

**DEPARTMENT OF LIFE SCIENCES
UNIVERSITY OF CALICUT**

**Scheme of M. Phil Biochemistry
2011-12**

Sem.	Course	Title	Marks			Credit
			Ext	Int	Total	
I	BCMP.C01	Science and research methodology	80	20	100	4
	BCMP.C02	Biochemical techniques and instrumentation	80	20	100	4
	BCMP.E01	Macromolecular characterization	80	20	100	4
	BCMP.E02	Introduction to metabolomics				
Total			240	60	300	12
II	Second Semester					
	BCMP(Pr)	Project work	120	30	150	12
		Viva-voce	40	10	50	
Total			160	40	200	
Grand Total			400	100	500	24

DEPARTMENT OF LIFE SCIENCES
M. Phil Biochemistry syllabus

Core courses

1. **BCMP. C01: Science and research methodology**
2. **BCMP. C02: Biochemical techniques and instrumentation**

Elective courses (any one of the following)

1. **BCMP. E01 Macromolecular characterization**
2. **BCMP. E02. Introduction to metabolomics**

BCMP. C01: SCIENCE AND RESEARCH METHODOLOGY

1. Science and its characteristics- Testability, Repeatability, Falsifiability, Hypotheses; theories and laws in science; Ad hoc-hypothesis, axillary hypothesis, Observations, evidences and proofs.
2. Design of an experiment; sample, procedure of sampling, sample size, experimentation, observation, data collection, interpretation and deduction. Planning of experiments, Experiment Design, selection of controls, observational requirements, instrumental requirements, Documentation of experiments.
3. Nature and types of data typical examples. Data acquisition, Treatment of data, Data interpretation, Significance of statistical tools in data interpretation, errors and inaccuracies. Data presentation: graphs, tables, histograms and pi diagrams. Statistical testing of hypothesis. Biased observations, Influence of observer on observations, using and acknowledging observations by others. Use of computer packages in storing, analyzing and managing data.
4. Writing a research report, scientific writing, format for scientific reporting, tables, text, foot notes, illustrations, and paginations, References, Index. Applications of computer packages in bibliographic management.
5. Preparation of a research project: Formulating the research idea, Defining the problem and literature search, finalizing the outline of writing.

**BCMP. C02: BIOCHEMICAL TECHNIQUES AND
INSTRUMENTATION**

1. Details of all modern biochemical separation techniques based on size, shape, molecular weight, polarity, charge, affinity (principle, methods, instrumentation and applications).

2. Use of the following techniques in modern biochemical research: MS, ESMS, LCMS, MALDI TOF.
3. Quantitative analytical methods based on Absorption, Emission, Fluorescence, use of polarimeter in biochemistry.
4. Techniques used in macromolecular conformational studies: NMR, X ray crystallography, AFM, circular dichroism in secondary structure studies of proteins, Surface plasmon resonance technique in DNA studies.
5. Gravimetric analysis, solvent extraction (organic solvents).
6. Immunochemical techniques and blotting techniques.

BCMP. E01: MACROMOLECULAR CHARACTERIZATION

1. Polysaccharides (starch): starch granules, gelatinization of starch, characters of starch and application in food industry, microscopy as a tool for starch structural elucidation, Optical and Electron Microscopy, Atomic Force Microscopy, molecular characterization using enzyme hydrolysis and solubility pattern, gel filtration chromatography, light scattering, high performance size exclusion chromatography, solid state NMR, magnetic angle spinning, CPMAS, VCT, thermal transition properties of starch.
2. Characterization of proteins: protein purification protocols of plant, animal and microbial proteins. Selection of protocols based on the nature of proteins (size, shape, charge, affinity and specific binding). Antigen and antibody separation protocols. Protein crystallization, X ray crystallographic and NMR in protein structural studies.
3. Characterization of nucleic acids: separation of nucleic acids (DNA and RNA) from plant, animal and microbial cells. Purity criteria for nucleic acids. Protocols of DNA characterizations. Spectral studies of nucleic acids.

BCMP. E02. INTRODUCTION TO METABOLOMICS

1. Historic perspective of metabolomics. Terminologies, data gathering, separation techniques used in metabolomics, detection techniques in metabolomics, use of NMR, MS, data analysis and interpretations in metabolomics. PCA,
2. Data bases in metabolomics for searching based on text, molecular weight, structure, formula, mass spectrum, sub structure, NMR specific search etc. of different metabolites.
3. Integration of metabolomics with other omics, applications of metabolomics in drug assessment, clinical toxicology, nutrigenomics, functional genomics, Human metabolome project.