Books and Allied Pvt Ltd, Kolkata
- Principles of Biotechnology 2007, A.J. Nair, Lakshmi Publications Pvt Ltd, Bangalore

REFERENCE BOOKS

- Biotechnology Mohan P. Arora (2003), Himalaya publishing house.
- Basic Biotechnology-(2001) C. Ratledge and B. Kristiansen Cambridge University.
- Biotechnology an Introduction- (2003) S.R. Barnum Thomson Books/cole- Australia.
- Biotechnology (2003) D. Bourgaize et al – Pearson education Singapore

DEPARTMENT OF PG ZOOLOGY

M.Sc. Zoology CBCS SYLLABUS – SEMESTER – IV

(For those who joined in June 2014 and After)

Core Subject Theory		
Subject Title **: Environmental Biology**		
Subject Code: **31CT42**	Hours per week: **6**	Credit: **5**
Sessional Marks: **25**	Summative Marks: **75**	Total Marks: **100**

6hrs/week 72hrs

Objectives

- Law of environment and fundamental limits of natural sources.
- Environmental issues, analysis and solutions
- Ways to protect the environment for the next generation

Unit- I: Ecosystem and Bio-geochemical Cycles.

a.Concept and dynamics of Ecosystem. Components and process of Ecosystem – Food chain – food web - trophic levels – Energy flow - Productivity-Ecological energetics –Trophic structure and ecological pyramids.

Biogeo chemical cycles and Limiting factors – Principles and concepts – Leibigs law and Shelfords law of maximum 15hrs

b.Community and Biodiversity

Biotic community – Concept – structure and composition- community and stability- concept of ecological niche - Ecological succession .

Biodiversity- measures of diversity- species richness- Evenness - Endangered species – Bioindicators and their role in Environmental monitoring – Remote sensing.

Biodiversity conservation –Methods of conservataion - (in situ and ex-situ)-germplasm conservation –Economic evaluation of Biodiversity – Intellectual property rights - Documentation of Biodiversity. 15hrs

Unit- II Economic Ecology and Field Biology.

a. Basic facts of conservation of natural resources- Natural resources – Impact of civilization on sustainable development – Soil erosion and soil conservation – Water resources- Conservation – Rain water Harvesting – Forest conservation .
b. Monsoon – its origin – Kinds – Its impact on Indian peninsula.

c. Non-conventional energy resources. 15hrs

Unit – III Environment toxicology and Radiation Ecology:

a. Basic concepts of toxicology – Sources of toxicants (air ,water, soil – Brief account)Toxicological testing methods- Toxicants of public health hazard- xenobiotics

b. Radiation ecology and environment:-

Radioactivity- Nuclear radiations- Half life period- E=mc2 – Safety hazards of the nuclear power plants – Radioactive fallout problems – Disposal of radioactive wastes- Biological effects of nuclear radiations. 15hrs

Unit –IV Demography And Urban ecology.:

a. Population ecology of man- History of human population growth- Population explosion – social impacts and ecological implications- Population control .

b. Urban ecology – History and development of urbanization Formation of urban areas- central business district – satellite towns – Impact of transport systems on urban environment – Housing – Slums its nature- Characteristics and problems on urban environment – drainage and storm water drainage.

c. Space ecology – Life supporting system. 15hrs

Unit- V Environmental Education and Organization

a. Goals , objectives and principles of environmental education – Environmental education programmes-Environmental education in India –Environmental laws – role of pollution control board . An account of Natural calamities (Flood, earth quake , forest fire, volcanoes, cyclones)

b. International bodies- Man and Biosphere Programmes(MAB)- National organization – Department of environment , forest and wild life – A list of important of Environmental agencies 12hrs

REFERENCE BOOKS

- Fundamentals of ecology-1971, Eugene P.Odum. wb.Saunders Co.
- Environmental science- 1988, Jonathan Turk and Amas Turk.Saunder's college publishing, Philadelphia.
- Encyclopaedia of Environmental sciences- 1992, P.R. Trivedi and Gurdeep Raj- Vol. 1 to Vol. 25 Akeshdeep publishing house New Delhi.

- Ecology- 1996, Micheal Begon et al – Blackwell science, Oxford.
- Modern Toxicology – 1985, P.K Gupta & DK Salunka Vol. 1 to 3 - Metropolitan book co. New Delhi.
- Ecology and field biology- 1990, Robert Leo Smith- Harper Collins. Pub New York.

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DEPARTMENT OF PG ZOOLOGY

M.Sc. Zoology (Biotechnology) CBCS SYLLABUS – SEMESTER – IV
(For those who joined in June 2014 and After)

Core Subject Theory		
Subject Title **: Biofarming Technology**		
Subject Code: **31EP41**	Hours per week: **6**	Credit: **5**
Sessional Marks: **25**	Summative Marks: **75**	Total Marks: **100**

6hrs/week 72hrs

Objectives:

- Developing self-employment skills
- Exposure to entrepreneurial avenues in animal studies

Unit I: Sericulture Technology:

Moriculture – propagation – pests and diseases – control measures.

Sericulture – Mulberry silkworm – Biology of *Bombyx mori* – Rearing – pests and diseases – control measures- Brief account on Non-mulberry silkworms (Eri, Muga and Tasar) – Brief account on grainage and silk technology. 15hrs

Unit II: Vermitechnology:

Earthworm – Biology

Vermicomposting – process – methods – harvesting – vermicast - its characteristics – application; preparation of vermiwash – characteristics and applications of vermiwash Role of Vermitechnology in organic farming 15hrs

Unit III: Pisciculture Technology:

Edible fishes – Biology of Indian major carps

Characteristics of Culturable fishes

Ornamental fish culture - Induced spawning technique – pests and diseases – control measures – 15hrs

Unit IV: Dairy Farming Technology:

Characteristics of Dairy breeds – Exotic, Hybrid and Native

Housing system, feeding and breeding – artificial insemination

Dairy products. 15hrs

Unit V: Poultry and Apiculture

Poultry – common breeds – housing – feeding – management – diseases and control measures.

Honey bee – species – life cycle –bee hives – bee keeping methods – harvesting of honey – Nutritive value of honey. 12hrs

Reference books

- Scientific Farm Animal Production An Introduction to Animal Science 2012, T.G. Field PHI Learning Private limited, New Delhi
- Vermicomposting for Sustainable Agriculture –2003, P.K.Gupta, AgroBios (India) P.K.Gupta., Jodhpur
- Beekeeping 2003, E.F.Phillips AgroBios (India)
- A Text Book of Animal Husbandary 2012, G.C.Banerjee, Oxford & IBH Publishing Co. Pvt.Ltd, New Delhi
- An introduction to Sericulture 2006 – G.Ganga and J. Sulochana Chetty – Oxford and IBH Pub. Co. Pvt.Ltd, New Delhi
- Fish and Fisheries of India 1983 V.G.Jhingram, Hindustan Publishing Corporation (India) New Delhi

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DEPARTMENT OF PG ZOOLOGY

M.Sc. Zoology CBCS SYLLABUS – SEMESTER – IV

(For those who joined in June 2014 and After)

Core Subject Practical		
Subject Title **: Practical – IV**		
Subject Code: **31CP43**	Hours per week: **6**	Credit: **3**
Sessional Marks: **40**	Summative Marks: **60**	Total Marks: **100**

Objectives

- Importance of commercial bio products and vermicomposting techniques
- Methodology to study population density in terrestrial organisms
- Methods of rearing the silk worms

Practical-1 Advanced Biotechnology

1. Installation, operation and maintenance of Bio-gas Plant (visit to biogas Plant)
2. Models a) Typical fermenter b) Culture systems – Batch and continuous culture c) Trickling filter
3. Substrates a)Starch b) Agricultural waste c) Energy crops
4. Commercially important bio-products a)amino acid b) Lactic acid c) Citric acid d) Ethanol e) Enzyme f) Antibiotics g) Vitamins h) Hormones i) Vaccines
5. Composting strategies and Vermicomposting methods

Practical- 2

ENVIRONMENTAL BIOLOGY

1. Morphometry of a Fresh water Pond.
2. Estimation of Primary Productivity in a pond using Dark and Light bottle method.
3. Estimation of Calcium and Magnesium in Water Samples.
4. Estimation of Nitrates and Phosphates in Water samples.
5. Qualitative and quantitative Estimation of Planktons in a pond.
6. BOD- Estimation.
7. Estimation of tolerance limits of Pesticides on an organism.
8. Study of Population density in grassland using quadrate method.
9. Observation of Pollution indicator organisms.
10. Estimation of Population size in an Imaginary Pond.

Practical-3

Bio farming Technology

Objectives:

- Hands on training in bio farming technologies
- Industrial and field visits to develop confidence among students to become Bio-entrepreneur

Practical, demonstration and field visit

1. Maintenance of mulberry farm – study on the biology of mulberry plant – pests (any five) – chawki leaves.

2. Morphology of silkworms – male and female identification in the larva, pupa and adult stages.
3. Rearing of silkworm from disease free laying – harvesting of cocoons
4. Morphology of Earthworm – segmentations – pores – ecotypes
5. Visit to Vermicomposting unit – observation for precomposting – composting
6. Observation of vermicast – Qualitative analysis of vermicast
7. Preparation of vermiwash - Qualitative analysis of vermiwash
8. Identification of Honey bees
9. Structure of bee hive - parts
10. Identification of poultry breeds
11. Identification of any three edible fishes (Morphology)
12. Identification of any three ornamental fishes(Morphology)