

**Mangalore University**  
**Department of Studies in Biochemistry**

**Ph.D Programme in Biochemistry**

**Course work**

- a) The Course work shall be of the following pattern. The course contents/syllabi of papers 1 to 3 shall be decided by the concerned Board of Studies.

| Papers  | Particulars   | Hourse of Instruction per week | Duration of Examination (hrs) | Marks |        |       | Credits    |
|---------|---|--------------------------------|-------------------------------|-------|--------|-------|------------|
|         |   |                                |                               | IA    | Theory | Total |            |
| Paper 1 | Research Methodology  | 4                              | 3                             | 30    | 70     | 100   | 4          |
| Paper2  | Theoretical Foundations   | 4                              | 3                             | 30    | 70     | 100   | 4          |
| Paper3  | Recent Developments   | 4                              | 3                             | 30    | 70     | 100   | 4          |
| Paper4  | Reviewing of Literature and Planning of the Proposed Research work with a Tentative Title | 16                             | -                             | -     | -      | 200   | 8          |
|         |   | Total                          |                               |       |        |       | 20 Credits |

- b) Part-time researchers may be allowed to complete the course work in two semesters. They shall take the Papers 1 to 3 in the first semester and Paper 4 in the second semester.
- c) The candidates are required to undertake the course work for a semester immediately after the enrollment as per the Calendar notified by the Registrar.

## PAPER 1: RESEACH METHODOLOGY

### Unit I:

Scope of research in Bio-Chemistry, Topics of research – Basic and applied , frontiers areas of research in Bio-chemistry, interdisciplinary research, outstanding discoveries. Choosing problem for research consistent with the field of interest,

[12hrs.]

### Unit-II

Research problem- Identification, Statement of research problem, objective, design and execution of experiments, Collection and interpretation of experimental data, Reporting the results of research-style and format-title, arriving at conclusions. abstract, Quotations and footnote. Writing of research papers and dissertations

[11 hrs.]

### Unit-III

General awareness of computer hardware, CPU, Computer memory, I/o device, information storage, software components, Types of computers, application of computers in Biology, programming language, computer program's, stored program concept, operating systems, DOS and its use, Algorithm, Program-flow charts.

[6 hrs.]

Introduction to computer applications and programming

Applications of computers in Biochemistry, Programming examples and use of software packages.

[5hrs.]

### Unit-IV

Errors and analysis of experimental data-classification of errors. errors in observation, accidental and systematic errors. Significant figures and computation, statistical treatment of errors-Curve fitting and regression analysis-tests of statistical significance. Statistical software and its uses

[11 hrs.]

### Unit-V

Popularization of science education. Social and educational applications of knowledge

[6 hrs.]

Changing face of Biochemistry:

Identification and development of key components in Bio-Chemistry. Preparation of Audio-visuals for teaching.

[5hrs.]

## **6. COURSE WORK:**

- 6.1** After having been admitted, every Ph.D student shall be required by the University/Institution/College as the case may be to undertake course work for a minimum period of one Semester (six months duration). dHowever, M.Phil Degree holders are exempted to undertake course work. The course work shall be treated as pre Ph.D preparation and must include a course on research methodology which may include quantitative methods and computer applications, reviewing of published research in the relevant field as prescribed by the concerned Board of Studies as per the guidelines framed by the University
- 6.2** The report of course work shall be referred to the Doctoral Committee headed by the Chairman of the concerned Board of Studies and one external member for opinion. The Doctoral Committee shall consider the report and approve it as such or approve with suggestions or modifications if any or ask for a fresh course work. The Chairperson of the Doctoral Committee shall communicate the opinion of the Committee to the Registrar within two months.



## References:

1. J. Anderson, Durston and Poole, Thesis and Assignment writing, Wiley Eastern (1977)
2. A.M. Heiss: Challenge to graduate students.
3. J. Topping: Errors of observation and their treatment, Chapman and Hall (1972).
4. P.N. Arora: Programming with basic for computers, Chand and co., New Delhi (1987).
5. V. Rajaraman: Computer programming in Fortran IV, V, Printice Hall, N. Delhi (1987).

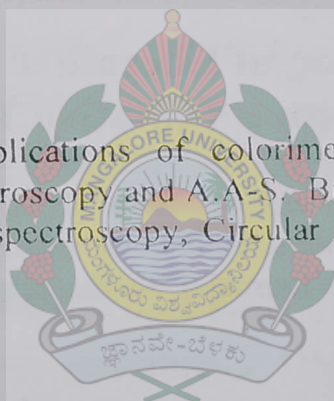
## PAPER 2 : THEORITICAL Foundations

### Unit - I

Chromatography: Basic principles of Chromatography separations. Separations and identification of biomolecules by chromatography. Ion-exchange chromatography, Gel-exclusion chromatography, affinity chromatography, Application of chromatography in research and Pharmaceutical industries. [12 hrs.]

### Unit II

Spectroscopy: Principle and applications of colorimetry, UV-Vis-Spectroscopy, IR spectroscopy. Fluorescence spectroscopy and A.A-S. Brief introduction to turbidimetry, Nebulometry, NMR and Mass spectroscopy, Circular Dichroism and ORD and their applications in Biochemistry [11 hrs.]



### Unit-III

Electrophoresis: Principles of different types of electrophoretic separations. Applications of paper, starch, Agarose electrophoresis, PAGE and SDS-PAGE. Characterization of Bio-molecules by electrophoretic methods. Is electric focusing, blotting techniques, other practical aspects of electrophoresis. Advantages and disadvantages of these techniques [11 hrs.]

### Unit-IV

Introduction and scope of Radioisotopes. Detection and measurements of Radioactivity. Labeling and Applications of radioisotopes in Biology  
Centrifugation: Basic principles and applications of centrifugation. Different types of rotors and advantages in Biology  
Methods of studying intermediary metabolism. [11 hrs.]

### Unit-V

Use of laboratory animals in research

Collection of different types of laboratory/experimental animals.

Care, feeding, breeding and maintenance. Experimental procedures for laboratory animals. [11 hrs.]

### PAPER 3 : Recent Developments

Studies on recent techniques used in research, Methods for biomolecular isolation, purification, characterization and application in different fields. Individual case studies, Field studies.

(Topics suggested by the guide depending upon his/her specialization will be included)



### Paper 4: Reviewing of Literature and Planning of the Proposed Research work with a Tentative Title

Literature review collection from books, monographs, periodicals, abstracts, documents, reviews, reports, conference proceedings, patents and dissertations, on-line requisition of literature (e-Journals). Studies related to the topic of Research.



## Recent developments.

PART -

**Unit -1:** Recent techniques; GC – MS, tracer techniques, ligand molecules, nano articles, its application, role of solvents in purification, model organisms, radio isotopes, phase chase labeling of DNA, RNA and proteins (antibodies) and its application in biology, dual labeling, quenching, Cell culture techniques.

**Unit -2:** Bio molecule isolation from plant source, Secondary metabolites, Host- pathogen interaction, mechanism of penetration and infection, effect of infection physiological function of host, defense related enzymes in plants, Patenting of genes and products, patent laws and I P R: salient feature of Indian and International patent laws, copy right. Filling of patent, patent regulation governing microbes and industrial process.

**Unit-3:** Clinical enzymes: Introduction to disease diagnosis enzymes, (LDH, CKMB, SGPT, SGOT, alkaline phosphatase, creatine kinase), food & drug interaction, metabolic disorders, disorders of carbohydrate metabolism, (Diabetes mellitus, inborn errors of carbohydrates, glycogen storage diseases, galactosemia, lactose intolerance, pentosuria) disorders of protein metabolism, (inborn errors of amino acids metabolism, phenyl ketonuria, alcaptonuria) disorders of lipid metabolism. (hyper lipoproteinemia, types of modification of lipoproteins)

**Unit -4:** Bio-informatics; Biological data basis tools, Visualization software, Drug designing, proteomics, genomics, DNA microarray, biostatistics application for biological Science. Hypothesis testing, t-test, F –test, Chi-Square test, Correlation, Regression, statistical design, statistical packaging, statistical methods.

**Unit-5:** Microbial biotechnology, microbial enzymes, endophytic organisms, role of media in cultivation of fungal metabolites, mass multiplication, therapeutic molecule from microorganisms, bio processing and bio energy, bio transformation. Fermentation and its types, Scaling up, downstream processing. industrial production of microbial chemicals, amino acids, and steroids.