S. V. K. P. & Dr. K. S. RAJU ARTS & SCIENCE COLLEGE (AUTONOMOUS)

Accredited by NAAC with grade 'A'
Recognized by UGC as "College with Potential for Excellence"

PENUGONDA-534320,

W. G. Dist., A.P.

(Affiliated to Adikavi Nannaya University)

M.Sc. Zoology

Syllabus

BOARD OF STUDIES OF

P. G. DEPARTMENT OF ZOOLOGY

2019-2020

S. V. K. P. & Dr. K. S. RAJU ARTS & SCIENCE COLLEGE (AUTONOMOUS), PENUGONDA, W. G. Dist., A.P.

P. G. DEPARTMENT OF ZOOLOGY

M.Sc. ZOOLOGY – SYLLABUS 2019-2020

(With effect from the admitted batch of 2019-2020 academic year)

Objectives of the Course:

i. To enrich the students' theoretical knowledge in basic, core and specialized papers of zoology and to develop competency in research in the field of zoology.

ii. To train the students with hands on experience and enhance their critical thinking, constructive planning and analytical skills.

iii. To train the students to acquire advanced laboratory skills required for placements.

Proposed Regulations:

1. The duration of the course is for two academic years with total four semesters. The nature of the course is full-time.

2. Candidates for the degree of Master of Science in Zoology, Zoology shall be required to have passed the B.Sc. with zoology as one of the Subjects.

3. Intake for M.Sc. zoology is 36 (30 Counseling seats + 6 Management seats).

4. Mode of admission is through (NANNAYACET / APPGCET) Entrance examination.

5. The course and scope of instruction shall be as defined in the syllabus prescribed. (Annexure-III).

6. The course will be conducted on credit system and evaluation will be on Ten point grading system (Annexure-II).

7. Candidate shall be required to take examinations at the end of each semester as specified in Annexure-I.

8. The course will be evaluated and the students will be graded on ten point scale with seven letter grades i.e., **O, A^+, A, B^+, B, C, P,** and **F.** A candidate shall be declared to have passed in any paper if he /she secures not less than 'P' grade in theory and not less than 'C' grade in the practicals provided the result otherwise is withheld .There is no minimum pass marks for internal assessment marks both in theory and practicals.

9. The minimum pass marks for Semester end examination is 30 (40%) and there is no minimum marks for internal examination. Candidate should get a total of 40 marks (40%) in both internal and external examinations put together. Further a candidate has to secure a minimum of 5.0 SGPA for a pass in each Semester.

10. A candidate shall be deemed to have satisfied the minimum requirement for the Award of the M.Sc. Zoology Degree.

i) If he/she is declared to have passed all the papers included in the scheme of examination

ii) If he/she secures 5.0 CGPA by the end of the fourth semester.

Further, a candidate will be permitted to choose any paper(s) to appear for improvement in case the candidate fails to secure the minimum prescribed SGPA/CGPA to enable the candidate to pass at the end of any semester examinations.

There shall not be any provision for the improvement of internal assessment marks in any theory or practical subjects in any year /semester of study.

11. The successful candidates in the M.Sc. degree examination shall be arranged in the order in which they are registered for the examination in two classes on the basis of the CGPA

Distinction – CGPA 7.0 or more

I Class – CGPA 6.0 or more but less than 7.0

II Class/Pass – CGPA 5.0 or more but less than 6.0

12. The Question paper will be set by external paper setters of other Universities and the valuation of the answer scripts will be done either by Internal or External examiners at the end of each semester.

13. The practical examinations will be conducted and valued by both internal and external examiners at the end of each semester. The Project viva- voce examination will be conducted by both internal and external examiners at the end of the IV semester

14. Each practical paper carries 50 marks for external evaluation process in which both the internal and external examiners conduct the examination.

15. The Minimum attendance of 75% in theory and completion of 90% of the practical prescribed for the course is necessary for a student to qualify to attend the Semester End Examination. The Principal is authorized to condone the shortage of attendance in theory papers in deserving cases on recommendation of the Head of the Department, by collecting prescribed fee. However, the student should have to put in a minimum attendance of 65% in aggregate of the total number of instructional days in theory classes.

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Annexure-I

M.Sc. ZOOLOGY

SCHEME OF INSTRUCTION AND EXAMINATION

Semester – I

Paper / Paper Code	Title of the Paper	Instruction Hours Per Week			Credits	Evaluation			Total Marks
		L	T	P		CIA Marks	SEE		
							Marks	Duration	
Paper-I 19ZOOT11	Tools and Techniques for Biology	4	--	--	4	25	75	3 hours	100
Paper-II 19ZOOT12	Biosystematics, Biodiversity and Evolution	4	--	--	4	25	75	3 hours	100
Paper-III 19ZOOT13	Biomolecules	4	--	--	4	25	75	3 hours	100
Paper-IV 19ZOOT14	Molecular Cell Biology	4	--	--	4	25	75	3 hours	100
Practical-I 19ZOOP15	Tools and Techniques for Biology	--	--	3	2	12	38	3 hours	50
Practical-II 19ZOOP16	Biosystematics, Biodiversity and Evolution	--	--	3	2	12	38	3 hours	50
Practical-III 19ZOOP17	Biomolecules	--	--	3	2	12	38	3 hours	50
Practical-IV 19ZOOP18	Molecular Cell Biology	--	--	3	2	12	38	3 hours	50

CIA – Continuous Internal Assessment, **SEE** – Semester End Examination

Semester – II

Paper / Paper Code	Title of the Paper	Instruction Hours Per Week			Credits	Evaluation			Total Marks
		L	T	P		CIA Marks	SEE		
							Marks	Duration	
Paper-I 19ZOOT21	Biostatistics & Bio-informatics	4	--	--	4	25	75	3 hours	100
Paper-II 19ZOOT22	Animal Physiology	4	--	--	4	25	75	3 hours	100
Paper-III 19ZOOT23	Immunology	4	--	--	4	25	75	3 hours	100
Paper-IV 19ZOOT24	Molecular Biology	4	--	--	4	25	75	3 hours	100
Practical-I 19ZOOP25	Biostatistics & Bio-informatics	--	--	3	2	12	38	3 hours	50
Practical-II 19ZOOP26	Animal Physiology	--	--	3	2	12	38	3 hours	50
Practical-III 19ZOOP27	Immunology	--	--	3	2	12	38	3 hours	50
Practical-IV 19ZOOP28	Molecular Biology	--	--	3	2	12	38	3 hours	50

Annexure-II

M.Sc. ZOOLOGY

I SEMESTER

19ZOOT11 TOOLS AND TECHNIQUES FOR BIOLOGY

UNIT- I

Assay- Definition, Biological & Chemical assay. Microscopy- Principles and applications of light, dark field, phase contrast, fluorescence, transmission, electron, scanning electron microscopes. Different fixation and staining techniques for EM. Freeze-etch, freeze-fracture methods for EM, Image processing methods in microscopy. pH meter: Operation of pH electrodes, Principles and applications of Ion-selective and gas sensing electrodes, Oxygen electrodes.

UNIT - II

Centrifugation -Basic principles of centrifugation, types of centrifuges, applications of preparative and analytical ultra-centrifuges. Principles and applications of sedimentation, lyophilization. Chromatography: Principles and applications of gel-filtration, ion-exchange and affinity chromatography; TLC, GC & HPLC.

UNIT - III

Properties of electromagnetic radiations; Principles, instrumentation and applications of UV, visible, infrared, NMR spectroscopy; Spectrofluorimetry and mass spectrometry. X-ray diffraction, Incorporation of radio-isotopes in biological tissues and cells.
Radiolabeling techniques: Detection and measurement of different types of radio-isotopes used in biology, Molecular imaging of radio-active material, safety guidelines.

UNIT - IV

Micro-biological Techniques: Media preparation & sterilization, Inoculation & Growth monitoring, Biochemical Mutants & their uses, Microbial assays.

Suggested Reading Material:

1. Introduction to Instrumental Analysis. Robert Braun. McGraw Hill International Editions

2. A Biologist Guide to Principles and Techniques of Practical Biochemistry. K. Wilson & K.H. Goulding, ELBS Edn.

19ZOOT12 BIOSYSTEMATICS, BIODIVERSITY AND EVOLUTION

UNIT - I

Biosystematics- Definition and basic concepts. Importance and applications of biosystematics. Material Basis of Biosystematics. Biological classification-Theories and objectives. Procedures in taxonomy - Taxonomic collections. taxonomic keys. Types of taxonomy-Conventional types, Cytotaxonmy. Chemotaxonomy and Molecular taxonomy. Concept of Zoological Nomenclature.

UNIT - II

Origin of basic biological molecules. Abiotic synthesis of organic monomers and polymers. Concept of Oparin and Haldane. Experiment of Miller. Evolutionary time scale – Eras, Periods and epochs. Origin and diversification of eukaryotes - Origin of cells and first organisms. Evolution of eukaryotic cell from prokaryotes. Evolution of eukaryotic genomes. duplication and divergence. Molecular divergences, molecular clocks and molecular drive. Phylogenetics- Molecular tools in phylogeny.

UNIT - III

Universal common ancestor and tree of life – three domain concepts of living kingdom. hierarchical components of bio-diversity. Evolutionary relationships among taxa. Concepts of species. Species category, subspecies and other infraspecific categories. Hierarchy of categories. Speciation- Genetics of speciation, modes of speciation, Patterns and mechanisms of reproductive isolation. Allopatry, sympatry, Convergent evolution, Sexual selection, Co-evolution.

UNIT - IV

Concepts of evolution – An overview of evolutionary biology, & theories of organic evolution. Concepts of Neutral Evolution, Population genetics- Populations, gene pool, Gene frequency; Hardy Weinberg law. Concepts and rate of change in gene frequency through Natural selection, mutation, migration and random genetic drift. Phylogenetic gradualism, punctuated equilibrium and origin of higher categories

Suggested Reading Material:

1. M. Kato. The Biology of Biodiversity, Springer.
2. J.C. Avice. Molecular Markers. Natural History and Evolution, Chapman & Hall, New York.
3. E.O. Wilson. Biodiversity, Academic Press, Washington.
4. G.G. Simpson. Principles of Animal Taxonomy. Oxford IBH Pub. Co.
5. E. Mayr. Elements of Taxonomy.
6. E.O. Wilson. The Diversity of Life (The College Edition), W.W. Northern & Co.
7. Dobzhansky, Th. Genetics and origin of species, Surjeet Publication, Delhi
8. Dobzhansky, Th., F.J.Ayala, G.L.,Stebbens and J.M. Valentine Evolution, Surjeet Publication,
Delhi

9. Futuyama, D.J. Evolutionary Biology, Suinuer Associates, INC, Publishers, Dunderland
10. Hartl. D.L.A. Primer of population Genetics, Sinauer Associates, INC Massachusetts.
11. Jha, A.P. Genes and Evolution, John Publication, New Delhi
12. King, M. Species Evoluution -the role of chromosomal change. The Cambridge University
Press, Cambridge.
13. Strikberger, M.W. Evolution, Jones and Bartett Publishers, Boston London
14. TandonRK.1999.Biodiversity, Taxonomy & Ecology. Prithipal singh Scientific
Publishers, Jodhpur.

19ZOOT13 BIOMOLECULES

UNIT - I

Chemical foundations of biology, Amino acids – classification, Peptide bond, Proteins – classification, structural organization of proteins, primary structure, secondary structure, tertiary structure, quaternary structure, Conformation of proteins (Ramachandran plot) - domains, motifs and folds. Denaturation & renaturation of proteins.

UNIT - II

Carbohydrates: Definition and classification of carbohydrates, nomenclature, Reaction of Mono-saccharides, Acid derivatives of Mono-saccharides, amino-sugars, Oligo-saccharides, structure and properties, Chemistry and biological roles of homo and hetero-polysaccharides, peptidoglycan, glycosaminoglycans, glycoproteins and other glycoconjugates.

UNIT - III

Classification of Lipids & Fatty acids and their physicochemical properties, characterization of fats and oil; Structure, properties and biological roles of triacylglycerol, phospholipids, sphingolipids, Gangliosides, Prostaglandins, Thromboxanes, Leukotrienes and steroids.

UNIT - IV

Nucleic acids – nitrogen bases, nucleosides, nucleotides, physicochemical properties of nucleic acids, cleavage of nucleic acids by enzymatic and non-enzymatic methods, chemical synthesis of DNA; Nucleic acid sequencing, chromatin structure, Three dimensional structure of DNA; Types of RNA, Structure of RNAs – Secondary and Tertiary structure; DNA denaturation and renaturation.

Suggested Reading Material:

1. Nelson.D.L, Cox. M. M. Lehninger's Principle of Biochemistry. Freeman.
2. Murray. R.K, Granner.D.K, Mayes. P. A, Rodwell. V. W. Harper's Biochemistry, McGraw Hill.
3. Fundamentals of Biochemistry by Donald Voet.
4. Textbook of Biochemistry West, E.S., Todd, Mason &Vanbruggen, Macmillian&Co.
5. Biochemistry, Lubert Stryer.

19ZOOT14 MOLECULAR CELL BIOLOGY

UNIT - I

Introduction: Experimental system in Cell Biology

Biomembranes

- Molecular composition and arrangement, functional consequences
- Transport across cell membrane: diffusion, active transport, pumps, uniports, symports and antiports
- Membrane potential
- Co-transport by symporters or antiporters
- Transport across epithelia: Transport of macromolecules

UNIT - II

Cytoskeleton

- Microfilaments and microtubules – structure and dynamics
- Microtubules and mitosis
- Cilia and flagella
- Cell movements – intracellular transport, role of kinesin and dynein, signal transduction mechanisms

UNIT - III

Cell-Cell Signaling

- Cell surface receptors
- Second messenger system
- MAP kinase pathways
- Apoptosis: Definition, mechanism and significance

Cell-Cell adhesion and communication

- Ca++ dependent homophillic cell-cell adhesion
- Ca++ independent homophillic adhesion
- Gap junctions and connections
- Integrins
- Collagen

UNIT - IV

Cell cycle

- Cyclines and cyclin dependent kinases
- Regulation of CDK-cycline activity

Genome organization

- Hierarchy in organization
- Chromosomal organization of genes and non-coding DNA
- Mobile DNA
- Morphological and functional elements of eukaryotic chromosomes

Intracellular protein traffic

- Protein synthesis on free and bound polysomes
- Uptake into ER
- Membrane proteins, Golgi sorting, post-translational modifications
- Biogenesis of mitochondria and nuclei
- Trafficking mechanisms

Suggested Reading Material:

1. Molecular Cell Biology, J. Darnell. H. Lodish and D. Baltimore, Scientific American Book INC, USA.

2. Molecular Biology of the Cell, B. Alberts, D. Bray, J. Lewis, M. Raff, K. Roberts and J.D. Watson Garland Publishing INC, New York.

I SEMESTER PRACTICALS

19ZOOP15 Tools and Techniques for Biology lab:

1. Spectrophotometer – Estimation of biomolecules
2. Centrifugation – Demonstration and working
3. Separation Techniques - Paper chromatography
4. Electrophoresis – Demonstration and usage
5. PH Meter – Preparation of Phosphate buffer Preparation
6. Microscope –

a) Demonstration of oil immersion – WBC & RBC
b) Preparation of tissue for SEM & TEM procedure

19ZOOP16 Biosystematics, Biodiversity and Evolution Lab:

1. Invertebrate and Vertebrate Phyla
2. Types of Speciation-Models/Charts
3. Problems on Hardy-Weinberg law
4. Random genetic drift causing change in gene frequency-Practical demonstration.
5. Recent studies in Evolution- Examples

19ZOOP17 Biomolecules lab:

1. Estimation of glycine by formal titration
2. Estimation of proteins by Lowry and Biurett methods
3. Analysis and identification of monosaccharides
4. Estimation of maltose by DNS method
5. Determination of Iodine value of oils
6. Estimation of Cholesterol
7. TLC of Amino acids

19ZOOP18 Molecular cell Biology lab:

1. Light microscopic examination of tissues
2. Preparation of different cell – types Hepatic parenchymal cells, adipocytes, macrophages, neuronal cells, epithelial cells
3. Stages of Mitosis and Meiosis
4. Squash preparation
5. Sub-cellular fractionation – separation of macromolecules

M.Sc. ZOOLOGY

II SEMESTER

19ZOOT21 BIOSTATISTICS & BIOINFORMATICS

UNIT - I

Biostatistics- Introduction and Scope of biostatistics, Sampling. Primary and Secondary data, Frequency distribution, Graphic representation of data- bar diagram, histograms, pie diagram, frequency polygon and Ogive. Measures of central tendency- mean, median, mode. Measures of Dispersion- variance, standard deviation, coefficient of variation

UNIT - II

Probability and probability distributions-definition of probability - Bernoulli, binomial, Poisson and normal distributions; Correlation and regression Tests of Significance - hypothesis, critical region and error probabilities, t- test, chi-square test for independence, one way and two- way analysis of variance.

UNIT - III

Basic components of computers– hardware (CPU, input, output, storage devices), Software (operating systems), Application software; Introduction to MS-EXCEL. Use of in-built statistical functions for computations of mean, SD, correlation, regression coefficients, Use of bar diagram, histogram, scatter plots, Graphical tools in EXCEL for presentation of data; Introduction to MS- WORD, word processor- editing, copying, moving, formatting, table insertion, drawing flow charts etc; Introduction to Power Point, image and data handling.

UNIT - IV

Bio-informatics –Introduction, History, Internet, Knowledge. Review of relevant definitions in molecular biology. Biological Databases –introduction. Examples of databases together with steps involved in use and interpretation of results). Sequence alignment. Phylogenetic analysis with the program PHYLIP, Introduction to computational genomics and proteomics.

Suggested Reading Material:

1. Batschelet, E., Introduction to Mathematics for Life Scientists. Springer- Verlag, Berling.
2. Principles of Biostatistics, Pagano M., Gauvreau, K, (2000), Duxbury Press, USA
3. Murray, J.D. Mathematical Biology. Springer – Verlag, Berlin.
4. T.K. Attwood & D.J. Parry-Smith 1999. Introduction to Bioinformatics. Pearson Education Asia.
5. Stephen Misener & S.A. Krawez 2000. Bioinformatics: Methods and Protocol.
6. Bioinformatics: Sequence and Genome Analysis, Mount, D. W. (2nd Ed., 2001), Cold Spring Harbor Laboratory Press, New York, USA
7. Bioinformatics for Dummies, Claverie J. M., Notredame C., (2nd Ed., 2007), Wiley Publishing, Inc., New York, USA
8. Sokal, R.R. & F.J. Rohlf. Biometry. Freeman, San Francisco.
9. Snedecor, G.W. and W.G. Cochran, Statistical methods for environmental biologists. John Wiley Sons, New York.

19ZOOT22 ANIMAL PHYSIOLOGY

UNIT - I

Muscle: Molecular Structure and properties of Muscle and muscle contraction , Sliding filament theory

Blood and Circulation – Blood corpuscles, haemopoiesis and formed elements, plasma function, blood volume, blood volume regulation, Blood groups, Haemoglobin, immunity, haemostasis , factors affecting blood coagulation

Nerve impulses , Synaptic transmission & Neurotransmitters,

Nervous system : Neurons, action potential, gross neuro anatomy of the brain and spinal cord, central and peripheral nervous system, neural control of muscle tone and posture

UNIT - II

Thermoregulation: Comfort zone, body temperature- Physical, chemical, neural regulation, acclimatization.

Osmoregulation in aquatic and terrestrial Environments mechanism of ionic regulation

Stress Physiology: Responses to biotic and abiotic factors: Light, temperature, salts

UNIT – III

Digestion: absorption, energy balance of BMR

Respiratory system - comparison of respiration in different species, anatomical considerations, transport of gasses, exchange of gases, waste elimination, neural and chemical regulation of respiration.

Excretory System : Comparative physiology of excretion, Kidney, Urine formation, Urine concentration, waste elimination, micturition, regulation of water balance, blood volume, blood pressure, electrolyte balance, acid-base balance.

Cardiovascular System: Comparative anatomy of heart structure, myogenic heart, specialized tissue ECG - its principle and significance, heart as a pump, blood pressure.

UNIT - IV

Sensory physiology: Photoreceptors, Auditory, Chemoreceptor, Mechanoreceptors

Physiological Adaptation: Marine environment, shores, Estuaries

Fresh water and Terrestrial environment

Role of Yoga and meditation on Health.

Suggested Reading Material:

1) Eckert, R .Animal Physiology: Mechanisms and adaptation, W .H.Freeman and Company, New York
2) Hochackka,P.W. and Somero, G.N.Biochemical adaptation,Princeton,N.J.
3) Hoar,W.S.General and comparative Animal physiology prentice Hall of India.
4) Schimdt Neisen,Animalphysiology ,Adaptation and Environment,Cambridge.
5) Stamd,F.L.Physiology: A regulatory systems approach,Macmillan publishing Co., NewYork.
6) Punmer, L.Practical Biochemistry,Tata McGraw-Hill.
7) Prosser,C.L. and Brown .Comparative Animal physiology.
8) Wilson,K.and Walker, j.Practical Biochemistry.
9) Willmer, PIG Sone and 1.Johnson, Environmental physiology,BlackWell Science,Oxford,

U.K .944p
10) Newell,R.C.(ed)1976.Adaptation to environment, Essays on the physiology of marine animals. Butterworths,London,UK539pp
11) Townsend ,C.R and P.Callow, physiological Ecology An evolutionary approach resource use, Blackwell Sci.publication, Oxford, UK.

19ZOOT23 IMMUNOLOGY

UNIT - I

Immunity-innate and acquired, innate immune mechanisms, acute phase reactants, properties of acquired immunity

Immunogens and antigens- Properties, factors governing immunogenicity, haptens, epitopes size and identification. Adjuvants- properties and mechanism of action.

Immunoglobulins- structure, isotypes, allotypes and idiotypes. Functions of antibody in relation to structure

UNIT - II

Antigen-antibody interactions- affinity of antibody, avidity, bonus effect, classical precipitin reaction, antigen-binding site of antibody, forces involved in antigen - antibody complex formation.

Lymphoid tissue- primary and secondary lymphoid organs, structure and cellular organization. Lymphocyte traffic.

Cells involved in the immune response- T cells, B cells, CD antigens, neutrophils, eosinophils and natural killer cells.

Antigen presentation - pathways of antigen processing and presentation of intracellular and extracellular antigens.

UNIT - III

Antibody response - Primary and secondary antibody response, antibody response to haptens, enumeration of antibody-forming cells, T- dependent and T- independent antigens.

Macrophage- role in immune response and activation.

Cell mediated immunity- helper, cytotoxic, suppressor T cells. In vivo and in vitro assays for assessment of cell mediated immunity

Complement- classical and alternative pathways of activation. Regulation of complement activation and functions.

Antigen receptors -On T and B cells. Generation of receptor diversity.

UNIT - IV

Development of immune system- T cell ontogeny in thymus, thymic hormones, cell development. Immunological tolerance - pathways of tolerance and mechanisms of tolerance in T and B cells. Immunological tests- Immunodiffusion, immunoelectrophoresis, immunofluorescence, radioimmunoassay and enzyme-linked immunosorbent assay.

Suggested Reading Material:

1. Immunology and Immunopathology by Stewart.
2. Cellular and Molecular Immunology by Abul K. Abbas et. al.
3. Textbook of Immunology by Barret.
4. Essential Immunology by Roitt, Brostoff, Male, Harcourt Brace & Company (5th Ed), Mosby (6th Ed).
5. Immunology by Kuby, Richard A. Goldsby, Thomas, J. Kindl, Barbara A.Osbome, Freeman & Company, Mosby publishers.
6. Immunobiology – The immune system in Health disease by Janeway and Travers.
7. Immunology – An introduction by Tizard.
8. Text book of Immunology by Unani and Benacerraf.
9. Fundamentals of Immunology by Paul.
10. Immunology – A short course by Benjaini, Sunshine and Lesrowitz.

19ZOOT24 MOLECULAR BIOLOGY

UNIT - I

History and scope of Molecular Biology

DNA Structure and Replication

- Prokaryotic and Eukaryotic DNA Replication
- Mechanics of DNA Replication
- Enzymes and accessory proteins involved in DNA Replication

UNIT - II

Transcription

- Prokaryotic Transcription
- Eukaryotic Transcription
- RNA Polymerases

Post-transcriptional modifications in RNA

- Cap formation
- Transcription
- Nuclear Export of m-RNA

UNIT - III

Translation

- Genetic Code
- Prokaryotic and eukaryotic Translation
- Mechanisms of initiation, elongation and termination
- Regulation of translation

Antisense and Ribozyme technology

- Molecular mechanisms of antisense molecules
- Inhibition of splicing, polyadenylation and translation

UNIT - IV

Recombination and Repair

- Holiday junction, gene targeting and gene disruption
- RecA and other Recombinases
- DNA repair mechanisms

Molecular mapping of genome

- Genetic and physical maps
- Physical mapping and map-based cloning
- Southern fluorescence insitu hybridization (FISH) for genome analysis

Suggested Reading Material:

1. J.D. Watson, N.H. Hopkins, J.W. Roberts, J.A. Steitz and A.M. Weiner. Molecular biology of Gene. The Benjamin/Cummings Pub. Co. Inc., California.
2. Alberts, B., D. Bray, J. Lewis, M. Raff, K. Roberts and J.D. Watson. Molecular Biology of the Cell. Garland Publishing Inc., New York.
3. Benjamin Lewin, Gene IV, Oxford University Press, U.K.
4. Meyers, R.A. (Eds.) Molecular Biology and Biotechnology : A comprehensive desk reference. VCH Publishers Inc., New York.
5. Sambrook, J., E.F. Fritch and T. Maniatis. Molecular cloning : A Laboratory Manual. Cold Spring Harbor Laboratory Press, New York.
6. Daber, P.D. Introduction to practical Molecular Biology.John Wiley & Sons Ltd., New York.
7. Brown, T.a. (Eds.). Molecular Biology Lab Fax. Bios Scientific Publishers Ltd., Oxford.

II SEMESTER PRACTICALS

19ZOOP25 Biostatistics & Bioinformatics lab:

1. Sampling and Frequency distribution
2. Graphical presentation of the data
3. Measures of Central Tendency – Mean, median and mode
4. Measures of Dispersion – Standard deviation and Coefficient of variation
5. Correlation and Regression
6. Nucleic acid and protein databases.
7. Retreval and analysis of DNA or protein sequence from NCBI
8. Sequence Alignment in excel sheet for data processing.

19ZOOP26 Animal Physiology lab:

1. Digestive enzymes
2. Effect of body size vs oxygen consumption
3. oxygen consumption vs temperature
4. Osmotic regulation
5. Ion concentration measurements
6. Spotters
7. Dissection- Pituitary gland of fish
8. Dissection- Nervous system of prawn.

19ZOOP27 Immunology lab:

1. Blood grouping
2. Widal test for detection of typhoid bacteria
3. VDRL Test
4. SRID
5. Ouchterlony DID
6. Immunoelectrophoresis
7. Blood clotting time and bleeding time.
8. RIA -Demonstration
9. ELISA - Demonstration

19ZOOP28 Molecular Biology Lab:

1. Estimation of DNA (Colorimetric method)
2. Estimation of RNA in tissue (Colorimetric method)
3. Fulgen reaction method for DNA localization
4. Localization of RNA by methyl green pyronin – ‘Y’
5. SDS PAGE of serum proteins.
6. Testing purity of DNA