

**BHARATHIAR UNIVERSITY, COIMBATORE.**  
**M. Sc., BIOCHEMISTRY DEGREE COURSE**  
**(AFFILIATED COLLEGES)(REVISED)**  
(Effective from the academic Year 2016-2017)  
**SCHEME OF EXAMINATIONS – CBCS PATTERN**

SEM	Subject and Paper	Inst. Hrs/ week	Examinations				Credit
			Dur.	CIA	Mark	Total Mark	
I	Paper-I Biopolymers	5	3	25	75	100	4
	Paper-II Analytical Biochemistry and Bioinformatics	5	3	25	75	100	4
	Paper-III Enzymes and Enzyme Technology	4	3	25	75	100	4
	Paper-IV Cellular Biochemistry	4	3	25	75	100	4
	Paper-V Plant Biochemistry and Biotechnology	4	3	25	75	100	4
	Practical-I Core Biochemistry Practical-I	5	-	-	-	-	-
	Elective – Paper I	3	3	25	75	100	4
II	Paper-VI Microbial Biochemistry	5	3	25	75	100	4
	Paper-VII Immunology	5	3	25	75	100	4
	Paper-VIII Advanced Clinical Biochemistry	5	3	25	75	100	4
	Paper-IX Molecular Biology	5	3	25	75	100	4
	Practical-I Core Biochemistry Practical-I	5	6	40	60	100	4
	Elective – Paper II	5	3	25	75	100	4
III	Paper-X Biostatistics and Research Methodology	5	3	25	75	100	4
	Paper-XI Metabolism and Metabolic Regulation	4	3	25	75	100	4
	Paper-XII Genetic Engineering	5	3	25	75	100	4
	Paper-XIII Endocrinology	4	3	25	75	100	4
	Paper-XIV Pharmaceutical Chemistry and Neurochemistry	5	3	25	75	100	4
	Practical –II Core Biochemistry Practical-II	4	-	-	-	-	-
	Elective – Paper III	3	3	25	75	100	4
IV	Practical-II Core Biochemistry Practical-II	5	6	40	60	100	4
	Project Work	20	6	100	150	250*	10
	Elective – Practical/ Project	5	6	40	60	100*	4
	Total					2250	90

- \* For Project report - 80%; Viva-voce - 20% [ Assessment of Internal marks should be based on Monthly assessment and report by the concerned guide and HOD]
- \* Includes 25 / 40% continuous internal assessment marks for theory and practical papers respectively.

**List of Group Elective papers (Colleges can choose any one of the Group papers as electives)**

Paper / Sem	GROUP A Elective - Cell Culture and Molecular Techniques	GROUP B Elective - Computational Molecular Biology	GROUP C Elective – Nanoscience
I	Plant Tissue Culture	Computational Molecular Biology	Fundamentals of Nanoscale Science
II	Animal Tissue Culture	Genomics	Nanomaterials Synthesis
III	Methods in Molecular Biology	Proteomics	Characterization and Application of Nano Materials
IV	Elective Practical	Elective Practical	Elective Project work

Note : **The syllabus for the following papers furnished below be followed and there is no change in the existing scheme of examination and syllabi of remaining papers.**  
**Semester I Paper IV – Cellular Biochemistry, Semester III Paper X - Biostatistics and Research Methodology and Paper XIV – Pharmaceutical Chemistry and Neurochemistry .**

### Semester- I-Paper-IV

**Subject Title** : **CELLULAR BIOCHEMISTRY**

**Course Number** : **Number of Credit Hours: 4 (Four)**

**Subject Description** :

This course is concerned with the structure and function of cells. "Structure" and "function" are two different ways of looking at the same thing; structures exist to accomplish certain functions and we account for biological function in this course.

**Goals:** This course of study aims:

To develop an understanding of the fundamentals of cell biology.

To gain an understanding of the structure and function of living organisms, their life processes and Biochemical basis of motility

To provide a strong basis for membrane and organelle biogenesis, cell-cell interaction, cell-cell signaling, Cancer and cell cycle.

**Objectives:** At the end of this Course of study students will be able to:

Demonstrate an understanding of the membrane models and membrane transport.

Demonstrate an understanding of the major types of living organisms and the characteristics of and fundamental differences in their body plans/organisation and functions.

Demonstrate an understanding of the various types of microfilaments and microtubules .

Demonstrate an understanding of the structures and functions of the major cell and tissue types of higher animals, particularly humans.

Demonstrate an understanding of the cell cycle, its control through apoptosis, and explosion of cancer and its mechanism

#### UNIT-I

Membrane bilayer - Models, Membrane lipids - fluidity, Asymmetry phase transition, Liposomes . Membrane proteins - Types, Orientation, Mobility - Experiments, flippases, proteins or RBC membrane, Bacteriorhodopsin, Porins-aquaporin. RBC ghosts, solubilisation of proteins, lipid anchored proteins Carbohydrates - cell surface carbohydrates – Lectins.

#### UNIT II

Membrane transport - Overview, Passive diffusion, Facilitated diffusion in erythrocytes, Carriers and Ion - Channels. Ion conc. gradients. Uniporter Catalyzed transport. Active transport systems. Transport process driven by ATP - Ion Pumps :-Calcium ATP ase;  $\text{Na}^+\text{K}^+\text{ATP}$  ase; Mechanism, Gastric  $\text{H}^+\text{K}^+\text{ATP}$  ase, ATP ases that transport peptides and drugs.

ABC superfamily - Bacterial PM permeases, Mammalian MDR proteins: Transport process driven by light and ion gradients.

Co-transport by Symporters and antiporters, Group translocation Osmosis and Receptor mediated endocytosis.

### UNIT III

Mitochondria - Reduction potentials, electron transport chain Overview, Complexes, Q-cycle, Cyt.C oxidase complex, Translocation of Protons and the establishment of a proton, motive force, Machinery for ATP formation. Chemi-osmotic mechanism, ATP Synthase - Experiments, Inhibitors and Uncouplers of oxidative phosphorylation.

Microfilaments - Actin – Structures, Assembly, Myosin.

Microtubules - Organisation and dynamics, Kinesin and dynein.

Striated muscle - structure, excitation - contraction.

### UNIT IV

Cell – Cell and Cell - matrix adhesion: - An overview.

Cell-Cell, interaction:- ECM; Collagen, hyaluronan & proteoglycans, laminin, integrins and fibronectins.

Cell-Cell adhesion: Specialised junctions -- Desmosomes, Gap junctions, Adhesion molecules - Cadherins - Connexins.

Cell-Cell signaling - Signaling molecules and their receptors: functions of cell surface receptors, pathways', of intracellular signal transduction, second messengers - G -protein coupled receptors, receptor tyrosine kinases, Ras, MAP kinases.

### UNIT V

Cell cycle and cancer: - Cell Cycle: - Overview of cell cycle and its control. General studies with yeasts. Cell cycle Control in mammalian cells, Checkpoints in cell -cycle regulation.

Apoptosis (Programmed cell death) -- Pathways, regulators & effectors in apoptosis.

Cancer: Properties of tumor cells & Genetic basis and onset of cancer.

Tumor viruses - DNA & RNA viruses as transforming agents - mechanism.

Tumor suppressor genes and functions of their products. Carcinogenic effect of chemicals and radiation. Molecular diagnosis of cancer.

### References:

1. Molecular cell biology 5<sup>th</sup> edition- Lodish, Berk *et al.*, Freeman and Co., 2004
2. Principles of biochemistry, Garrette, Grisham, Saunders College Publishing Co. 1994
3. Molecular Cell biology 3<sup>rd</sup> edition, Lodish *et al.*, Scientific American Books. Freeman and Co.,1995
4. Molecular biology of the cell 4<sup>th</sup> edition – Alberts *et al.*, Garland Publishers, 2002
5. Harper's Biochemistry 26<sup>th</sup> edition – Murray *et al.*, McGraw Hill, 2003

### SEMESTER- III PAPER –X

**Subject Title : BIostatistics and Research Methodology**  
**Course Number : Number of Credit Hours: 5 (Five)**

**Subject Description :**

The course emphasizes on various statistical methods and significance. In this paper the methods for which there are applications in life sciences are taught. The students are expected to understand the concepts and solve relevant problems pertaining to each topic. No derivations or proofs are expected of them. Emphasis is laid on learning to solve the problems

**Goals:**

To equip the students with basic statistical knowledge and its biological applications

**Objectives:**

To provide knowledge and skills sufficient to allow students to understand the role of statistics in research.

To develop skill in the basic methods of data gathering and analysis.

To provide sufficient background to be able to interpret statistical results in research papers.

To develop sufficient knowledge of probability and probability distributions to support further studies in statistics and operations research.

#### UNIT I

Organising a statistical survey - Planning and executing the survey. Source of data - Primary and secondary data, Collection -- observation; interview; enquiry forms, questionnaire schedule and check list. Classification and tabulation of data. Diagrammatic & graphic presentation of data.

Thesis writing, Publication in a scientific journal, Preparation of Abstract and manuscript. Research problem, research design, preparation for a research and funding agencies.

#### UNIT II

Measures of central tendency; arithmetic mean, median, mode, quartiles, deciles and percentiles.

Measures of variation: range, quartile and Quartile deviation, mean deviation, standard deviation.

Correlation analysis: Scatter diagram, Karl Pearson's coefficient of correlation and Spearman's rank method. Regression analysis- Regression line, Regression equation.

#### UNIT III

Probability -- definition, concepts, Addition and Multiplication theorems (proof of the theorems not necessary) and calculations of probability.

Theoretical, distributions.

Binomial ,Poisson, Fit a Poisson distribution.

Normal distribution -importance, properties, conditions and constants of the distribution (proof not necessary).

Simple problems.

#### UNIT IV

Sampling distribution and test of significance:

Testing of hypothesis errors in hypothesis testing, standard error and sampling distribution. sampling of variables (large samples and small samples ).

Student's 't' distribution and its applications.

Chi - square test & goodness of fit.

#### UNIT V

Analysis of variance one way and two-way classification, Duncans Multiple Range Test.

Design of experiment - completely randomized block design randomized clock design

#### References:

1. Statistical methods S.P. Gupta
2. Biostatistics – A foundation for analysis in health science Danien.
3. Biostatistical analysis - Jerrold H.Zar. Pearson Education, 4<sup>th</sup> Edition

### SEMESTER- III PAPER-XIV

**Subject Title : PHARMACEUTICAL CHEMISTRY AND NEUROCHEMISTRY**

**Course Number : Number of Credit Hours: 5 (Five)**

**Subject Description :**

This course. deals with the drug, drug metabolism, drug receptors, drug tolerance, dependance , resistance. It also contains the effect of drugs on neuro system

#### **Goals:**

To enable the students to learn about various drugs with its effects and metabolism. Therapeutic monitoring of drugs.

#### **Objectives:**

After the completion of this course the student would have understood

Various routes of Drugs administration, its distribution, metabolism and excretion.

Genetically engineered drugs for AIDS and cancer and novel drug delivery systems

Effect of drugs on central nervous system and associated diseases

#### UNIT-I

Drugs – sources, Classification, dosage forms and routes of administration. Drugs – structural features and pharmacological activity, prodrug concept. Absorption, factors modifying drug absorption. Distribution, metabolism and excretion of drugs – phase I, II reactions, action of cytochrome P450.

Drug receptors – localization, types and subtypes, models and theories. G-protein coupled receptor and ion-channel linked receptors. Examples of drug-receptor interactions. Agonists and antagonists.

## UNIT-II

Drug tolerance and drug dependence. Principles of basic pharmacokinetics. Adverse response to drugs, drug intolerance, pharmacogenetics, drug allergy, tachyphylaxis, drug abuse, vaccination against infection, factors modifying drug action and effect. Assay of drug potency: chemical, bioassay and immunoassay.

## UNIT-III

### Biotechnology and Pharmacy

Genetically engineered protein and peptide agents. Drug delivery systems : Non-conventional routes of administration, anti-AIDS drug development, oncogenes as targets for drugs, multidrug resistance, production of secondary metabolites by plant culture.

Patenting of Drug, Marketing, Computer aided drug design.

## UNIT-IV

Mechanism of action of drugs used in therapy of

- a) Respiratory system – cough, bronchial, asthma, pulmonary tuberculosis.
- b) Antimicrobial drugs – sulfonamides, trimethoprim, penicillins, aminoglycosides and bacterial resistance.
- c) Cancer chemotherapy
- d) Thyroid and antithyroid drugs, insulin and oral antidiabetic drugs, antifertility and ovulation inducing drugs.

## UNIT-V

Neurotransmitters :- Cholinergic transmission and receptors; adrenergic transmission and receptors; muscarinic receptors.

Non-steroidal and anti-inflammatory drugs; adrenergic blocking drugs; cholinergic blocking drugs; muscarinic blocking drugs; Parkinson's disease; Alzheimer's disease.

Neurodegenerative disorders – amyotrophic, lateral sclerosis, senile dementia, Schizophrenia, Huntington's disease,

### References:

1. The pharmacology, Volumes I and II – Goodman, Gilman
2. Basic and clinical pharmacology 7<sup>th</sup> edition – Katzung, Printice Hall, New Delhi
3. Pharmacology 3<sup>rd</sup> edition – Rang, Tale
4. Pharmacology and pharmacotherapeutics – Satoskar *et al.*, Popular Prakashar, Mumbai
5. Principles of medicinal chemistry – Foye, Waverks Pvt. Ltd. New Delhi
6. Burger's medicinal chemistry and drug discovery: principles and practice – Wolf, John Wiley
7. Molecular basis of inherited diseases – Davies, Read, IRL Press
8. Molecular biotechnology 2<sup>nd</sup> edition – Glick, Pasternak, Panima Publishers, 2002