# Program and Course Structure

## School of Medical Science and Research

## MSc(Medical Biochemistry)
## Session:2025-26
## Program Code: SMS0402

## 1. Standard Structure of the Program at University Level

### 1.1 Vision, Mission and Core Values of the University

#### Vision of the University

To serve the society by being a global University of higher learning in pursuit of academic excellence, innovation and nurturing entrepreneurship.

#### Mission of the University

1. Transformative educational experience
2. Enrichment by educational initiatives that encourage global outlook
3. Develop research, support disruptive innovations and accelerate entrepreneurship
4. Seeking beyond boundaries

#### Core Values

- Integrity
- Leadership
- Diversity
- Community

## 1.2 Vision and Mission of the School

### Vision of the School

To serve the society by being a premier institute that promotes a comprehensive approach to human health through excellence inacademics, research and clinical care

### Mission of the School

- Provide a transformative educational experience in Medical Science
- Develop skills and competencies to create global leaders in clinical care
- Promote innovative and collaborative research through intellectual and technological advancement
- Establish a center for excellence in preventive, promotive and curative health care

### Core Values

- Integrity
- Leadership
- Ethics
- Community Health

## 1.3 Program Educational Objectives (PEO)

### 1.3.1 Writing Program Educational Objectives (PEO)

Program Objectives
A post graduate student having qualified the MSc (Medical Biochemistry) examination should be able to:

PEO1. explain clearly concepts and principles of biochemistry and cell biology, including correlations of these with cellular and molecular processes involved in health and disease.
PEO2. effectively teach undergraduate students in medicine and allied health science courses so they become competent health care professionals and able to contribute to training of postgraduate post graduate students.
PEO3. Assist to set up/supervise/manage a diagnostic laboratory in Biochemistry in a hospital, ensuring quality control, and providing a reliable support service.
PEO4. Conductbiochemical lab tests and interpret laboratory results using an ethical and professional approach
PEO5. carry out a research project from planning to publication and be able to pursue academic interests and continue life-long learning to become more experienced in all the above areas and to eventually be able to guide postgraduates in their thesis work.

### 1.3.2 Map PEOs with Mission Statements:

| **PEO Statements** | **School Mission 1** | **School Mission 2** | **School Mission 3** | **School Mission 4** |
|---|---|---|---|---|
| PEO1.explain clearly concepts and principles of biochemistry and cell biology, including correlations of these with cellular and molecular processes involved in health and disease | **3** | **3** | **3** | **3** |
| PEO2.effectively teach undergraduate students in | **3** | **3** | **2** | **2** |

| | | | | |
|---|---|---|---|---|
| medicine and allied health science courses so they become competent health care professionals and able to contribute to training of postgraduate post graduate students | | | | |
| PEO3. Assist to set up/supervise/manage a diagnostic laboratory in Biochemistry in a hospital, ensuring quality control, and providing a reliable support service. | **3** | **3** | **3** | **3** |
| PEO4. Conduct biochemical lab tests and interpret laboratory results using an ethical and professional approach | **3** | **3** | **3** | **3** |
| PEO5.carry out a research project from planning to publication and be able to pursue academic interests and continue life-long learning to become more experienced in all the above areas and to eventually be able to guide postgraduates in their thesis work | **3** | **3** | **3** | **2** |

**1.3.3 Program Outcomes (PO's)**

The student during the training program should acquire the following competencies:

**A. Cognitive domain**

PO1. Understand, describe and summarize the molecular and functional organization of cells. Structure function relationship of and interrelationships of various biomolecules in health and disease.

PO2. Summarize the basic clinical aspects of enzymology with emphasis on diagnostic enzymes

1. Understand and describe digestion, assimilation of nutrients and associated disorders

PO3. Understand and integrate the various metabolic pathways and their regulation
PO4. Describe mechanisms involved in water, electrolyte and acid base balance.
PO5. Understand and summarize basic molecular mechanism of organization of genome, genetic expression and regulations; recombinant DNA technology and genetic engineering and explain biochemical basis of common inherited disorders.
PO6. Summarize basic concepts of immunology including body defense mechanism.
PO7. Understand biochemical aspects of carcinogenesis and effects of xenobiotics.
PO8. Identify principles of routine and specialized biochemical laboratory investigations and techniques: analysis and interpretation of biochemical laboratory reports.
PO9. Be familiarwith literature survey/computer skills, basic knowledge of biostatistics

**B. Affective domain**

PO10. Communicate biochemical reasoning effectively with peers, staff and faculty, and other members of the health care team.
PO11. Demonstrate respect in interactions with patients, families, peers, and other healthcare professionals.
PO12. Demonstrate effective use of nutrition, lifestyle and genetic counseling.
PO13. Be aware of the cost of diagnostic tests and economic status of patients.
PO14. Acquire skills for self-directed learning

**C. Psychomotor domain**

PO15. Use basic devices for qualitative and quantitative biochemical investigations.
PO16. Plan and conduct lecture, practical demonstrations and tutorial classes
PO17. Critically review and comment on research papers
PO18. Prepare research protocols to conduct experimental studies, analyse, interpret diseases

| | PEO1 | PEO2 | PEO3 | PEO4 | PEO5 |
|---|---|---|---|---|---|
| PO1 | 3 | 3 | 3 | 3 | 3 |
| PO2 | 3 | 3 | 3 | 3 | 3 |
| PO3 | 3 | 3 | 3 | 3 | 3 |
| PO4 | 3 | 3 | 3 | 3 | 3 |
| PO5 | 3 | 3 | 3 | 3 | 3 |
| PO6 | 3 | 3 | 3 | 3 | 3 |
| PO7 | 3 | 3 | 3 | 3 | 3 |
| PO8 | 3 | 3 | 3 | 3 | 3 |
| PO9 | 3 | 3 | 3 | 3 | 3 |

| | | | | | |
|---|---|---|---|---|---|
| PO10 | 3 | 3 | 2 | 3 | 3 |
| PO11 | 2 | 2 | 3 | 3 | 3 |
| PO12 | 2 | 2 | 3 | 3 | 2 |
| PO13 | 2 | 2 | 3 | 3 | 3 |
| PO14 | 2 | 3 | 3 | 3 | 2 |
| PO15 | 3 | 3 | 3 | 3 | 3 |
| PO16 | 3 | 3 | 3 | 3 | 3 |
| PO17 | 3 | 3 | 2 | 3 | 3 |
| PO18 | 2 | 3 | 2 | 3 | 3 |

| | | |
|---|---|---|
| **School: SMSR** | | **Batch: 2019-20** |
| **Program: MSc MEDICAL BIOCHEMISTRY** | | **Current Academic Year: 2019-20** |
| 1 | Programme Code | SMS0402 |

**DEPARTMENT OF BIOCHEMISTRY**
**SCHOOL OF MEDICAL SCIENCES & RESEARCH**
**SHARDA UNIVERSITY**
**M.Sc. (Medical Biochemistry) Course**

**About the course**

M.Sc. Medical Biochemistry programme would provide basic and applied biochemistry with emphasis on Medical Biochemistry.

**The course is of three years for basic Life Science graduates and two year duration for MBBS/BDS graduates.**

The course programme includes the following:

The academic programme consists of strong practical component consisting of basic and advanced techniques in basic biochemistry and Medical biochemistry with emphasis on Clinical biochemistry. The programme is supplemented by theory lectures, discussions, tutorials and research skills through assignments, dissertation and Journal club seminars etc

The course content includes Anatomy, Physiology and Biochemistry course of MBBS students in the first year. From second year the specialization in Biochemistry which comprises basic and advanced techniques of biochemistry, clinical biochemistry and Molecular biology.

**Career options**

As a Post graduate of Medical Biochemistry has following career options in various fields
a. Teaching and Research institutions
b. Pharmaceutical companies
c. Clinical diagnostic laboratories
d. R&D firms/companies
e. Food industries

**Career Path**
**A. Teaching field:**
**Medical**: Immediately after passing the course the candidates are eligible to be appointed as Tutors/Demonstrators in Biochemistry Departments of Medical/Dental/Pharmacy Colleges. After obtaining Ph.D. in Medical Biochemistry the candidate becomes eligible to be appointed as Assistant Professor and with experience and requisite research publications can be promoted up to Professor

**Basic Science Institutions**: Becomes eligible to become Lecturer/Assistant Professor and after obtaining Ph.D and with experience can be promoted as Professor
**Research Institutions** Can be eligible to be appointed as Junior Scientist and after obtaining Ph.D becomes eligible for the post of Scientist
**Clinical Laboratories/Pharmaceutical companies**: can be appointed as Biochemist
**Infrastructure available in the Department**:
**Teaching Faculty of the Department**: Well experienced faculty with 1 Professor, 1 Associate Professor and 2 Assistant Professors
**Infrastructure**: Department has basic infrastructure for teaching and research. The clinical laboratory has Autoanalyser, Semiautoanalyser, ISE based electrolyte analyzer, ABG etc
**M.Sc Medical Biochemistry course**
**Duration:** 3 years for B.Sc in Life Science/BSc.MLT graduates 2 years for MBBS graduates
**Eligibility:** MBBS/B.Sc .in Biochemistry or Life Sciences/BSc.MLT

**Objectives:**
At the end of the course the learner should be able to
1. Understand, describe and summarize the molecular and functional organization of cells. Structure function relationship of and interrelationships of various biomolecules in health and disease.
2. Summarize the basic clinical aspects of enzymology with emphasis on diagnostic enzymes
3. Understand and describe digestion, assimilation of nutrients and associated disorders
4. Understand and integrate the various metabolic pathways and their regulation
5. Describe mechanisms involved in water, electrolyte and acid base balance.
6. Understand and summarize basic molecular mechanism of organization of genome, genetic expression and regulations; recombinant DNA technology and genetic engineering and explain biochemical basis of common inherited disorders.
7. Summarize basic concepts of immunology including body defense mechanism.
8. Understand biochemical aspects of carcinogenesis and effects of xenobiotics.
9. Identify principles of routine and specialized biochemical laboratory investigations and techniques: analysis and interpretation of biochemical laboratory reports.

10. Use basic devices for qualitative and quantitative biochemical investigations.
11. Plan and conduct lecture, practical demonstrations and tutorial classes
12. Critically review and comment on research papers
13. Prepare research protocols to conduct experimental studies, analyse, interpret diseases
14. Be familiarize with literature survey/computer skills, basic knowledge
Of biostatistics

**METHODOLOGY**

Following methods are used to facilitate learning and training of the students.

**A. Theory**

1. **Tutorials:** will be held for 1 hour duration, at least twice a month. The objective is to provide an opportunity to the students to have interaction with the teachers and gain maximum coordinated information on the subject.
2. **Seminars:** will be held once a month. The topics will be chosen from the latest advances in the subject and also from areas of general biological / biochemical interest. One student will take up a topic for one seminar, prepare and speak on it. Presentation and discussion will be for 1 hour.

By this exercise, the students will know the advanced developments in the fields & also learn, comprehend and explain the information they have obtained.

3. **Journal club:** To develop a) skills of analysis, evaluation and presentation of research papers b) familiarity with approaches and methodologies of research and c) to update on new development/ emerging trends in biochemistry.
4. **Invited lectures:** to gain access to recent work by an expert in an area and opportunity for free interactions with scientists of eminence.
5. **Relevant lectures in medical biotechnology**

**1st Year: students shall attend the classes along with first year M.B.B.S. students**
**f2nd Year: The thesis topic shall be allotted to the candidates within a month after promotion. The thesis topic shall be on research work/methodology on any topic of Biochemistry including Clinical Biochemistry.**
**No annual examination shall be conducted but regular class tests will be conducted**
**3rd Year Six months before the examination the candidate has to submit the thesis which has to be accepted by the external examiner**
**The Final examination shall be conducted with 4 theory papers followed by practical examination**

**Internal Assessment:**

- Theory 50 Marks
- Practical 50 Marks

**Total Marks** **MM 100**

**University Examination:**

**A. Theory: 4 papers**

**Paper -I:** 100 Marks

**Paper –II:** 100 Marks

**Paper- III:** 100 Marks
**Paper –IV:** 100 Marks

| | | |
|---|---|---|
| | **Total Marks of Theory Papers** | **MM 400** |
| **B.** | **Practical (200)&Viva-voce (100)** | **MM 300** |
| **Grand total (A+B+Int. Ass)** | | **MM 800** |

Pass marks 50%

**Detailed course contents**

**Paper –I**

1. Chemistry of Carbohydrates
2. Chemistry of Lipids
3. Chemistry of AminoAcids and Proteins
4. Chemistry of Nucleic Acids
5. Enzymes
6. Biological Oxidation
7. Instrumentation

**Paper – II**

1. Molecular and Functional Organization of Cell
2. MolecularBiology
3. Nutrition.

**Paper –III**

1. Introduction to Metabolism
2. Metabolism of Carbohydrates
3. Metabolism of Lipids
4. Metabolism of Proteins
5. Interrelation ship of metabolism of carbohydrates, proteins & lipids.
6. Vitamins

7. Water and mineral metabolism.
8. Hemoglobin metabolism.
9. Mechanism of hormone action.

**Paper –IV**

1. Clinical biochemistry.
2. Biochemical basis of inherited disorders.
3. Porphyrias, Plasma Proteins, Various Organ Function Teats
4. Biochemical basis of environmental health hazards.
5. Detoxification,
6. Biochemical basis of cancer and carcinogenesis.
7. Biochemical basis of nerve conduction and muscular conduction.

**Practical course**

1. Physical aspects of Biochemistry: Concept of pH, Preparation of Buffers and determination of pH using indicators, pH meter, acidimetry and alkalimetry, Colorimetry.
2. Qualitative tests for identification of Carbohydrates, Quantitative estimation of glucose, lactose
3. Preparation and estimation of glycogen.
4. Qualitative tests for identification of proteins, quantitative estimation of proteins by Biuret , Lowry and Bradford methods
5. Purification of proteins and enzymes. Paper electrophoresis
6. Qualitative tests for lipid, Saponification number, Iodine number, Isolation and estimation of phospholipids, estimation of Cholesterol. Thin Layer chromatography
7. Isolation and estimation of DNA and RNA
8. Restriction enzyme digestion of DNA and agarose gel electrophoresis
9. Digestion: Digestion of starch, proteins, analysis of gastric juice, bile.
10. Estimation of enzymes: Salivary amylase, Determination of Km
11. Estimation of Vitamins: Vitamin C, Vitamin E
12. Blood: Plasma proteins, Hemoglobin spectroscopy, Separation of plasma, serum, Estimation of protein, albumin, creatinine, glucose, cholesterol , bilirubin , calcium, phosphorous, serum alkaline phosphatase,SGOT and SGPT
13. Urine: normal and pathological constituents
14. Paper chromatography, Ion exchange chromatography, PAGE, ELISA, etc.
15. Separation and identification of isoenzymes of LDH
16. Flame photometer,Autoanalyser,ISE based ion analyzer.

SIGNATURE OF ASSESSEE SIGNATURE OF CONSULTANT SIGNATURE OF HOD