SYLLABUS

MANONMANIAM SUNDARANAR UNIVERISTY, TIRUNELVELI-12

PG - COURSES – AFFILIATED COLLEGES

Course Structure for

M.Sc. Zoology

(Choice Based Credit System)

(with effect from the academic year 2017- 2018 onwards)

Semester-III				
Part	**Subject Status**	**Subject Title**	**Subject Code**	**Credit**
3	Core	Animal Physiology	PZOM31	4
3	Core	Biotechnology	PZOM32	4
3	Core	Biostatistics & Bioinformatics	PZOM33	4
3	Core	Research Methodology	PZOM34	4
3	Practical	Practical V	PZOL31	2
3	Practical	Practical VI	PZOL32	2

ANIMAL PHYSIOLOGY

Preamble :

This course develop the knowledge about the functions of organs and tissues in the Animal. This study also provide the students with the basic understanding of the fundamental processes and mechanisms that serve and control the various functions of the body. The basic idea of paper were learned earlier and the detailed course structure were dealt.

Unit I :

Nutrition and Digestion :

Importants of Carbohydrates, Protein, Lipids. Vitamins and Minerals with regard to human health. Balanced diet, Malnutrition and BMR. Human digestive tract and functions. Role of enzymes in digestion of carbohydrates, proteins and lipids. Gastrointestinal hormones .Intestinal villi and absorption.

Unit II :

Blood and Circulation :

Structure of arteries and Veins. Blood Corpuscles. Haemopoiesis and formed elements. Plasma functions. Blood volume regulation. Blood groups Coagulation of blood. Structure and function of the human heart. Structure function of coronary arteries and vein. ECG, Cardiac cycle, Heart rate, Blood pressure. Neural and chemical regulation of heart.

Unit III :

Respiration and Excretion :

Respiration in air and water. Structure and function of human lung and the respiratory tract. Respiratory pigments. Gas transport between the lungs and tissues. Neural and chemical regulation of respiration .Human: Structure of the Kidney – Nephron Renal circulation –Urine formation. Renal disorders – Micturition and dialysis. Regulation of water and electrolytes. Hormonal control of osmo –iono regulation.

Unit IV :

Nervous System and Sense Organs :

Neuron –Structure and function Neuro transmitters –Synapse, Conduction of nerve impulses. Structure and function of brain and Spinal cord, EEG. Muscles – Classification – Ultra structure of skeletal muscle -Mechanism of muscular contraction –Neural control of muscles tone and function. Sense organ of vision, hearing and tactile responses.

Unit V :

Endocrinology and Reproduction :

Structure and function of Endocrine glands. Hormones and diseases. Basics mechanism of hormone action. Estrus and endometrial reproductive cycle's. Neuro

endocrine regulation of reproduction.

Reference books :

1. General and Comparative Physiology – William S. Hoar.
2. Chordate Zoology – E. L. Jordan and P. S. Verma, S. Chand and Co., New Delhi.
3. Comparative Animal Physiology – C. D. Prosser and F. A. Brown.
4. Textbook of Animal Physiology – R. Nagabhushanam, M. S. Kodarkar and R. Sarojini.
5. Kunt Schmidt – Nicolsen Animal Physiology – Adaptation and Environment, Cambridge University Press.
6. Gayton, A. C. and Hall, J. E., A Textbook of Medical Physiology, 9th Edn., Harcourt Brace and Company Asia Pvt. Ltd., W. B. Saunders Company.

BIOTECHNOLOGY

Preamble :

This course facilitates the method of natural raw materials into useful products by the application of living organism in the industrial process. The main objectives of biotechnology is the conservation of resources via the recycling of waste material and the recoveries of more valuable products. The basics were learned and the detailed course structure is dealt.

UNIT I :

Genetic engineering

Gene cloning -the basic steps, types of restriction enzymes, ligases - linkers and adaptors, C DNA, selection of recombinants. Hybridization techniques, chemical synthesis of oligonucleotides, PCR and DNA sequencing techniques.

UNIT II :

Gene cloning vectors

Cloning vector based on pBR322 and bacteriophage, cloning vector for yeast. Cloning vector for Agrobacterium tumefaciens, Simian virus 40. Gene transfer technology- Particle bombardment, micro injection techniques, electrophoresis, liposome fusion.

UNIT III :

Animal Biotechnology

Cell culture : Organ culture, whole embryo culture, embryo transfer - in-vitro fertilization (IVF) technology. Dolly- in vitro fertilization and embryo transfer in human. Transgenic animals. Human gene therapy. Cryobiology.

UNIT IV :

Microbial Biotechnology

Fermentation: Bioreactor. Microbial products: primary and secondary metabolites. Protein engineering. Bioremediation of hydrocarbons, industrial wastes and heavy metals. Single cell protein, biopolymers, bio pesticides and bio fertilizers. Xenobiotics , bio-leaching, bio-mining and bio-fuel.

UNIT V :

Medical Biotechnology

Drug development : production of pharmaceuticals by genetically engineered cells (hormones, interferons), microbial transformation for production of important pharmaceutical (steroids and semi-synthetic antibiotics), drug design and targeting. Diagnostic kit development for micro analysis.

Reference books:

1. Satyanarayana, U.2007. Biotechnology. Uppala author-publisher interlinks,Vijayawada, Andhra Pradesh, India. Old,R.W and Primrose, S.B.1993.Principles of Gene manipulation:

2. An introdution to Genetic Engineering.Blackwell Science Publication. Ignacimuthu, S.2008. Biotechnology: An introduction, Narosa Publishing house, New Delhi.
3. Purohit, S.S.2008. Biotechnology. Student Edition, Jodhpur. Lee and Savage, L.M. Biological Molecules in Nanotechnology.
4. Biological Molecules in Nanotechnology – By Ratner M and Ratner D – Nerosha Publishing house, New Delhi.

BIOSTATISTICS AND BIOINFORMATICS

Preamble :

The objectives of biostatistics is to advance statistical science and its application. The role of biostatistics is an important one in designing studies and analyzing data from research problems. Computer study operate a variety of advanced spread sheet, operating system and word processing function.

Unit 1 :

Collection of Data :

Primary and Secondary data –Methods of collecting primary data –sources of secondary data. Sampling and Sample Designs : Essentials of sampling –Methods of sampling –Random sampling methods –Non random sampling methods –Merits and Limitations of sampling. Classification and tabulation of data –Diagrammatic and graphic presentation of data.

Unit II :

Measures of Central Tendency :

Mean- Arithmetic mean –Weighted arithmetic mean – Median – Mode. Measures of Dispersion : Quartile deviation – Mean deviation – Standard deviation – Lorenz curve. Skewness Moments and Kurtosis : Measure of skewness –Absolute measure of skewness -Relative measure of skewness -Karl Pearson's coefficient of skewness- Bowley's coefficient of skewness. Moments. Measures of kurtosis. Correlation analysis : Types of Correlation –Methods of studying correlation Karl Pearson's coefficient of correlation –Regression Analysis –Regression line, Regression equations.

Unit III :

Probability and Expected Value :

Concepts of probability –Types of events - Theorems of probability - conditional probability –Bayes' Theorem. Theoretical Distribution : Binomial distribution -Poisson distribution - Normal distribution. Statistical Inference : Test of hypothesis -procedure of testing hypothesis. Estimation : Test of significance for large sample - Test of significance for small samples –Student's t- distribution.

Unit IV :

Chi square test and a Goodness of fit –Yates correction F-Test and Analysis of Variance – one way classification and two way classification .Experimental design – Randomized block design –Latin squares – The Sign Test – A rank sum test (The Mann-Whitney U Test).

Unit V :

Bioinformatics :

Information Technology in Biology - Types of sequences used in

bioinformatics – Application of Bioinformatics. **Biological Database** : Objectives – Properties of Database –database retrieval system –Symbols used in data base – Nomenclature of DNA sequences Nomenclature of protein sequences –NCBI .SWISS-PROT. **Data Base Similarity Search Tools** : BLAST –FASTA –Application of bioinformatics tools –Homology search tools –Protein functional analysis tools – Sequences analysis tools –Structural analysis tools - Molecular modeling and visualizing tools –Polygenetic analysis tools .

Text book

1. Gupta S.P. 2008 Statistical methods Sultan Chand & Co .New Delhi.
2. Khanum. A& I.A. Khan 2004 Fundamental of Biostatistics ,Ukazz Publication. Hyderabad.
3. Ramakrishnan P.1994 Biostatistics SARAS Publication TamilNadu
4. C.S.V.Murthy 2008 Bioinformatics Himalya Publishing House Pvt Ltd . New Delhi.
5. Sundararajan and Balaji 2007 Introduction to Bioinformatics Himalya Publishing House Pvt Ltd .Mumbai.

Reference book

1. Gerrold H Zar Fundamentals of Biostatistics 5th edition
2. Banergi,P.K. 2004Introduction to Biostatistics S Chand & company Ltd .NewDelhi.
3. Gurumani,N. 2004Introduction to Biostatistics .MJP Puplishers Chennai
4. Misra ,B.N.and Misra ,B.K.1998 Introductory Practical Biostatistics. Naya Prakash, Calcutta.
5. Pillai, RSN.and Bhavathi ,V.1989 Statistics S Chand & company Ltd .New Delhi
6. Schefler W.C.1980. Statistics for biological sciences Addison –Wesley Publishing Company, NewYork.
7. Sokal,R.R.and Rohif ,F.J. 1987 Introduction to Biostatistics .W.H.Freeman and Company New York.
8. Sundar Rao,P.S.S and Righard ,J.2002 An Introduction to Biostatistics .III edn Prentice Hall of India . NewDelhi.
9. N.J.Chikhale and V.S. Gomare 2007 Bioinformatics Theory and Practice Himalya Publishing House Pvt Ltd .Hyderabad.
10. Attwood T.K. Parry smith D.J. 2006
11. Introduction to biostatistics ,Dorling Kindersley (India) Pvt Ltd .South Asia

RESEARCH METHODOLOGY

Preamble :

The purpose of research is to discover answers and questions through the application of scientific procedures. The main aim of research is to find out the truth which is hidden and which has not been discovered as yet. Research study has its own purpose and objectives.

Unit I :

Research – Characteristics – types of research – steps in research – objectives of research – research report formatting and typing – laboratory safety – intellectual property rights.

Unit II :

Microscopy – Principles – types of light microscopes – bright field – dark field – phase contrast – fluorescence – scanning – micrometry. Electron microscopes and types – atomic force and magnetic force microscopes.

Unit III :

Centrifuge – types – principles and applications. pH meter – types – principles and applications. Colorimeter – principles and applications. Cryopreservation and its applications. Freezing and freeze drying microtomes. Cytotechniques.

Unit IV :

Chromatography – paper – thin layer – column – gas liquid chromatography – affinity chromatography. Electrophoresis – paper – cellulose acetate – gel – immune electrophoresis. Blotting techniques – southern – northern – western. Radioactive counters – autoradiography – labeling studies.

Unit V :

Spectrophotometer - Spectrofluorimeter – ESR –NMR Spectrophotometer – Flame Emission Photometry.

Reference Books

1. Gurumai, N., 2006. Research Methodology for Biological Sciences, MJR Publishers, Chennai.
2. Rana, S. V. S., Biotechniques, Rastogi Publications, Meerut.
3. Vijayalakshmi, G. and Sivapragasam, C., 2008. MJP Publishers, Chennai.
4. Wilson, K. and Walker, J., Practical Biochemistry, Cambridge Publications.
5. Palanivelu, R., Analytical Biochemistry and separation techniques. Tulsi Book Centre, Town Hall Road, Madurai.

PRACTICAL – 5

Practicals

1. Estimation of haemoglobin – Any method.
2. Determination of ESR – Demonstration
3. Detection of haemin crystals in blood.
4. Estimation of salt loss in fish.
5. Estimation of salt gain in fish.
6. Opercular activity of fish in relation to salinity
7. Opercular activity of fish in relation to temperature.
8. Qualitative analysis of excretory products in ammonotelic, ureotelic and uricotolic animals.
9. ECG, EEG, conditional reflex – Chart.
10. Kymograph and Sphymomanometer.

Practicals

1. Estimation of citric acid in citrus fruits
2. Preparation of wine - Demonstration
3. Preparation of bread - Demonstration
4. Preparation of yoghurt - Demonstration
5. Diagnosis of diseases using ELISA - Demonstration
6. Preparation of Vermicompost - Demonstration
7. Extraction of genomic DNA from bacteria - Demonstration
8. Southern and Northern blotting techniques –charts
9. Flow Charts - Bioreactor - Antibiotics production
10. Spotters

- pBR322
- Lambda phage
- Dolly
- RAPD
- Gene cloning

Stem cells

PRACTICAL – 6

Practical

1. Calculation of mean, median, mode, standard deviation, standard error, variance and coefficient of variation - individual observation.
2. Calculation of mean, median, mode, standard deviation, standard error, variance and coefficient of variation – continuous series.
3. Calculation of correlation coefficient – length and width of leaves.
4. Calculation of correlation coefficient – height and weight of students in the class.
5. Calculation of regression co-efficient using length and width of leaves.
6. Probability experiment with coin tossing (one coin, two coins). using chi square test
7. Test of significance for small samples – student's t test.
8. PubMed, NCBI, EMBL, SWISS-PROT – printout.

Practical

1. Centrifuge – techniques, types.
2. Phase contrast microscope – principle
3. Micrometry – measurement of cells.
4. PH meter – principle, measurement of PH in water and soil sample
5. Colorimeter – Verification of Beer Lambert's law
6. Microtome techniques – staining procedure
7. Chromatography principle – paper, thin layer, column and gas chromatography
8. Separation of aminoacid mixture using paper chromatography
9. Electrophoresis (demonstration only)
10. Spotters: Spectrophotometry, Flame Emission Photometry.