PERIYAR UNIVERSITY

SALEM – 636011

DEGREE OF MASTER OF SCIENCE

CHOICE BASED CREDIT SYSTEM

M.Sc. BIOCHEMISTRY

OBE REGULATIONS AND SYLLABUS

(SEMESTER PATTERN)

(For Candidates admitted in the Colleges affiliated to Periyar University from 2021-2022 onwards)
“Biochemistry reveals what living things are made of and how they work, beginning at the level of atoms and working up through the genes and proteins to the cells, tissues and organs of multicellular life”

1. Introduction

Biochemistry is a fundamental science between the exact sciences like physics, chemistry, computer science, and the biological sciences. It deals with the molecular structures and functions of living organisms in a wider sense, molecular biology, cell biology and biotechnology.

The primary objectives of the major are

- To give students a solid foundation in biology and chemistry;
- To develop analytical and critical-thinking skills that allow independent exploration of biological phenomena through the scientific method
- To introduce students to modern methods of biochemical experimentation within the disciplines of biology, chemistry and biotechnology.
- To impart analytical knowledge in Biochemistry and Molecular Biology.
- To provide students with practical skills in the areas of Biochemistry and Molecular Biology.
- To train students on relevant and recent advances in Biochemistry and Molecular Biology. Oncology, Clinical Chemistry and Cancer Research heavily depend on Biochemistry.
- The objective of the course has therefore been to consolidate students training in Biochemistry and other integrated sciences and encourage them to develop intellectual independence, critical thinking skills and versatility for problem solving in Biochemistry and other related courses. This and the core values have been the guiding principle of the research programmes.
- The Biochemistry Programme has pursued its curriculum and research agenda in recognition of the role of Biochemistry in contributing to both basic life sciences and applied research in industries.

The degree program will be offered in collaboration with Biological and Physical Science departments. The students will acquire practical and theoretical
understanding of basic metabolism, Molecular Biology and Biotechnology. Other areas included in the programme are cell and Molecular Immunology, Industrial and Nutritional Biochemistry, Biochemical Pharmacology and Medical Biochemistry. These courses are designed to expose students to a wider perspective in Biochemistry course to achieve these goals; the program has crafted a curriculum courses already offered in each participating department that cover the essential material listed in the scheme in each semester. These courses prepare students to participate in independent research. Depending on his/her background, a student required to complete as many as 17 theory papers and 6 practicals to complete the programme. On completing first year students have to participate in a capstone laboratory experience, in the second year, students must conduct an independent research projects on which they then base a thesis.

2. General Graduate Attributes
The graduate attributes reflect both disciplinary knowledge and understanding, skills, competencies, that students should acquire/attain and demonstrate while studying Biochemistry program. Some of the characteristic attributes that a graduate should demonstrate are as follows:

- **Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of Biochemistry
- **Communication Skills:** express thoughts and ideas effectively in writing and orally
- **Critical thinking:** Capability of analyzing, interpreting, discussion by following scientific approach to knowledge enrichment.
- **Problem solving:** apply one’s learning to real life situations.
- **Analytical reasoning:** ability to analyze and solve problems quickly and effectively
- **Research-related skills:** Ability to define problems, analyse, interpret and draw conclusions from data and report the results of an experiment or investigation.
- **Cooperation/Team work:** Ability to work effectively as a member of a team rather than individually.
- **Scientific reasoning:** Ability to evaluate ideas and evidence of a particular problem and reason them based on scientific approach.
- **Reflective thinking:** ability to learn from experience
- **Information/digital literacy:** Capability to use ICT in a variety of learning situations.
- **Self-directed learning:** Ability to work independently with efficiency based on the knowledge acquired while learning.
- **Moral and ethical awareness/reasoning:** Ability to follow moral/ethical values in all aspects of work.

- **Leadership readiness/qualities:** Capability to guide people to the right destination, in a smooth and efficient way.

- **Lifelong learning:** Ability to acquire knowledge and skills through self-directed learning aimed at personal development

### 2.1. Program specific qualification Attributes

The cognitive domain involves knowledge and the development of intellectual skills (Bloom, 1956). This includes concepts that serve in the development of intellectual abilities and skills. There are six major categories of cognitive processes, starting from the simplest to the most complex

- Knowledge and understanding level (K1 and K2)
- Application level (K3)
- Analytical level (K4)
- Evaluation capability level (K5)
- Scientific or synthesis level (K6)

### 3. Program objectives and outcomes

#### 3.1 PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The career perspectives of the Master's program in Biochemistry are

PEO 1: To prepare students for the future careers in the concerned/various relevant fields in which a core understanding of the chemistry of life is important.

PEO 2: To enable the graduates to exhibit leadership, make life long learners with professional and social ethics and make them communicate effectively.

PEO 3: To add highly skilled scientific workforce in the area of biomedical research sectors, academic, industry as well as for research laboratories across the country and the globe by following best practices for improving the professionalization and employability of students.
PEO 4: The practical and technical skills with laboratory-based work and the final year research project prepare the students for a research or technical position by defining specific and transferable skills.

PEO 5: To sensitize and train the students towards research with typical employers include pharmaceutical, biotechnology, food, water and agricultural companies and specialist services, such as toxicological studies.

PEO 6: To train the students in generic and competency skills so as to be able to work in potential places including scientific and medical publishers and the Intellectual Property Office

3.2 PROGRAMME SPECIFIC OBJECTIVES (PSOs)

The Overall objective of the Program is to promote education and research in biochemistry and provide academic and professional excellence for immediate productivity in industrial, or clinical settings for an ultimate benefit of society and environment.

<table>
<thead>
<tr>
<th>PSO1:</th>
<th>To acquire necessary knowledge and skills in core themes, principles and components of basic Biochemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSO2:</td>
<td>To demonstrate the knowledge of biochemical processes from the cellular and molecular aspects</td>
</tr>
<tr>
<td>PSO3:</td>
<td>To Integrate and apply the techniques studied and to compare and contrast the depth of scientific knowledge in the broad range of fields</td>
</tr>
<tr>
<td>PSO4:</td>
<td>to be able to understand, analyze and apply the studied basic and concepts in wide variety of applications including diagnostics, biochemical pathway regulation and drug development and use this knowledge and apply the same for multitude of laboratory applications.</td>
</tr>
<tr>
<td>PSO5:</td>
<td>To provide students with the knowledge and skill base that would enable them to go for self-employment and entrepreneurship</td>
</tr>
</tbody>
</table>

PROGRAMME OBJECTIVES (POs)

PO1: To demonstrate comprehensive knowledge on various areas of Biochemistry. PO2: To acquire skills in areas related to the current and emerging developments.

PO3: To communicate the concepts, constructs and techniques of the subject learnt in a clear, concise and lucid manner.
PO4: To plan and execute the experiments to the relevant theories of Biochemistry.

PO5: To apply critical thinking, scientific reasoning and mathematical skills in studied areas of Biochemistry.

PO6: To train the students to acquire various relevant generic and competency skills in various aspects of biochemistry so as to be able to work independently in a group or individually.

PO7: To make a student life long learner with moral and ethical values.

3.3 PROGRAMME OUTCOME (PO’S):-

M.Sc programme in Biochemistry will provide students with the necessary knowledge and skills to undertake a career in research, either in industry or in an academic setting. The training provided will give students the breadth and depth of scientific knowledge in Biochemistry. On completion of the programme, students will be qualified to apply for a PhD or to gain employment in the pharmaceutical or biotechnology industries, which are among the strongest growth sectors. The programme will be based on a combination of taught modules, independent learning and an extended research project to be carried out either in the University departments or industry or in association with industry at the University. The programme incorporates a substantial element of hands-on research experience, with enhanced experimental skills being gained alongside experienced research workers.

It is intended that, on successful completion of the M.Sc degree programme, students will:

1. **be capable of demonstrating comprehensive knowledge** and have a fundamental/systematic or coherent understanding of major concepts, theoretical principles and experimental findings in biochemistry.

2. **acquire skills in areas related to the current and emerging developments** in the field of Biochemistry.

3. **be identifying and applying appropriate biochemical principles** and methodologies to solve a wide range of problems associated with Biochemistry.

4. **communicate the results of studies undertaken** in Biochemistry accurately in a range of different contexts using the main concepts, constructs and techniques of the subject learnt in a clear and concise manner in writing and oral skills.

5. **Plan and execute the experiments**, investigate, analyze and interpret data collected using appropriate experimental methods, and report the
findings of the experiment and relate the interpretations and conclusions to relevant theories of Biochemistry.

6. They will have the ability to employ critical thinking, scientific reasoning and efficient problem solving skills in the basic areas of biochemistry.

7. Be able to demonstrate relevant generic skills and competencies such as (i) problem solving skills, (ii) investigative skills, (iii) communication skills (iv) analytical skills, (v) ICT skills, (vi) skills such as the ability to work both independently and in a group.

8. demonstrate professional behaviour such as (i) unbiased and truthful in all aspects of work (ii) follow moral and ethical practices (iii) Life long learners aimed at personal development and for improving knowledge/skill development (iv) focusing on issues related to social cause.

4. CONDITION FOR ADMISSION

A candidate who has passed B.Sc degree in Biochemistry, Chemistry, Microbiology, Biotechnology, Botany, Zoology or an Equivalent B. Sc. Examination in Bachelor in Medical / Clinical Laboratory Technology Course or some other B.Sc board equivalence submitted by the respective University may be accepted by the syndicate as equivalent there to with Biochemistry shall be eligible for admission into M.Sc., course in Biochemistry.

5. DURATION OF THE COURSE:

The course for the degree of Master of Science shall consist of two academic years divided into four semesters.

6. COURSE OF STUDY:

The course of study for the M.Sc. Degree in the Branch Biochemistry shall comprise the following subjects according to the syllabus,

a. Major: Biochemistry

b. Extra Disciplinary Course (EDC)

c. Human Rights

d. Ad-on Course / Internship Training / Online course (SWAYAM/NPTEL)

e. Major Project

Extra Disciplinary course subjects may be chosen by the respective colleges in the Second semester and the same must be communicated to the University.
7. **EXAMINATIONS**

There shall be four examinations - two in the first year, two in the second year. Candidates failing in any subject / subjects will be permitted to appear for such failed subject / subjects at subsequent examinations. The Syllabus has been divided into four semesters. Examinations for I and III semesters will be held in November/December and for II and IV semesters will be held in April / May.

The practical examination I to IV will be held in semester-II. Practical V & VI will be held at the semester-IV and individual Research Project should be performed and dissertation should be submitted and their report shall be evaluated in Viva-Voce examination conducted before the examiners at the end of IV-semester.

8. **PASSING MINIMUM**

A candidate shall be declared to have passed the examination if he/she secure not less than 50% of the marks in each paper / practical. Candidates who do not secure the required minimum marks for a pass in a paper / practical shall be required to appear for and pass the same at a subsequent appearance. For practical, the minimum for a pass includes the record notebook marks also. There is no passing minimum for the record notebook. However submission of a record notebook is a must.

9. **GRADING SYSTEM**

Evaluation of performance of students is based on ten-point scale grading system as given below

<table>
<thead>
<tr>
<th>Ten Point Scale</th>
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<tbody>
<tr>
<td>Grade of Marks</td>
<td>Grade Points</td>
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<tr>
<td>90-100</td>
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<td>80-89</td>
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<td>75-79</td>
<td>7.5-7.9</td>
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<td>70-74</td>
<td>7.0-7.4</td>
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<td>60-69</td>
<td>6.0-6.9</td>
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<td>50-59</td>
<td>5.0-5.9</td>
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<td>00-49</td>
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<tr>
<td>ABSENT</td>
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10. **RANKING**

Candidates who pass all the examinations prescribed for the course in the first instance and within a period of two academic years from the year of admission to the course only are eligible for University Ranking.
11. **MAXIMUM DURATION FOR THE COMPLETION OF THE PG PROGRAMME**

   The maximum duration for completion of the PG Programme shall not exceed EIGHT semesters.

12. **COMMENCEMENT OF THIS REGULATION**

   These regulations shall take effect from the academic year 2021-2022, i.e. for students who are to be admitted to the first year of the course during the academic year 2021-2022 and thereafter.

13. **TRANSITORY PROVISION**

   Candidates who were admitted to the PG course of study before 2018-2019 shall be permitted to appear for the examinations under those regulations for a period of three years i.e. up to and inclusive of the Examination of April/May 2022. Thereafter, they will be permitted to appear for the examination only under the regulations then in force.

14. **PAPERS GIVEN BY THE BOARD AS EXTRA DISCIPLINARY COURSE**

   **Semester III**

   Fundamentals of Human physiology (Or) Biochemistry and Health (Or) Biochemistry in Diagnosis

15. **PATTERN OF QUESTION PAPER (FOR MAJOR, ELECTIVE AND EDC)**

   Maximum – 75 marks

   Duration – 3 hours

   **Section –A (1 x15 = 15 marks)**

   Answer all the questions

   (Multiple Choice Questions- Three questions from each unit)

   **Section –B (2x5 = 10 marks)**

   Answer any two questions

   (One question from each unit)

   **Section –C (5x10 = 50 marks)**

   Answer all the questions (Either or Choice-Two questions from each unit)
16. PATTERN OF QUESTION PAPER (FOR PRACTICAL)

Internal – 40 marks (includes Attendance, Observation and Performance in the laboratory)

External – 60 marks

Question paper should contain two experiments with either or choice. First experiment is Major which has 25 marks and the second experiment is Minor question which has 20 marks. The mark distribution as follows

<table>
<thead>
<tr>
<th>S No</th>
<th>Content</th>
<th>Experiment I</th>
<th>Experiment II</th>
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<tr>
<td>1</td>
<td>Principle</td>
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<td>2</td>
<td>Procedure</td>
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<tr>
<td>3</td>
<td>Table / Graph</td>
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<td>4</td>
<td>Observation / Calculation</td>
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<td>5</td>
<td>Result</td>
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<td>Spotters</td>
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FOR RESEARCH

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<td>30%</td>
<td>External Examiner</td>
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<td>2</td>
<td>Viva-voce</td>
<td>20%</td>
<td>Internal Examiner</td>
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<td>20%</td>
<td>External examiner</td>
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17. Credit calculation

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<td>Lecture</td>
<td>1</td>
<td>1</td>
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<td>2</td>
<td>Tutorial/demonstration</td>
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<td>3</td>
<td>Practical/Internship/ Self-Learning</td>
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## COURSE OF STUDY AND SCHEME OF EXAMINATION

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Subject</th>
<th>Subject Title</th>
<th>Instruction Hrs / Week</th>
<th>Exam Hours</th>
<th>Internal (25%)</th>
<th>External (75%)</th>
<th>Total</th>
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<td>I SEMESTER</td>
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<td>Core Practical I</td>
<td>LAB - I</td>
<td>5</td>
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<td>Core Practical II</td>
<td>LAB - II</td>
<td>5</td>
<td>6</td>
<td>40</td>
<td>60</td>
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<td>Core IV</td>
<td>INTERMEDIARY METABOLISM</td>
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<td>2.</td>
<td>Core V</td>
<td>GENETIC ENGINEERING AND CANCER BIOLOGY</td>
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<td>Elective II</td>
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<td>4.</td>
<td>EDC</td>
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<td>40</td>
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</table>

Note: Online Course (SWAYAM/NPTEL) certificate should be submitted to the Institution at the end of third semester (Compulsory)
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Subject</th>
<th>Subject Title</th>
<th>Instruction Hrs / Week</th>
<th>Exam Hours</th>
<th>University Examination</th>
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<tr>
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<td>Internal (25%)</td>
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<td>Credits</td>
<td>Credits</td>
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**III SEMESTER**

1. Core VI  ADVANCED CLINICAL BIOCHEMISTRY  4 3 25 75 100 4
2. Core VII  CONCEPTS OF IMMUNOLOGY  4 3 25 75 100 4
3. Core VIII  PHARMACEUTICAL BIOCHEMISTRY  4 3 25 75 100 4
4. Core IX  BIOSTATISTICS AND RESEARCH METHODOLOGY  4 3 25 75 100 4
5. Elective III  MICROBIAL BIOCHEMISTRY  4 3 25 75 100 3
6. Core Practical V  LAB COURSE - V  5 6 40 60 100 4
7. Core Practical VI  LAB COURSE - VI  5 6 40 60 100 4

**IV SEMESTER**

1. Core X  HUMAN PHYSIOLOGY AND ENDOCRINOLOGY  4 3 25 75 100 4
2. Elective IV  BIOINFORMATICS AND NANOTECHNOLOGY  5 3 25 75 100 4
3. Project  100 5
4. TOTAL  99 2300 90

*(Choose from other departments EDC papers)*

No. Of Core papers/practical/project : 17
Elective - Major : 04
Non Major Supportive course -[ EDC ] : 03
Ad–on course/Online Course (Extra) 01
<table>
<thead>
<tr>
<th>S. No</th>
<th>Type of paper</th>
<th>Title of the subject</th>
<th>Subject code</th>
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<tbody>
<tr>
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<td>Core I</td>
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<td>21PBC01</td>
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<td>2.</td>
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<td>14.</td>
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Course Name: Biomolecules

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Total Marks: Internal – 25 External – 75

Paper Type: Core I

OBJECTIVE

❖ To study the structure and functions of macromolecules

UNIT I - CARBOHYDRATES

Classification, Structure, functions, physical and chemical properties of Monosaccharides, Disaccharides; N-linked, O-linked and GPI linked oligosaccharides, glycoproteins structure, function and recognition, Polysaccharides; Homo & hetero polysaccharides, Bacterial Cell wall Polysaccharides. Structure, location and biological role of Proteoglycans (Glycosaminoglycans).

UNIT II - LIPIDS


UNIT III - AMINOACIDS AND PROTEINS

AMINOACIDS

Classification, structure, properties (physical and chemical) of amino acids and proteins. Ramachandran plot, linkage in Peptide bond.

PROTEINS

UNIT IV - NUCLEIC ACIDS

DNA: Physical (Buoyant density, viscosity) and chemical properties (renaturation and denaturation). Structure of nitrogenous bases, nucleosides, nucleotides, DNA Double helix - Watson & Crick model of DNA, Other forms; A, B and Z DNA, Triple helix, Palindromes, Inverse repeats, cruciform and hairpins & quadruple structures, Cot value. Histone proteins, chromatin and non-histone proteins. Miscellaneous alternative confirmation of DNA - slipped mispaired DNA, parallel stranded DNA and anisomorphic DNA. RNA Classes; mRNA, tRNA and rRNA, hnRNA, SnRNA, miRNA structure and functions.

UNIT V – VITAMINS AND MINERALS

Classification, structure and function of fat soluble and water soluble vitamins (including antioxidant properties). Minerals of biological significance: Na, K, Ca, Mg, Mn, P, Fe, Cu, I, Zn, Se, Co.

REFERENCE BOOKS


Course Outcome

1. To explain about the structure, properties and functions of polysaccharides
2. Illustrate on structure, properties and functions of lipids, interactions of lipids in biological membrane.
3. Determine the classification, properties and significance of proteins
4. Explain about the DNA properties and functions, biological importance of histone proteins
5. To determine the significance of vitamins and its antioxidant activity, minerals of biological significance
M.Sc. BIOCHEMISTRY
SEMESTER I

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OBJECTIVE
This paper aims to provide a basic understanding of biological catalysis, Mechanism of action of enzymes, structure and function relationship, Understanding the enzyme kinetics and role of coenzymes/co-factors and an overview of Industrial application of enzymes.

UNIT I

UNIT-II

UNIT-III

UNIT-IV
Multi Enzyme complex-Structure and Mechanism of action and Regulation of Pyruvate Dehydrogenase Complex (PDC) and Fatty acid Synthase Complex (FAS). Enzyme

UNIT-V

REFERENCE BOOKS

5. Protein Biochemistry and Biotechnology, Gary Walsh, 2002. John Wiley and Sons Ltd.

Course outcomes

After the completion of this course, the student will be able to

1. Distinguish the fundamentals of enzyme properties, nomenclatures, characteristics and Compare methods for production, purification, characterization of enzymes.
2. To derive the equations of Enzyme kinetics. Discuss the factors affecting enzymatic reactions. Mechanism of enzyme catalysis and structure and functions of coenzymes
3. Describe the concepts of co-operative behavior, enzyme inhibition and allosteric regulation.
4. Compare methods for production, purification, characterization and immobilization of enzymes. Describe the multi enzyme complex with example. To know about the biosensors and its functions.
5. Describe the major applications of enzymes in industry, understand the principles of enzyme immobilisation techniques and enzyme extraction procedures. Develop new ideas for the development of enzyme-based drugs. Discover the current and future trends of applying enzyme technology for the commercialization purpose of biotechnological products.
OBJECTIVE

To understand the structure and functions of the cells

To gain the knowledge about the concepts of central dogma of molecular biology and the details of Replication, Transcription and Translation process

UNIT I:


UNIT II:

Structure and organization of Membrane - Model membranes, Glyco conjugates and proteins in membrane systems; Active and passive transport, channels and Sodium- potassium pumps, Calcium pump, Proton pump of cells. Mitosis and Meiosis- Regulation of cell cycle, factors and genes regulating cell cycle. Cell signaling – types of cell signaling-G protein mediated, Tyrosine kinase mediated signaling. MAP Kinases mediated cell signaling.

UNIT III:


UNIT IV:
Transcription: RNA polymerases, Regulatory sequences in protein-coding genes, Transcription factors and enzyme machinery, formation of initiation complex, transcription activators and repressors, regulation of transcription factor activity, capping, elongation and termination, Processing of Pre-mRNA, splicing, polyadenylation; RNA transport, Cytoplasmic mechanisms of Post-transcriptional control, Processing of rRNA and tRNA.

Regulation of gene expression – Basic elements in control of gene expression, structural and regulatory genes. Mechanism of activation of gene expression; Lac operon, Trp operon, Arab operon, catabolic repression, attenuation, anti-termination and methylation.

UNIT V:

Genetic code – features of genetic code, properties of genetic code.

REFERENCE BOOKS:
**Course Outcomes:**

✔ Know about tissue types, organization and classes of cell junctions and describe the role of cell adhesion molecules and ECM components.

✔ Understand what happens during the cell cycle and cell death and explain about membrane transports and checkpoints in the cell cycle.

✔ To understand the basic structures, properties and organisation of eukaryotic and prokaryotic chromosomes.

✔ To emphasize the molecular mechanism of DNA replication and recombination involved in eukaryotes and prokaryotes.

✔ Deeply understand the transcription process in prokaryotes and eukaryotes.

✔ To knows about the translation and post translational modification in prokaryotes and eukaryotes.

✔ Learn the changes and consequences in chromosome structure and its related disorders, thereby know how the DNA repair mechanism by anticancer therapeutics involved against DNA mutation and uncontrolled cell growth.
M.Sc. BIOCHEMISTRY  
SEMESTER I

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COURSE OBJECTIVES:
This course focus on the biochemical techniques includes spectrophotometry, centrifugation, electrophoresis, radioactivity etc., Learning these techniques will be very useful for operating instruments and become the basic knowledge in their future.

UNIT –I
**Microscopy and Electrochemical techniques:**

UNIT-II
**Chromatography and Electrophoresis Techniques:**
Chromatographic techniques – General principle; adsorption and partition chromatography. Techniques and application of paper, column, thin layer, ion-exchange chromatography, exclusion chromatography, affinity chromatography, GLC and HPLC, HPTLC.
**Electrophoresis Techniques:**

Unit-III
**Spectroscopic Techniques:** Principle, Working mechanism and applications of Colorimeter, UV-Visible and FTIR spectroscopy, Flame and Flameless spectrophotometer, Basic principles of NMR, ESR, Atomic Absorption Spectroscopy, Luminometry, X-Ray Crystallography.
UNIT-IV

Centrifugation Techniques:
Basic principles of sedimentation, Types of Rotors, Types of Centrifugation: Ultra centrifuge, Analytical and Preparative centrifuges and applications. Molecular weight and density determination, Sub cellular fractionation, Ultra-filtration; Principle, instrumentation and application. Dialysis, principle and uses of equilibrium dialysis. Precipitation; methods and applications. Flow Cytometry; Principle and design of flow cytometer, cell sorting.

UNIT-V

Tracer Techniques:

REFERENCE BOOKS:
2. An Introduction to spectroscopy for Biochemist, Brown. SB Academic Press.
4. The Tools of Biochemistry (Wiley-Interscience Publication) Terrance G. Cooper

Course Outcome:
Students who complete this course will be able to:
1. Have a strong and sound knowledge of the fundamental principles of Instrumentation.
2. Have the practical skills and techniques in biochemical analysis.
3. Have the practical knowledge of all the instrumental applications.
## M.Sc. BIOCHEMISTRY
### SEMESTER I

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### COURSE OBJECTIVE:
This course aims to bring the skills of performing basic biochemical techniques which are important in clinical investigations. It helps in learning all the basic biochemical estimations and aids in hands on training.

1. Isolation and Estimation of Glycogen by Colorimetric method.
2. Determination of Maltose by DNSA method.
3. Estimation of Total Protein by Lowry’s method
4. Estimation of Total Protein by Biuret’s method
5. Estimation of Albumin by Bromocresol green method.
6. Determination of Acid number.
7. Determination of Saponification number
8. Estimation of Iodine value.
9. Estimation of Thiamine and riboflavin by Flourimetry
10. Estimation of Ascorbic Acid Vitamin C by 2 4-DNPH Method
11. Estimation of Total phenolics by modified Folin Ciocalteau method.
12. Separation of Amino acids by paper chromatography

### Reference Books:
Course Outcome:

After the completion of this Lab Course I, the student will be able to:

1. Learn how to standardize the biochemical tests.
2. Can do chromatographic techniques.
5. Isolate glycogen from tissues.
M.Sc. BIOCHEMISTRY
SEMESTER I

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COURSE OBJECTIVE:
This course aims to bring the skills of performing isolation, identification and purification of enzymes

I. Enzyme Isolation and Assay of Enzyme/Specific Activity.
   a. Extraction and Purification of Enzyme and Specific Activity - Peroxidase/Urease
   b. Molecular Weight Determination of Enzymes–Peroxidase/Urease by Molecular Sieve chromatography method
   c. Determination of Aspartate transaminase activity
   d. Determination of Alanine transaminase activity
   e. Determination of activity of Amylase
   f. Determination of specific activity of Lipase

II. Immobilisation Enzyme
   a. Immobilisation of peroxidase/ Acid phosphatase by matrix entrapment, ionic and cross linking

III. Enzyme Kinetics
   a. Effect of pH, Temperature, Substrate and enzyme concentration of Lipase / Cellulase [determine Km value]
   b. Effect of pH, Temperature, Substrate and enzyme concentration of Peroxidase
   c. Effect of pH, temperature, Substrate and enzyme concentration of Urease.

REFERENCE BOOKS (LAB COURSE –I & LAB COURSE – II)


M.Sc. BIOCHEMISTRY
SEMESTER II

Course Name: Intermediary metabolism
Course code: 21PBC04

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Total Marks: Internal – 25 External – 75
Paper Type: Core IV

COURSE OBJECTIVES:
The Course aims
- to understand the major metabolic pathways involved in synthesis and degradation of biomolecules and energy generation

UNIT I
Carbohydrate metabolism and regulation

UNIT II
Fatty acid metabolism and regulation

UNIT III
Amino acid metabolism and regulation
Degradation of amino acids – transamination, oxidative and non - oxidative deamination, decarboxylation - Urea cycle and regulation. Biosynthesis and degradation of phenylalanine, tryptophan and glutamine. Catabolism of amino acids - carbon skeleton of amino acids to amphibolic intermediates, key role of glutamate dehydrogenase in nitrogen metabolism.
Conversion of amino acids to specialized products: Serotonin, Gamma amino butyric acid, Dopamine, Epinephrine, Nor - Epinephrine, Melanin, Creatinine, Creatine.

Integration of Metabolism - Interrelationship of Carbohydrates, Protein and Fat metabolism.

UNIT IV
Metabolism of Porphyrin - Biosynthesis and degradation of Porphyrin, Heme formation, Biosynthesis of Bilirubin, transport and excretion of bile pigment.
Metabolism of Nucleotides, De novo synthesis and Salvage pathway of Purine nucleotides, degradation of Purine nucleotides, De novo synthesis and Salvage pathway of Pyrimidine nucleotides. Degradation of Pyrimidine nucleotides, Inhibitors of Nucleotide metabolism.

UNIT V
Bioenergetics
Thermodynamics and biochemical equilibria – laws of thermodynamics, free energy, ΔG - Endergonic and exergonic reactions

REFERENCE BOOKS

Course Outcomes:
The learners will be able to:
- Understand the concepts of metabolism, characteristics of metabolic pathways and strategies used to study these pathways.
- To relate various metabolic interrelationship and its control
- Gain a detailed knowledge of various catabolic and anabolic pathways
- Understand the regulation of various pathways
M.Sc. BIOCHEMISTRY

SEMESTER II

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Total Marks : Internal – 25  External – 75  Paper Type: Core V

OBJECTIVES

❖ To study the gene manipulation, cloning and gene expression techniques.
❖ To understand on biology and genetic basis of cancer

UNIT I

Techniques-Isolation and purification of Nucleic Acids. Agarose Gel Electrophoresis, Southern, Northern and Western hybridization. Restriction Modification enzymes in recombinant DNA technology and cloning: Restriction endonuclease (nomenclature, types, recognition sites, applications), DNA Ligase, Alkaline phosphatase, Reverse transcriptase, Nuclease, Terminal transferase, Polynucleotide kinase. Linkers and adaptors. Marker genes, selectable and screenable markers and aptamers. DNA sequencing – Sanger’s method. PCR - principle, types and applications.

UNIT II

Cloning vectors – Plasmid vector - pBR322, pUC18. Bacteriophage vectors, cosmids, phagemids, YAC and BAC vectors, Viral vectors - SV 40


UNIT III

Hybridization: RAPD, RFLP, types of probes and application, FISH, DNA Finger printing and Foot printing. Applications of rDNA technology, Gene targeting and gene tagging. Construction of genomic and cDNA libraries.

Therapeutic applications - Insulin, Growth hormones, Hepatitis B vaccines. Gene therapy: Stem cell gene therapy, Somatic cell gene therapy, gene therapy for inherited diseases; familial hypercholesterolemia, ADA and Cystic fibrosis.
UNIT IV
Cancer Biology

UNIT V
Carcinogenesis

REFERENCE BOOKS

Course Outcome
1. Explain the basic techniques in gene manipulation and various enzymes used in gene transfer.
2. Analyze on basic characteristic features and significance of cloning vectors, gene transfer methods and various cloning techniques.
3. Depict on the significance and applications of recombinant DNA technology.
4. Pertain on Overview of cell cycle, cell growth, tumors, cancers and isolation techniques
5. Describe on carcinogenesis
M.Sc. BIOCHEMISTRY
SEMESTER II

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COURSE OBJECTIVES
This paper aims to provide a basic understanding of structure and functions of cell, photosynthesis, nitrogen fixation, and pytohormones. This paper also provides knowledge about secondary metabolites and gene transfer methods.

UNIT I

UNIT II

UNIT III

UNIT IV
Micropropagation, Callus induction, cell and protoplast culture, organogenesis and somatic embryogenesis. Applications of tissue culture for crop improvement in agriculture, horticulture and forestry. Haploid production – Anther, pollen, embryo and ovule culture and their applications. Soma clonal variation.

UNIT V


REFERENCE BOOKS

8. Biotechnology by David S. Goodsell
10. Engineering Principles in Biotechnology, Wei-Shou Hu, 2018

Course outcome:

- Understand the basic knowledge of mechanism of water transport and Photosynthesis
- Describe the nitrogen fixation mechanisms in plants and interrelationship between photosynthesis and nitrogen metabolism.
- Get the Knowledge about the Biosynthesis, transport, distribution, mechanism of action and physiological effects of plant hormones
- Understand the role of secondary metabolites in drug development
- Know about the isolation, fusion and culture of protoplast and also understand genetic manipulation of plants. Understand the gene transfer methods for plants and also know marker free gene methodologies and gene targeting.
• Know the transgenic plants and its applications & risks. Also understand the genetic modification in food industry and its applications, controversies over risks.
• Know the plant molecular biology techniques and its applications.
OBJECTIVES

- To study the basic concepts of techniques in isolation, identification and estimation of plant constituents.

I. Plant tissue culture
1. Sterilization and media preparation
2. Callus Induction and micro propagation
3. Isolation of protoplasts
4. Protoplast Culture
5. Anther culture
6. Somatic Embryogenesis

II. Phytochemical analysis
1. Qualitative analysis of secondary phytochemicals in medicinal plants
2. Estimation of chlorophyll in leaves
3. Determination of aldehydes in lemon oil
4. Extraction and confirmation
   - a. Pectin from orange peel
   - b. Caffeine from tea
   - c. Solanine from potato
III. Quantitative analysis

1. Estimation of total alkaloids
2. Estimation of total phenols
3. Estimation of total flavonoids
4. Estimation of Phytosterols
M.Sc. BIOCHEMISTRY
SEMESTER II

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OBJECTIVES

- To study the basic concepts of techniques in isolation, identification and estimation of nucleic acids.

1. Estimation of DNA
   a) Diphenylamine method
   b) UV method
2. Estimation of RNA
   a) Orcinol method
   b) UV method
3. Comet Assay
4. Agarose Gel Electrophoresis
5. Isolation of plasmid DNA
6. Isolation of Genomic DNA
7. Isolation of RNA
8. Restriction digestion of DNA
9. Preparation of competent cell and Transformation
10. PCR – Demonstration
11. Southern Blotting – Demonstration

Reference books


5. James J. Greene, Veningalla B.Rao. Recombinant DNA principles and methodologies

Objectives:
The aim of the study of this paper is clinical approach of blood and urine samples and their complications.

UNIT I

UNIT - II
Disorders of carbohydrate metabolism – Diabetes mellitus - type I, II and gestational DM. metabolic abnormalities, diagnosis and management, acute and long term complications, glycogen storage diseases and Mucopolysaccharidosis.

Disorders of lipid metabolism, Lipid storage diseases - Taysach's and Niemann picksdiseases, fatty liver and lipoproteinemias. Atherosclerosis – risk factors, biochemical findings and management. Obesity - types, metabolic changes.

UNIT-III
Disorders of amino acid metabolism: Inborn errors of Branched chain amino acids, aromatic amino acids, aliphatic amino acids.


UNIT–IV
Liver function test: clinical significance of AST, ALT, ALP and GGT. Jaundice – types and differential diagnosis.

Renal function test: clearance tests, tests for renal blood flow, concentration and dilution tests. Acute and chronic renal failure, glomerulonephrities, nephrotic syndrome, urinary calculi and dialysis.

Pancreatic function test. Gastrointestinal function test: fractional gastric analysis, stimulation tests. Detection of inborn errors in fetus and heterozygous carriers by enzyme assay in amniotic fluid.

UNIT – V
Disorders of mineral metabolism: Porphyrins, Hemoglobin - Disorders of erythrocytemetabolism, hemoglobinopathies, thalassemia and anemia, Classification of anemia, blood clotting disorders.

REFERENCE BOOKS

Course Out come:
✓ Understand the collection and analysis of blood and urine samples.
✓ Understand the role of carbohydrates and lipid metabolism in various diagnostic and therapeutic approaches.
✓ Have a clear knowledge about inborn error and hereditary defects in amino acids metabolism.
✓ Know about the gastric function test for diagnosis and therapeutic complications.
✓ To learn the differentiate blood tests that are used to evaluate renal function test and liver functions.

✓ Know in detail about the disorders of mineral metabolism and Erythrocyte metabolisms
OBJECTIVES:
To study the immune responses of human body against antigen, immunological techniques and vaccine synthesis.

Unit I

Unit II
Immunity and Immune Response:

Unit III
Unit IV
Transplantation Immunology: Immunology of Allogeneic Transplantation, Types of Graft Rejection, Specific Immunosuppressive Agents, Immunology of Xenogeneic Transplantation, Transplantation- types of grafts, principles involved and mechanism of transplantation of various organs, immunosuppressive therapy, Graft Versus Host Disease. Role of MHC in transplantation, disease susceptibility and resistance and genetic control of primary histocompatibility.

Unit V

Vaccine production- types of vaccines, principles of vaccine production, production of conventional and modern vaccines, new vaccine strategies and vaccines under development. Vaccination strategies, immunization schedules.

Reference books for immunology

2. Basic immunology by Jacqueline Sharon. Williams and Wilkins, Baltimore MD.

Outcomes:

✓ Understand the humoral and cell mediated immunity.
✓ Know the primary and secondary lymphoid organ.
✓ Describe the theories of antibody formation and factors influencing antibody production.

✓ To learn the types of transplantation and understand how its malfunction linked with autoimmune disease and hyper sensitivity.

✓ Understand the active and passive immunization and learn how to make recombinant vector vaccines.

✓ Clear knowledge about the agglutination and precipitation techniques involved in research level.
M.Sc. BIOCHEMISTRY
SEMESTER III

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COURSE OBJECTIVES:

This course deals with the study of fundamental concepts of pharmacology about the physicochemical properties of the drug, their origin, classification and nomenclature of drugs, how do they act etc., It also enables the students to gain the complete knowledge about drug designing and also know about the principles of toxicology.

UNIT-I: General Pharmacology

Introduction to pharmacology, Sources of drugs, Classification and Nomenclature of drugs, Dosage forms, Routes of Drug administration, Factors influencing dosage and drug action, Absorption of drugs and factors affecting absorption, Distribution of drugs, Factors affecting distribution, Bioavailability, Dose response relationship, ED50 and LD50. Combined effect of drugs.

UNIT-II: Pharmacodynamics:


UNIT-III

Drug design and Discovery:

Physicochemical factors in relation to biological activity of drugs: Hydrogen bonding, Ferguson principle, Ionisation and pKa value, stearic features of drug, bioisosterism, Lipinski’s rule of five, Concepts of drug designing and marketing, Molecular modeling, QSAR-Quantitative structure Activity Relationship, Drug targets.
UNIT-IV

Systemic Pharmacology:
Anticholinergic drugs, Diuretics and anti diuretics, Antiarrhythmic drugs, Anti hypertensive drugs, Antibacterial agents, Antiviral agents, anticancer agents, Antiulcer agents, Anaesthetics-General and Local, Tranquillizers, Anti histamines, Non steroidal Anti inflammatory drugs-NSAIDS, Sedatives ,Analgesics, Anti tussives.

UNIT-V

Toxicology:
Basic Principles of Toxicology: Toxicants and its types, Classification of Poisons, Sources of Poisoning, Factors affecting toxicity, Chemical food poisoning, Toxic effects of metals (Arsenic Lead, Mercury, Copper, Iron) and nonmetals (Phosphorus, Chlorine, Bromine, Iodine, Formaldehyde) Toxic effects of Poisonous plants (Abrus precatorius, Ricinus communis, Calotropis) Toxic effects of Cardiac poison (Oleanders, Nicotine, Aconite) Toxic Effects Caustics, Treatment and management of poisoning, Antidotes.

REFERENCE BOOKS:


Course Outcome:

➢ Students who complete this course will be able to:
➢ Understand clearly about the basic concepts of pharmacology
➢ Have a thorough knowledge about the mechanism of drug action, Drug interaction, Receptors.

➢ Know the aspects of New discovery of drugs and drug designing.

➢ Recognize the principles of toxicology, Antidotes and the management of poisoning.
M.Sc. BIOCHEMISTRY
SEMESTER III

<table>
<thead>
<tr>
<th>Course Name: Biostatistics And Research Methodology</th>
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COURSE OBJECTIVES:
To study this paper we can understood methods which is used to implement in Research.

UNIT I
Organizing a statistical survey, Planning and executing the survey. Source of data - Primary and secondary data collection. Classification and tabulation of data. Diagrammatic and graphic presentation of data.

UNIT II
Measure of central tendency - arithmetic mean, median, mode, quartiles, deciles and percentiles. Measure of variation - range, quartile deviation, mean deviation, standard deviation, Coefficient of variation. Correlation analysis - Scatter diagram, Karl's Pearson's coefficient of correlation and Spearman's rank method. Regression analysis.

UNIT III
Sampling distribution and test of significance – Concepts of sampling, 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 and goodness of fit. Analysis of variance - one way and two way classification. Duncan's Multiple Range test.

UNIT IV
Meaning and significance of research, characteristics and types of research, the research process, features of good research study. Research applications. Research report - Structure and components of scientific reports, types of report, writing and documentation of research report, developing successful research proposals,
UNIT V

Research problem - components of research problem, formulation of research problem,
Research Design - Classification of research designs, need for research design, features of good
research design, experimental research design

REFERENCE BOOK

7. Research methods in biological science. Dr.S.Palanichamy, & M. Shanmugavelu,
8. Biochemical calculation and biostatistics. Dr. E.Padmini

Course Outcome:

✓ On completion of this course, students are able to understand about biostatistics, bioethics,
  IPR and legal protection, patent filling and infringement and biosafety.
✓ Understand the sample, population and statistical inference.
✓ Gain knowledge about concept, philosophical consideration and epistemology of science,
  ethical terms, principles and theories of bioethics
M.Sc. BIOCHEMISTRY
SEMESTER III

<table>
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<tr>
<th>Course Name: Microbial Biochemistry</th>
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Total Marks : Internal – 25  External – 75

Paper Type: Elective III

COURSE OBJECTIVES:
The aim of the study is to get knowledge about microorganisms and their characters. Gain knowledge about the applications of microorganisms.

UNIT I

UNIT II

UNIT III
Introduction to fermentation technology: Isolation and screening of industrially important microbes, Inoculum preparation - primary and secondary strain improvement. Detection and assay of fermentation products. Fermentation – Submerged and solid state fermentation. Fermenter - Types, Downstream processing. Microbes in mineral recovery and petroleum recovery - Bioleaching and Biosorption, Production of Biomass, Production of Single cell protein and Mushrooms.. Organic acids – Acetic acid, lactic acid, citric acid and gluconic acid. Solvent production - Ethanol and Butanol.
UNIT IV

UNIT V

REFERENCE BOOKS

Course Outcomes:

✓ Understand the classification and controlling of microbes and study isolation of microbes and maintenance.
✓ Describe important characteristic of microorganisms, thereby identify different type of microorganisms.
✓ Study about various types of microorganisms involved in infection of food products.
✓ Recognise the sources and transmission of infections and how the factors involving in infection.

✓ Know about the different types of microscopes and its functioned.
M.Sc. BIOCHEMISTRY
SEMESTER III

<table>
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<tr>
<th>Course Name: Lab course V</th>
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COURSE OBJECTIVES:
To study the basic concepts of techniques in isolation, identification and estimation of clinical samples.

I. Haematology
1. Enumeration of RBC and WBC
2. Differential count
3. Estimation of Haemoglobin
   a) Colorimetric method
   b) Sahli's method
4. Bleeding Time and Clotting time
5. ESR and PSV

II. Blood/Serum Analysis
1. Estimation of total blood sugar
2. Estimation of Total protein by Lowry's method
3. Determination of A:G ratio by Biuret method
4. Estimation of Urea DAM method
5. Estimation of Creatine and Creatinine- Alkaline picrate method
6. Estimation of Cholesterol- Zak's method
7. Estimation of Bilirubin [TB, DB & IB]
8. Estimation of Triglycerides
9. Estimation of Free Fatty Acids
10. Estimation of Vitamin C
11. Determination of LDH activity
12. Determination of AST & ALT activity
13. Determination of tissue antioxidant enzyme activity – SOD/CAT

III. Urine Analysis
1. Estimation of Urea, Uric acid, Creatine and Creatinine
2. Estimation of Titrable acidity
3. Estimation of Phosphate
4. Estimation of Na & Ka
5. Estimation of Chloride- Vanslyke's method

IV. Urinary Calculi analysis

V. Internship- 30 days training in fully automated Diagnostic laboratory Score; 20 out of 40 marks in practical Internals

*Note: Practical + Internship combined for 3+1 credits
M.Sc. BIOCHEMISTRY
SEMESTER III

<table>
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<th>Course Name: Lab course VI</th>
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**COURSE OBJECTIVES:**
To study the basic concepts of techniques in isolation, identification and estimation of Nucleic acids.

1. Blood Grouping and Rh Typing
2. RA test
3. CRP test
4. Pregnancy Test
5. Radial Immunodiffusion (RID) by Mancini’s technique.
6. Double Immunodiffusion (DID) by using Ouchterlony method
7. Immuno Electrophoresis
8. Rocket Immuno Electrophoresis
9. Counter Current Immuno Electrophoresis
10. Immunoprecipitation test
11. Total Leukocytes Count (TLC) of the given sample
12. Lysis of red blood cells (hypotonic lysis with H2O and ammonium chloride)
13. ELISA
14. Western Blotting

**REFERENCE BOOKS**

1. Practical immunology Frank L Hay and Olywn M R 4 thEdn. Westwood
3. Laboratory techniques in Biochemistry and Molecular Biology, Work and Work.
**M.Sc. BIOCHEMISTRY**

**SEMESTER IV**

<table>
<thead>
<tr>
<th>Course Name: Human Physiology And Endocrinology</th>
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**COURSE OBJECTIVES:**

To study the mechanism of human body systems and mode of action of Hormones

**UNIT I**

Digestive system – Structure, Digestive juices; composition and functions; digestion and absorption of carbohydrates, lipids, proteins. Intestinal and bile secretion and functions

Respiratory system - components and functions – transport and exchange of respiratory gases.

Circulatory system – structure and functions of heart, functions of blood, blood coagulation mechanism.

**UNIT II**

Excretory system – structure of nephron, formation of urine, tubular reabsorption; glucose, water, electrolytes and tubular secretion. Normal and abnormal constituents of urine.

Reproductive system - structure and functions of male and female reproductive system. Physiology of pregnancy and lactation. Spermatogenesis and Oogenesis. Brief account on the biological actions of testosterone and estrogen.

**UNIT III**

Nervous system – organization, conduction of nerve impulse and neuro transmission, action potential. Anatomical structure and function of nervous system, Gross anatomical structure of brain; CNS - Cerebral hemisphere, Diencephalon, brain stem, the spinal cord.

Muscle; Types of muscle. Structure of skeletal muscle. proteins - myosin, actin, troponin, tropomyosin and other proteins. Action potential, Reflex action, Mechanism and regulation of contraction and relaxation of skeletal muscle. The neuromuscular junction, Role of acetylcholine and Ach Receptor.

**UNIT IV**

The hypothalamus-pituitary axis. Hypothalamic hormones, Anterior and posterior pituitary hormones: Biological functions and regulation.

UNIT V


REFERENCE BOOKS
3. Principles of biochemistry. Emil I. Smith,

Course Outcomes:
✓ To understand the fundamental mechanisms of body fluids and blood cells.
✓ Illustrate the circulatory system includes heart structure, cardiac cycles and cardiac factors and respiratory system includes anatomy, physiology, gas exchange and explain the role of lungs in acid base balance.
✓ Learn about the anatomy of digestive system and secretions, composition and functions of gastric and biliary system thereby learn how to digest the biomolecules in intestine.
✓ Understand the classification, biosynthesis and mechanism of anterior and posterior pituitary hormones in biological regulation and know about its deficiency diseases.
√ Know in detail about synthesis, secretion, regulation, transport, metabolic fate and biological actions of thyroid hormone and learn about thyroid function test.

√ To learn clear picture about adrenal hormone’s synthesis, regulation, transport, metabolism and biological effects.

√ Recognize a role of gonadal hormones and know about biological effects of oestrogen and progesterone. Know what kind of biochemical changes occur during pregnancy.

√ Understand the signal transduction pathway through cytoplasmic and nuclear level and its role in cellular function.
M.Sc. BIOCHEMISTRY
SEMESTER IV

<table>
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<th>Course Name: Bioinformatics And Nanotechnology</th>
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COURSE OBJECTIVES:
To study different levels of Bioinformatics tools and applications. To gain knowledge about nanoparticles and their applications in science.

UNIT I
History, Scope and Importance
Important contributions - Aims and tasks of Bioinformatics - applications of Bioinformatics - challenges and opportunities - internet basics – HTML - introduction to NCBI data model - Various file formats for biological sequences.
Databases -Tools and their uses
Primary sequence databases - Composite sequence databases - Secondary databases
- Nucleic acid sequence databases - Protein sequence data bases - Structural databases -- Protein structure visualization tools (RasMol, Swiss PDB Viewer)

UNIT II
Sequence Alignment Methods
Sequence analysis of Biological data - Significance of Sequence alignment - Pairwise sequence alignment methods - Use of Scoring matrices and Gap penalties in sequence alignments - Multiple sequence alignment methods – Tools and application of multiple sequence alignment. Definition of genome and genomics. Types of gene map- genetic, cytogenetic and physical. Molecular markers for mapping - RFLPs, microsatellites and SNPs. Assembling a physical map of the genome - chromosome walking and jumping.

UNIT III
Proteomics and Genomics
Genome projects: E.coli, D.melanogaster, A. thaliana and mouse. The human genome project: goals, mapping strategies, markers, sequencing technologies, results of final sequence, potential benefits and risks, ethical, legal and social issues (ELSI).
UNIT IV
Introduction to Nanotechnology

UNIT V
Synthesis and applications of Nanomaterials
Top-down (Nanolithography, CVD), Bottom-up (Sol-get processing, chemical synthesis). Biological methods of Synthesis: Use of Plant extracts, bacteria, fungi, yeast and other biological particles. Applications of Nanotechnology in Biomedical and Pharmaceutical Industries.

REFERENCE BOOKS

Course Outcomes:

✔ Understand the basic concepts of bio-informatics databases and tools on internet. Learn how to apply computational facility in different fields of life sciences, physical and chemical sciences.

✔ Have a clear detail about different protein structure and its predicting method.

✔ To learn how can utilise the BLAST and FASTA analysis for biological sequence.

✔ Recognise how can visual the structures and classification of proteins by visualization tools and learn to utilise this tools for alignment and analysis.

✔ Understand the drug designing through computer based modification programs using synthetic or natural source.
M.Sc. BIOCHEMISTRY
EXTRA DISCIPLINARY COURSE I

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<th>Course Name: Biochemistry in Human Health</th>
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UNIT - I

UNIT - II
Protein - Sources of proteins and amino acids. Importance of proteins in living organisms. Normal level of protein in human. Protein deficiency disease-Kwashiorkor and Marasmus Protein quality 'Inborn error of amino acid metabolism.

UNIT - III
Fatty acids - source of fats and importance of fats and lipids in living organism and. Role of LDL, VLDL, HDL and chylomicrons in human body. Normal levels of cholesterol hypercholesterolemia and role of cholesterol in Blood pressure. Atherosclerosis and Heart attack' Prevention and control of heart related diseases

UNIT – IV
Water structure, physical and chemical properties. Vitamins- water soluble and fat soluble vitamins; Sources, chemical composition, Biological function and property, Deficiency diseases in human.

UNIT - V
Minerals Source and deficiency disorders of Macro-minerals; Sodium, Potassium, Calcium, Magnesium, Micro-minerals: Copper, phosphorus, Iron, Iodine, Zinc and Selenium in human Prevention and control of Anemia.
REFERENCE BOOKS


6. Fundamentals of Biochemistry for Medical Students by Ambika shanmugam 2006. Published by author; West CIT Nagar, Chennai-35


M.Sc. BIOCHEMISTRY
EXTRA DISCIPLINARY COURSE II

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<th>Course Name: Human Physiology And Nutrition</th>
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Paper Type: EDC II

UNIT I

Excretory system; Structure of kidney and ultra-structure of nephron. Formation and composition of urine. Outline of excretory system - 'Micturition'.

UNIT - II

Circulatory organs, composition of blood, systemic, pulmonary circulation, Heartbeat, cardiac cycle, origin and conduction of heart beat, Regulation of heart beat, human heart' coronary circulation, ischemic heart disease, ECG, Bloodpressure and cardiac output.

UNIT - III

UNIT - IV
UNIT - V

REFERENCE BOOKS
1. Food Science, Potter.
10. Human nutrition and dietetics I.S. Garral, W.P.T. James ILPs co3
M.Sc. BIOCHEMISTRY
EXTRA DISCIPLINARY COURSE III

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<th>Course Name: Hospital Management And Medical Coding</th>
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Paper Type: EDC III

UNIT I
Introduction on Hospital management: Eligibility and personal skills required for Hospital management. Job opportunities in Hospital management. Important hospital management Institutes in India and World Hospital management. Concept of Modern Hospital & privatization in Health Sector, Public Sector Hospitals and Level of care offered, facilities, Effects of Globalization in Health care, Concept of Corporate Hospital in developing countries.,

UNIT - II
Infrastructure and lay out of an ideal corporate hospital, Functioning of modern hospitals & changing need of patients Hospitality in Hospital Care, Invasive and non-invasive diagnostic facilities in modern hospital Care offered in Specialty and Super specialty Hospitals. Hospital management system: Benefits of Hospital management systems, Modules of Hospital management system. Interfacing of analyzer Pathology lab management, Radiology, Blood Bank, Pharmacology management softwares.

UNIT - III
History of Medical Transcription: Drawbacks of MRP system, Advent of Medical Transcription, Web friendly operating system. Market information on companies. What Medical Transcription does? Benefits in a nut shell. Planning on Medical Transcription set up Induction and orientation.

UNIT - IV
Impact of Medical Transcription: Medical Transcription impact on its stock holders Impact during the implementation process. Impact on Departments, Organization as whole, Employment, Nature of job, Information access and Individual employees. Advantages in corporate entity, Disadvantages.

UNIT - V
Medical Transcription implementation: Medical Re engineering, Choosing appropriate
transcription, Customise to suit the changes Medical Transcription: Best practices Costs, Failure, Gap analysis. Implementation, Life cycle Medical Transcription- Trouble and their solutions.

**REFERENCE BOOKS**

1. Hospital Management module II- NIHFW, New Delhi
2. G. D. Kunders. Hospital Administration.
3. Tabish. Hospital Administration. calorie malnutrition in children. protein and energy/requirements Nitrogen balance