# MATS University

## MATS SCHOOL OF SCIENCES

## SYLLABUS

## FOR

**Three Year Full Time Bachelor Degree Program**

## BACHELOR OF SCIENCE

B. Sc. Biotechnology

# SEMESTER PATTERN

# (2025 - 2028)

**GENERAL INTRODUCTION OF THE DEPARTMENT**

MATS School of Sciences (MSS) was established with a vision to create technocrats in the applied branches of Sciences to convey updated scientific knowledge. In the school theperformances of the students are constantly monitored by continuous assessment. The School believes in supplementing academic input of students with the help of regular Seminar, Guest Lectures, Industrial/Research Institute visits and encouraging the students to participate in National & International Seminars, Conferences and Workshops.

**DEPARTMENT HIGHLIGHTS**

- Research focus on frontier of Life Sciences and affordable healthcare
- Highly acclaimed scientists as faculty
- State-of-the-art Lab facilities
- Hand-on training on sophisticated equipments
- Academia – Industry interface
- Multidisciplinary research in affordable healthcare, Agriculture and Food

**COURSEDESIGN**

The department follows a unique course-design which is contemporary and cutting-edge. It includes modern and advanced papers/ subjects including the papers from Management Science as given in the curriculum matrix

**PEDAGOGY**

- Chalk Board, LCD and Projector based teaching
- Research based teaching
- Project based learning
- Separate lab bench for each student

**FACILITIES**

State-of-the-art facilities include:

- Double beam UV- Visible Spectrophotometer, Cooling Centrifuge, Microfuge, Incubators, Microscopes, Laminar flow hoods, Colorimeter, Micro- and regular balance, Electronic Balance Autoclave, Glass distillation apparatus, Computers, Deep freeze, pH meter, conductivity meter, DNA/RNA & Protein Electrophoresis apparatus, Plant Tissue Culture racks with light arrangements, Shakers, BOD incubator & Orbital Shaking Incubator etc
- Microbial cell culture
- Plant tissue culture

**FACULTIES**

- Well experienced faculties from Academic Institutes and Industries
- Invited lectures by eminent scientists from different countries

**B. SC. BIOTECHNOLOGY: SCOPE AND CONTENT**

Biotechnology is the research-oriented science including a fusion of biology and technology. This study includes a large variety of subjects including Cellular Genetics, Molecular biology, Plant Diversity, Chemistry, General Microbiology, Animal Sciences, Plant Sciences, Environmental Studies, Computer applications, Biostatistics, Biochemistry, Medical Microbiology & Immunology, Genetic Engineering, Entrepreneurship, Languages English & Hindi, Industrial Biotechnology, Principles of Management, Plant & Animal Biotechnology, Anatomy, Physiology &

Reproductive Biology, Principles of Marketing Project work etc. Biotechnology features the use of living cells and bacteria in the industrial process. Biotechnology can be applied in developing various vaccines, medicines and diagnostics, improving energy production and conservation and increasing productivity.

**OBJECTIVES OF THE B.Sc. BIOTECHNOLOGY PROGRAM (Three Years and Four Year (Research/ Honors)**

1. To impart basic knowledge and skills of various aspects of biotechnology.
2. To train the students for industrial need and to pursue further education.
3. To develop human resource and entrepreneurs in biotechnology with the ability to independently start their own ventures or small biotech units in the field of biotechnology.
4. Understand modern biotechnology - practices and approaches with an emphasis in technologyapplication in pharmaceutical, medical, industrial, environmental and agricultural areas.
5. Become familiar with public policy, bio-safety, and intellectual property rights issues related tobiotechnology applications nationally and globally
6. Gain experience with standard molecular tools.
7. Develop skills in teamwork.

**ELIGIBILITY FOR ADMISSION:**

Interested aspirants for B.Sc. Biotechnology degree need to fulfill the below mentioned eligibility criteria.

- Completion of Higher Secondary (10+2) level of education.
- Physics, chemistry and biology as main subjects at HSC level
- Instead of biology, one may even have had any subject related to biological sciences as one of the mainsubject of study.

**PROGRAM OUTCOME:**

1. Students will acquire **fundamental knowledge** of skills, vocational certificates, and their practical applications.
2. Students will be able to **demonstrate and apply** principles of skills and vocational training in real-life contexts.
3. Diploma holders will be able to **apply knowledge and concepts** to solve issues related to their respective courses.

4. Diploma holders will develop the ability to **analyze problems and derive valid conclusions** using fundamental subject knowledge.
5. Diploma holders, considering the needs of **society and the environment**, will be able to propose solutions within the safety limits of existing rules and guidelines.
6. Graduates will possess the ability to **design and conduct experiments, analyze results, and interpret data** for problem investigation in their fields.
7. Graduates will have the capacity to **select and apply appropriate tools, techniques, and modern technologies**.
8. Graduates will gain knowledge for **assessing societal, health, safety, and legal aspects** and will recognize their duties as responsible citizens.
9. Honors degree holders will understand the **need for sustainable development** and apply it in their field.
10. Honors degree holders will develop knowledge of **ethics, regulatory norms, and professional standards** in their course of study.
11. Honors degree holders will possess strong **oral and written communication skills**, along with teamwork and collaborative spirit.

**PROGRAM SPECIFIC OUTCOMES:**

1. Ability to apply **knowledge and techniques of basic sciences** related to biological and chemical sciences.
2. Competence in **designing, optimizing, scaling up, and analyzing biochemical processes** for the development of useful products for society.
3. Proficiency in **tabulating, analyzing, and interpreting biological data** using relevant computer software.
4. Capability to understand the three **fundamental aspects of biological phenomena**: *What to seek? How to seek? Why to seek?*

**CAREER PROSPECTS:**

The bio-technology Industry is constantly growing and in the past 10 years, human resources in the field have grown drastically. Today, Indian biotech sector comprises of lot many companies and bio suppliers, generating ample amounts of revenues. Indian biotech industry comprises of clinical research, new drug discovery, bioinformatics, R&D, biopharmaceuticals etc. Bio-tech industry has rapid growth rate per annum. As there is increasing popularity and explosive growth, there are plenty of opportunities available in Biotechnology field. One can be a Research Scientist, Teacher, Marketing manager, Science Writer, Bioinformatician, Quality Control Officer or Production in-charge in the Food, Chemical and Pharmaceutical industry, Analyst, Environmental / Safety Specialist.

**THE MAIN JOB SECTORS ARE AS FOLLOWS:**

Biotechnology companies, Health service organizations, Pharmaceutical companies, Universities and Research institute, Horticultural industries, Conservation organizations, Food and drink manufacturers, Water industry, Agricultural industry, Law Enforcement.

**ATTENDANCE:**

A candidate shall be deemed to have undergone a regular course of study in the University, if he/she

has attended at least 60% of the lectures in each subject will be at least 75% in the aggregate of lectures, tutorials and practical in order to be eligible to appear at the Final Examination.

**SCHEME OF EXAMINATION, EVALUATION AND DISTRIBUTION OF MARKS:**

1. The overall weightage of a course in the Syllabi and Scheme of Teaching & Examination shall bedetermined in terms of Marks assigned to the course.
2. The evaluation of students in a course shall have two components unless specifically stated otherwise inthe Scheme of Teaching & Examination and Syllabi:

(i) Evaluation through a semester-end examination (University Examination Marks)
(ii) Continuous evaluation by the teacher(s) of the course.

| | | Bachelor's degree/ Under-graduate diploma | Master's degree/ Post-graduate diploma |
|---|---|---|---|
| **A.** | **THEORY COURSES** | | |
| | (i) Semester-end examination | 70% | 70% |
| | (ii) Continuous evaluation by the teachers | 30% | 30% |
| B. | PRACTICAL/LABORATORY COURSES | | |
| | (i) Semester-end examination | 70% | 70% |
| | (ii) Continuous evaluation by the teachers | 30% | 30% |
| C. | DISSERTATION/THESIS | | |
| | (i) Assessment by External Examiner | 70% | 70% |
| | (ii) Assessment by Internal Examiner | 30% | 30% |

**CONTINUOUS EVALUATION (INTERNAL MARKS)**

**(i) Theory courses**

The division of internal marks will of 50% marks for mid semester examination and 50% of marks for the internal class tests. There shall be three class tests held during each semester. These class tests shall ordinarily be held after 4 weeks, 8 weeks and 12 weeks of teaching in accordance with the University Academic Calendar.

**(ii) Practical/Laboratory courses**

The total internal marks in practical /Laboratory courses shall be based on performance in the laboratory, regularity, practical exercises /assignments, quizzes, etc. The assessment shall be given at three nearly equi-spacedintervals.

**PASSING MARKS:**

For undergraduate students, obtaining a minimum of 40% marks in aggregate in each course shall be essential for passing the course and earning its assigned credits. A candidate, who secures less than 40% of marks in a course, shall be deemed to have failed in that course.

**GRADING SYSTEM:**

**For UG:**

80% and above – "10 Grade Point" and Letter Grade "O" (Outstanding)
40% and above but below 45% - "Grade Point 4" and Letter Grade "P" (Pass)

**For PG:**
80% and above – "10 Grade Point" and Letter Grade "O" (Outstanding)
45% and above but below 50% - "Grade Point 4" and Letter Grade "P" (Pass)

**PROGRAM DURATION:**
The maximum permissible period for completing a program for which the prescribed program duration is **n semesters**, shall be **(n+4)** semesters. All the program requirements shall have to be completed in (n+4) semesters.

**ATKT CRITERIA:**
ATKT Candidate means a candidate who failed in not more than forty percent of the total number of Core and Core bracket papers, excluding the Practical Examination / Project Work / Viva Voce Examination in the Semester Examination and is appearing in the Examination of same semester again which is organized with the next Semester Examination. Forty percent will be rounded off to higher side in case it is not a whole number. In case a Students fails or was absent in Practical Examination / Project Work / Viva Voce Examination, he/she may be allowed to have ATKT exam on his/her own expense.

| Programme: Bachelor of Biotechnology (B.Sc) Sem: I | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| NHEQF Level: 5 \| Courses | | | | Teaching Scheme | | | | Evaluation Scheme | | Total Marks |
| Course Category | Course Sub Category | Course Name | Code | Hours | | | Credits | | | |
| | | | | Theory | Tutorial | Practical | | CIA | ESE | |
| Discipline Specific Core Course (DSCC) | Major | Biotech-I: General Biotechnology | BSC DSC – 009 | 3 | 0 | 0 | 3 | 70 | 30 | 100 |
| | Major | Bioscience-I: Plant Diversity | BSC DSC - 010 | 3 | 0 | 0 | 3 | 70 | 30 | 100 |
| | Major | Fundamental Chemistry - I | BSC DSC - 011 | 3 | 0 | 0 | 3 | 70 | 30 | 100 |
| Discipline Specific Core Practical (DSCCP) | Major | Biotechnology Lab - I | BSC DSC - 012 | 0 | 0 | 2 | 1 | 35 | 15 | 50 |
| | Major | Bioscience Lab – I | BSC DSC - 013 | 0 | 0 | 2 | 1 | 35 | 15 | 50 |
| | Major | Chemistry Lab – I | BSC DSC - 014 | 0 | 0 | 2 | 1 | 35 | 15 | 50 |
| General Elective Inter/Multidisciplinary/ Allied Courses (GEC) | GEC | Nutrition for Health | GE 005 | 4 | 0 | 0 | 4 | 70 | 30 | 100 |
| Ability Enhancement Course (AEC) | AEC | Communication Skill | AEC 001 | 2 | 0 | 0 | 2 | 35 | 15 | 50 |
| Skill Enhancement Course (SEC) | SEC | Instrumentation and System Biology | SEC 005 | 2 | 0 | 0 | 2 | 35 | 15 | 50 |
| Value Added Course (VAC) | VAC | Yoga and Human Consciousness | VAC 001 T | 1 | 0 | 0 | 1 | 35 | 15 | 50 |
| Value Added Course (VAC) | VAC | Yoga and Human Consciousness | VAC 001 P | 0 | 0 | 1 | 1 | 35 | 15 | 50 |
| **Total** | | | | **18** | **0** | **7** | **22** | **525** | **225** | **750** |

| Programme: Bachelor of Biotechnology (B.Sc) Sem: II | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| NHEQF Level: 5 \| Courses | | | | Teaching Scheme | | | | Evaluation Scheme | | Total Marks |
| Course Category | Course Sub Category | Course Name | Code | Hours | | | Credits | | | |
| | | | | Theory | Tutorial | Practical | | CIA | ESE | |
| Discipline Specific Core Course (DSCC) | Major | Biotech-II: General Biochemistry | BSC DSC - 044 | 3 | 0 | 0 | 3 | 70 | 30 | 100 |
| | Major | Bioscience-II: Animal Kingdom | BSC DSC – 045 | 3 | 0 | 0 | 3 | 70 | 30 | 100 |
| | Major | Fundamental Chemistry - II | BSC DSC - 046 | 3 | 0 | 0 | 3 | 70 | 30 | 100 |
| Discipline Specific Core Practical (DSCCP) | Major | Biotechnology Lab - II | BSC DSC - 047 | 0 | 0 | 2 | 1 | 35 | 15 | 50 |
| | Major | Bioscience Lab - II | BSC DSC - 048 | 0 | 0 | 2 | 1 | 35 | 15 | 50 |
| | Major | Chemistry Lab – II | BSC DSC - 049 | 0 | 0 | 2 | 1 | 35 | 15 | 50 |
| General Elective Inter/Multidisciplinary/ Allied Courses (GEC) | GEC | Intellectual Property Rights (IPR) | GE 014 | 3 | 1 | 0 | 4 | 70 | 30 | 100 |
| Ability Enhancement Course (AEC) | AEC | Science Communication Skills | AEC 002 | 2 | 0 | 0 | 2 | 35 | 15 | 50 |
| Skill Enhancement Course (SEC) | SEC | Vermicomposting and Organic Farming | SEC 019 | 2 | 0 | 0 | 2 | 35 | 15 | 50 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Value Added Course (VAC)** | VAC | Environmental Studies & Disaster Management | VAC 002 | 2 | 0 | 0 | 2 | 35 | 15 | 50 |
| **Total** | | | | **18** | **1** | **6** | **22** | **490** | **210** | **700** |

| Programme: Bachelor of Biotechnology (B.Sc) Sem: III | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| NHEQF Level: 5 \| Courses | | | | Teaching Scheme | | | | Evaluation Scheme | | Total Marks |
| Course Category | Course Sub Category | Course Name | Code | Hours | | | Credits | | | |
| | | | | Theory | Tutorial | Practical | | CIA | ESE | |
| Discipline Specific Core Course (DSCC) | Major | Biotech-III: Cell and Molecular Biology (SWAYAM) | BSC DSC – 312/ BSC DSC – 312M | 3 | 0 | 0 | 3 | 70 | 30 | 100 |
| | Major | Bioscience-III: Structure, Development and Reproduction in Flowering Plants | BSC DSC - 313 | 3 | 0 | 0 | 3 | 70 | 30 | 100 |
| | Major | Inorganic and Physical Chemistry - I | BSC DSC - 314 | 3 | 0 | 0 | 3 | 70 | 30 | 100 |
| Discipline Specific Core Practical (DSCCP) | Major | Biotechnology Lab – III | BSC DSC - 315 | 0 | 0 | 2 | 1 | 35 | 15 | 50 |
| | Major | Bioscience Lab – III | BSC DSC – 316 | 0 | 0 | 2 | 1 | 35 | 15 | 50 |
| | Major | Chemistry Lab - III | BSC DSC – 317 | 0 | 0 | 2 | 1 | 35 | 15 | 50 |
| General Elective Inter/Multidisciplinary/ Allied Courses (GEC) | GEC | Food Toxicology and Adulteration | GE 311 | 3 | 1 | 0 | 4 | 70 | 30 | 100 |
| Ability Enhancement Course (AEC) | AEC | Hindi Bhasha | AEC 301 | 2 | 0 | 0 | 2 | 35 | 15 | 50 |
| Skill Enhancement Course (SEC) | SEC | Computational Biology and Bioinformatics | SEC 304 | 2 | 0 | 0 | 2 | 35 | 15 | 50 |
| Value Added Course (VAC) | VAC | Ayurvedic Biology | VAC 311 | 2 | 0 | 0 | 2 | 35 | 15 | 50 |
| **Total** | | | | **18** | **1** | **6** | **22** | **490** | **210** | **700** |

| Programme: Bachelor of Biotechnology (B.Sc) Sem: IV | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **NHEQF Level: 5 \| Courses** | | | | **Teaching Scheme** | | | | **Evaluation Scheme** | | **Total Marks** |
| **Course Category** | **Course Sub Category** | **Course Name** | **Code** | **Hours** | | | **Credits** | | | |
| | | | | **Theory** | **Tutorial** | **Practical** | | **CIA** | **ESE** | |
| **Discipline Specific Core Course Core (DSCC)** | Major | Biotech-IV: Industrial Biotechnology | BSC DSC - 412 | 3 | 0 | 0 | 3 | 70 | 30 | 100 |
| | Major | Bioscience-IV: Medical Biotechnology (SWAYAM) | BSC DSC – 413/ BSC DSC – 413M | 3 | 0 | 0 | 3 | 70 | 30 | 100 |
| | Major | Organic and Physical Chemistry-I | BSC DSC - 414 | 3 | 0 | 0 | 3 | 70 | 30 | 100 |
| **Discipline Specific Core Practical (DSCCP)** | Major | Biotechnology Lab - IV | BSC DSC – 415 | 0 | 0 | 2 | 1 | 35 | 15 | 50 |
| | Major | Bioscience Lab - IV | BSC DSC – 416 | 0 | 0 | 2 | 1 | 35 | 15 | 50 |
| | Major | Chemistry Lab - IV | BSC DSC - 417 | 0 | 0 | 2 | 1 | 35 | 15 | 50 |
| **Discipline Specific Elective Course (DSEC)** | Minor | Plant Pathology/Microbial Diseases | BSC DSE - 407/BSC DSE - 408 | 3 | 1 | 0 | 4 | 70 | 30 | 100 |
| **Ability Enhancement Course (AEC)** | AEC | Society, Culture & Human Behaviour | AEC 309 | 2 | 0 | 0 | 2 | 35 | 15 | 50 |
| **Skill Enhancement Course (SEC)** | SEC | Computer Application | SEC 404 | 2 | 0 | 0 | 2 | 35 | 15 | 50 |
| **Value Added Course (VAC)** | VAC | Presentation Skills | VAC 314 | 2 | 0 | 0 | 2 | 35 | 15 | 50 |
| **Total** | | | | **18** | **1** | **6** | **22** | **490** | **210** | **700** |