**MANGALORE UNIVERSITY**
DEPARTMENT OF BIOSCIENCES
**M.Sc. BIOTECHNOLOGY**

**Scheme and Syllabus for two-year (four semester) M.Sc. in Biotechnology under Choice-based Credit System (CBCS)**

**Preamble:**
As per guidelines of the UGC and Higher Education Council, Government of Karnataka, the Board of Studies in Biotechnology, Mangalore University framed a new syllabus according to the regulations governing the Choice-based Credit System for the two-year (four semester) M.Sc. Degree Programmes in 2016. The syllabus has now been revised.

The M.Sc. programme in Biotechnology under CBCS scheme has a total of 90 credits consisting of hard core courses (including project work) for 58 credits (64%) and soft core courses with choice for 26 credits (29%) and open elective courses with choice for a total of 6 credits.

**Program outcome:**
PO 1 To engage and to involve the student in a challenging curriculum of the state-of-the-art in Biotechnology through a systematic study of the basics that support excellence in competitive examinations and lend competence to its application in the medical, agriculture, industrial, pharmaceutical, environmental sectors through value-based education towards sustainable development.
PO 2 The student is equipped with the required soft, transferable and technical skills through adequate practical sessions, test your learning though periodic tests, self study by means of assignments and presentation skills through seminars, all essential for careers in the industry, academia or entrepreneurship.

**Program specific outcomes:**
PSO 1 Laboratory-based skill training in biosafety and good laboratory practices
PSO 2 Independent work in the lab through project work
PSO 3 Edge in competitive exams through a challenging academic programme.
PSO 4 Exposure to labs/institutes through Summer Training/Research/Internship Programme
PSO 5 Develop a job profile for R&D, QC, QA etc in companies

**M.Sc. BIOTECHNOLOGY PROGRAM**
**CONTENTS**

| **FIRST SEMESTER** | **Hrs/week** | **Credits** |
|---|---|---|
| HARD CORE COURSES | | |
| BTH 401 Biochemistry and Biophysics | 4 | 4 |
| BTH 402 Molecular Genetics | 4 | 4 |
| BTH 403 Microbiology | 4 | 4 |
| SOFT CORE COURSES (Any One to be opted) | | |
| BTS 404 Enzymology | 3 | 3 |
| BTS 405 Cell Biology | 3 | 3 |
| PRACTICAL COURSES | | |
| BTP 406 Biochemistry | 4 | 2 |
| BTP 407 Molecular Genetics | 4 | 2 |
| BTP 408 Microbiology | 4 | 2 |
| BTP 409 Enzymology | 4 | 2 |
| BTP 410 Cell Biology | 4 | 2 |
| **SECOND SEMESTER** | | |
| HARD CORE COURSES | | |
| BTH 451 Molecular Biology | 4 | 4 |
| BTH 452 Genetic Engineering | 4 | 4 |
| SOFT CORE COURSES (Any Two to be opted) | | |
| BTS 453 Bioprocess Technology | 3 | 3 |
| BTS 454 Bioanalytical Techniques | 3 | 3 |
| BTS 455 Radiation Biology | 3 | 3 |
| BTS 456 Signal Transduction | 3 | 3 |
| PRACTICAL COURSES | | |
| BTP 457 Molecular Biology | 4 | 2 |
| BTP 458 Genetic Engineering | 4 | 2 |
| BTP 459 Bioprocess Technology | 4 | 2 |
| BTP 460 Radiation Biology | 4 | 2 |
| BTP 461 Signal Transduction | 4 | 2 |
| OPEN ELECTIVE COURSES (Any One to be opted) | | |
| BTE 462 Biotechnology in daily life | 3 | 3 |
| BTE 463 Food security | 3 | 3 |
| **THIRD SEMESTER** | | |
| HARD CORE COURSES | | |
| BTH 501 Microbial Biotechnology | 4 | 4 |
| BTH 502 Plant Biotechnology | 4 | 4 |
| SOFT CORE COURSES (Any Two to be opted) | | |
| BTS 503 Immunotechnology | 3 | 3 |
| BTS 504 Bioinformatics and Biostatistics | 3 | 3 |
| BTS 505 Medical Biotechnology | 3 | 3 |
| PRACTICAL COURSES | | |
| BTP 506 Microbial Biotechnology | 4 | 2 |
| BTP 507 Plant Biotechnology | 4 | 2 |
| BTP 508 Immunotechnology | 4 | 2 |
| BTP 509 Bioinformatics and Biostatistics | 3 | 2 |
| BTP 510 Medical Biotechnology | 3 | 2 |

| | | |
|---|---|---|
| OPEN ELECTIVE COURSES (Any One to be opted) | | |
| BTE 511 Environmental Management | 3 | 3 |
| BTE 512 Advances in Medicine | 3 | 3 |

**FOURTH SEMESTER**

| | | |
|---|---|---|
| HARD CORE COURSES | | |
| BTH 551 Animal Biotechnology | 4 | 4 |
| BTH 552 Environmental Biotechnology | 4 | 4 |
| SOFT CORE COURSES (Any One to be opted) | | |
| BTS 553 Regulations and IPR | 3 | 3 |
| BTS 554 Nanobiotechnology | 3 | 3 |
| BTS 555 Pharmacology and Drug development | | |
| PRACTICAL COURSES | | |
| BTP 556 Animal Biotechnology | 4 | 2 |
| BTP 557 Environmental Biotechnology | 4 | 2 |
| PROJECT WORK | | |
| BTP 558 Project Work (Dissertation & Viva) | 4 | 4 |

**MANGALORE UNIVERSITY**
**CHOICE BASED CREDIT SYSTEM (CBCS)**
**Scheme and Syllabus for M.Sc. Biotechnology**

## FIRST SEMESTER

| Paper Code | COURSE TITLE | Teaching Hrs/week | Exam Hrs | Marks | | Total | Credits |
|---|---|---|---|---|---|---|---|
| | | | | IA* | Exam | | |
| **HARD CORE COURSES - THEORY** | | | | | | | |
| BTH401 | Biochemistry and Biophysics | 4 | 3 | 30 | 70 | **100** | 4 |
| BTH402 | Molecular Genetics | 4 | 3 | 30 | 70 | **100** | 4 |
| BTH 403 | Microbiology | 4 | 3 | 30 | 70 | **100** | 4 |
| **SOFT CORE COURSES –THEORY (CHOOSE ANY ONE)** | | | | | | | |
| BTS 404 | Enzymology | 3 | 3 | 30 | 70 | **100** | 3 |
| BTS 405 | Cell Biology | | | | | | |
| **PRACTICALS** | | | | | | | |
| BTP 406 | Biochemistry | 4 | 3 | 15 | 35 | **50** | 2 |
| BTP 407 | Molecular Genetics | 4 | 3 | 15 | 35 | **50** | 2 |
| BTP 408 | Microbiology | 4 | 3 | 15 | 35 | **50** | 2 |
| BTP 409 | Enzymology | 4 | 3 | 15 | 35 | **50** | 2 |
| BTP 410 | Cell Biology | | | | | | |
| **Total** | | | | | | **600** | **23** |

## SECOND SEMESTER

| Paper Code | COURSE TITLE | Teaching Hrs/week | Exam Hrs. | Marks | | Total | Credits |
|---|---|---|---|---|---|---|---|
| | | | | IA* | Exam | | |
| **HARD CORE COURSES -THEORY** | | | | | | | |
| BTH 451 | Molecular Biology | 4 | 3 | 30 | 70 | **100** | 4 |
| BTH 452 | Genetic Engineering | 4 | 3 | 30 | 70 | **100** | 4 |
| **SOFT CORE COURSES -THEORY (CHOOSE ANY TWO)** | | | | | | | |
| BTS 453 | Bioprocess Technology | 3 | 3 | 30 | 70 | **100** | 3 |
| BTS 454 | Bioanalytical Techniques | 3 | 3 | 30 | 70 | **100** | 3 |
| BTS 455 | Radiation Biology | | | | | | |
| BTS 456 | Signal Transduction | | | | | | |
| **PRACTICALS** | | | | | | | |
| BTP 457 | Molecular Biology | 4 | 3 | 15 | 35 | **50** | 2 |
| BTP 458 | Genetic Engineering | 4 | 3 | 15 | 35 | **50** | 2 |
| BTP 459 | Bioprocess Technology | 4 | 3 | 15 | 35 | **50** | 2 |
| BTP 460 | Radiation Biology | | | | | | |
| BTP 461 | Signal Transduction | | | | | | |
| **OPEN ELECTIVES (CHOOSE ANY ONE)** | | | | | | | |
| BTE 462 | Biotechnology in daily life | 3 | 3 | 30 | 70 | **100** | 3 |
| BTE 463 | Food Security | | | | | | |
| **Total** | | | | | | **650** | **23** |

## THIRD SEMESTER

| Paper Code | COURSE TITLE | Teaching Hrs/week | Exam Hrs. | Marks | | Total | Credits |
|---|---|---|---|---|---|---|---|
| | | | | IA* | Exam | | |
| **HARD CORE COURSES -THEORY** | | | | | | | |
| BTH 501 | Microbial Biotechnology | 4 | 3 | 30 | 70 | **100** | 4 |
| BTH 502 | Plant Biotechnology | 4 | 3 | 30 | 70 | **100** | 4 |
| **SOFT CORE COURSES -THEORY (CHOOSE ANY TWO)** | | | | | | | |
| BTS 503 | Immunotechnology | 3 | 3 | 30 | 70 | **100** | 3 |
| BTS 504 | Bioinformatics and Biostatistics | 3 | 3 | 30 | 70 | **100** | 3 |
| BTS 505 | Medical Biotechnology | | | | | | |
| **PRACTICALS** | | | | | | | |
| BTP 506 | Microbial Biotechnology | 4 | 3 | 15 | 35 | **50** | 2 |
| BTP 507 | Plant Biotechnology | 4 | 3 | 15 | 35 | **50** | 2 |
| BTP 508 | Immunotechnology | 4 | 3 | 15 | 35 | **50** | 2 |
| BTP 509 | Bioinformatics and Biostatistics | 4 | 3 | 15 | 35 | **50** | 2 |
| BTP 510 | Medical Biotechnology | | | | | | |
| **OPEN ELECTIVES (CHOOSE ANY ONE)** | | | | | | | |
| BTE 511 | Environmental Management | 3 | 3 | 30 | 70 | **100** | 3 |
| BTE 512 | Advances in Medicine | | | | | | |
| **Total** | | | | | | **700** | **25** |

## FOURTH SEMESTER

| Paper Code | COURSE TITLE | Teaching Hrs/week | Exam Hrs. | Marks | | Total | Credits |
|---|---|---|---|---|---|---|---|
| | | | | IA* | Exam | | |
| **HARD CORE COURSES –THEORY** | | | | | | | |
| BTH 551 | Animal Biotechnology | 4 | 3 | 30 | 70 | **100** | 4 |
| BTH 552 | Environmental Biotechnology | 4 | 3 | 30 | 70 | **100** | 4 |
| **SOFT CORE COURSES -THEORY (CHOOSE ANY ONE)** | | | | | | | |
| BTS 553 | Regulations and Intellectual Property Rights | 3 | 3 | 30 | 70 | **100** | 3 |
| BTS 554 | Nanobiotechnology | | | | | | |
| BTS 555 | Pharmacology and Drug Development | | | | | | |
| **PRACTICALS** | | | | | | | |
| BTP 556 | Animal Biotechnology | 4 | 3 | 15 | 35 | **50** | 2 |
| BTP 557 | Environmental Biotechnology | 4 | 3 | 15 | 35 | **50** | 2 |
| **PROJECT WORK** | | | | | | | |
| BTP 558 | Project Work with Dissertation and Viva | 4 | 4 | 30 | 70 | **100** | 4 |
| **Total** | | | | | | **500** | **19** |
| **Grand Total** | | | | | | **2450** | **90** |

**IA includes Seminar/Assignment (per Course), Internal Tests (per Course), Objective Test [MCQs, Fill in the blanks, True/False, Problem solving, Analytical questions, Calculations, Definitions] (per Course) = 30**

**Schemeof M.Sc. Biotechnology Programme (CBCS)**

| SEM | HARD CORE COURSES | | | SOFT CORE COURSES | | | OPEN ELECTIVES | PROJECT | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| | No of Courses | Credits | Total Credits | No of Courses | Credits | Total Credits | Total Credits | | |
| I | 3Th+3Pr | 4+2 | 18 | 1Th+1Pr | 3+2 | 5 | | | 23 |
| II | 2Th+2Pr | 4+2 | 12 | 2Th+1Pr | 3+2 | 8 | 3 | | 23 |
| III | 2Th+2Pr | 4+2 | 12 | 2Th+2Pr | 3+2 | 10 | 3 | | 25 |
| IV | 2Th+2Pr | 4+2 | 12 | 1Th | 3 | 3 | | 4 | 19 |
| Total | | | 54=60% | | | 26=29% | 6 | 4 | 90 |

**NOTE:**

BASIS FOR INTERNAL ASSESSMENT: Internal Assessment marks in theory papers shall be awarded on the basis of theory test (70 Marks), Objective Test (MCQs)(15 Marks), Seminars and Assignments (15 Marks). The marks obtained shall be reduced to 30. The tests may be conducted 14 weeks after the start of a Semester. Practical Internal Assessment marks shall be based on practical test and records. 60 marks for Practical test and 10 marks for Class record. The marks obtained shall be reduced to 30. The test may be conducted 14 weeks after the start of a Semester. 70 marks for project work (Report/Dissertation and Presentation/Viva).

THEORY QUESTION PAPER PATTERN: Question Papers in all the four semesters consists of three sections (Model question paper enclosed). Section I: Write short notes on any ten out of twelve: (10x2=20 Marks) Section II: Write explanatory notes on any five out of seven: (5x6=30 Marks). Section III: Write long answers on any two out of four: (2x10=20 Marks). Questions are to be drawn from all the units of the syllabus by giving equal weightage to all the units.

PRACTICAL QUESTION PAPER PATTERN: 30 marks for practical exam proper (Major experiment-10 marks, Minor experiments/Problem solving-05+05 marks, Identify and Comment on-4x2.5=10 marks) and 05 marks for Class record. The Project work may be conducted either in the Department or any other Institution or in an Industry. Project Report/Dissertation and Presentation/Viva carry 70 marks.