

# SHIVAJI UNIVERSITY, KOLHAPUR

## SYLLABUS

### M.Sc. Environmental Biotechnology

(Semester Pattern)

Sem. III to IV



Estd. 1962

NAAC 'A' Grade

Choice Based Credit System  
(CBCS)

To be implemented From

**June, 2020 onwards**

**M.Sc. Env. Biotechnology (Horizontal Mobility) CBCS Pattern (2020-21)**  
**M.Sc. Part-II**

**SEMESTER-III (Duration- Six month)**

|  | Sr. No | Course code   | Teaching Scheme      |                 |           | Examination Scheme         |               |            |                          |               |             |
|--|--------|---|----------------------|-----------------|-----------|----------------------------|---------------|------------|--------------------------|---------------|-------------|
|  |        |   | Theory and Practical |                 |           | University Assessment (UA) |               |            | Internal Assessment (IA) |               |             |
|  |        |   | Lectures (per week)  | Hours(per week) | Credit    | Maximum Marks              | Minimum Marks | Exam Hours | Maximum Marks            | Minimum Marks | Exam. Hours |
| <b>CGPA</b>                              | 1      | <b>CC-301:</b> Genetic Engineering  | 4                    | 4               | 4         | 80                         | 32            | 3          | 20                       | 8             | 1           |
|  | 2      | <b>CCS-302:</b> Basics of Ecology, Ecotoxicology and Ecochemistry   | 4                    | 4               | 4         | 80                         | 32            | 3          | 20                       | 8             | 1           |
|  | 3      | <b>CCS-303A:</b> Fermentation Technology-I<br><b>OR</b><br><b>CCS-303B:</b> Biochemical and Environmental Toxicology- I | 4                    | 4               | 4         | 80                         | 32            | 3          | 20                       | 8             | 1           |
|  | 4      | <b>DSE-304 :</b> Immunology   | 4                    | 4               | 4         | 80                         | 32            | 3          | 20                       | 8             | 1           |
|  | 5      | <b>CCPR-305:</b> Laboratory Course  | 16                   | 16              | 8         | 200                        | 80            | -          | -                        | -             | *           |
| <b>Total (C)</b>                         |        |   | -                    | -               | <b>24</b> | <b>520</b>                 | -             | -          | <b>80</b>                | -             | -           |
| <b>Non-CGPA</b>                          | 1      | <b>AEC-306</b>  | 2                    | 2               | 2         | -                          | -             | -          | 50                       | 20            | 2           |
|  | 2      | <b>EC (SWMMOOC)-307:</b> Food Microbiology and Food Safety  | 5                    | 5               | 4         | -                          | -             | -          | -                        | -             | -           |
| <b>SEMESTER-IV (Duration- Six month)</b> |        |   |                      |                 |           |                            |               |            |                          |               |             |
| <b>CGPA</b>                              | 1      | <b>CC-401:</b> Environmental Monitoring and Risk Assessment   | 4                    | 4               | 4         | 80                         | 32            | 3          | 20                       | 8             | 1           |
|  | 2      | <b>CCS-402:</b> Environmental Biotechnology   | 4                    | 4               | 4         | 80                         | 32            | 3          | 20                       | 8             | 1           |
|  | 3      | <b>CCS-403:</b> Bioinformatics  | 4                    | 4               | 4         | 80                         | 32            | 3          | 20                       | 8             | 1           |

|                      |   |  |    |    |           |             |    |   |            |    |   |
|----------------------|---|--|----|----|-----------|-------------|----|---|------------|----|---|
|                      | 4 | <b>DSE-404A:</b> Biodiversity, IPR,<br>Biosafety & Bioethics<br><b>OR</b><br><b>DSE-404B:</b> Biochemical and<br>Environmental<br>Toxicology- II | 4  | 4  | 4         | 80          | 32 | 3 | 20         | 8  | 1 |
|                      | 5 | <b>CCPR-405:</b> Laboratory Course<br>and Dissertation   | 16 | 16 | 8         | 200         | 80 | - | -          | -  | * |
| <b>Total (D)</b>     |   |  | -  | -  | <b>24</b> | <b>520</b>  | -  | - | <b>80</b>  | -  | - |
| <b>Non-<br/>CGPA</b> | 1 | <b>SEC-406</b>   | 2  | 2  | 2         | -           | -  | - | 50         | 20 | 2 |
|                      | 2 | <b>GE-407:</b> Research Methodology<br>and Entrepreneurship<br>Development   | 2  | 2  | 2         | -           | -  | - | 50         | 20 | 2 |
| <b>Total (C + D)</b> |   |  | -  | -  | <b>48</b> | <b>1040</b> | -  | - | <b>160</b> | -  | - |

- \*Annual Practical examination
- Practical Examination will be external/internal and semester wise annual
- \*Duration of Practical Examination: 4 days (1 inspection day and 3 Practical days)

### **I. CGPA course:**

1. There shall be 10 Core Courses (CC) per program.
2. There shall be 02 Discipline Specific Elective (DSE) courses of 08 credits per program.
3. There shall be 04 Core Course Specialization (CCS) courses of 16 credits per program.
4. Total credits for CGPA courses shall be of 96 credits per program .

### **II. Mandatory Non-CGPA Courses:**

1. There shall be 02 Mandatory Non-CGPA compulsory Ability Enhancement Course (AEC) of 02 credits each per program.
2. There shall be 02 Mandatory Non-CGPA Compulsory Skill Enhancement Course (SEC) of 02 credits per program.
3. There shall be one Elective Course (EC) (SWAYAM/MOOC). The credits of this course shall be as specified on SWAYAM/MOOC portal.
4. There shall be one Generic Elective (GE) course of 02 credits per program. Each students has to take Generic Elective from the department other than parent department.
5. The total credits for Non-CGPA course shall be of 08 credits+2to 4 credits, as specified of the SWAYAM/MOOC portal.
6. The credits assigned to the course and program shall have no relation with the work load of the teacher.

**M.Sc. Part-II (Environmental Biotechnology)  
Semester - III**

|                      | <b>Course code</b>         | <b>Paper No.</b> | <b>Title of course</b>  | <b>Remark</b>     |
|----------------------|----------------------------|------------------|---|-------------------|
| CGPA<br>Non-<br>CGPA | CC-301                     | IX               | Genetic Engineering   | Compulsory Course |
|                      | CCS-302                    | X                | Basics of Ecology Ecotoxicology and Ecochemistry                            | Compulsory Course |
|                      | CCS-303A<br>Or<br>CCS-303B | XI               | Fermentation Technology<br>Or<br>Biochemical and Environmental Toxicology I | Choose any one    |
|                      | DSE-304                    | XII              | Immunology  | Compulsory Course |
|                      | CCPR-305                   |                  | Practical   | Compulsory Course |
|                      | ACE-306                    |                  |   |                   |
|                      | EC(SWMMOOC)-307            |                  | Food Microbiology and Food Safety   |                   |

**Semester – IV**

|              | <b>Course code</b>         | <b>Paper No.</b> | <b>Title of course</b>  |                   |
|--------------|----------------------------|------------------|---|-------------------|
| CGPA         | CC-401                     | XIII             | Environmental Monitoring and Risk Assessment  | Compulsory course |
|              | CCS-402                    | XIV              | Environmental Biotechnology   | Compulsory course |
|              | CCS-403                    | XV               | Bioinformatics  | Compulsory course |
|              | DSE-404A<br>Or<br>DSE-404B | XVI              | Biodiversity, IPR, Biosafety & Bioethics<br>Or<br>Biochemical and Environmental Toxicology II | Choose any one    |
|              | CCPR-405                   |                  | Practical and Dissertation  | Compulsory course |
| Non-<br>CGPA | SEC-406                    |                  |   |                   |
|              | GE-407                     |                  | Research Methodology and Entrepreneurship   |                   |

**Scheme of teaching and examination**

(Applicable to University Department and University affiliated collage centers)

The semester examination will be conducted at the end of each term (theory only).

Theory paper will be of 80 marks each and 20 marks for internal evaluation test conducted in the mid of the term.

Practical will be of 200 marks each.

Question papers will be set in the view of the entire syllabus and preferably covering each unit of the syllabus.

**Standard of Passing**

As per rules and regulation of M.Sc. course.

**Nature of Question Paper and Scheme of Marking**

Theory question paper Maximum marks - 80

Total No. Of question -7

All questions are of equal marks. Out of these seven questions five questions are to be attempted.

Question No.1 is compulsory. Remaining 6 question are divided into two sections, namely section-I and Section-II. Four question are to be attempted for these two section such that not more than two question from any of the section. Both sections are to be written in the same answer book.

## Equivalence in Accordance with titles and contents of the papers

### M.Sc. Environmental Biotechnology Semester I and II

| Old Course  | New Course (2018)  |
|---|--|
| <b>Semester I</b>   |  |
| LS 141: Cell Biology, Microbiology and Virology                     | CC-101B: Cell Biology, Microbiology and Virology   |
| CB 141: Cell Biochemistry   | After three attempts there will be no equivalence. Candidate have to appear for CC-101A: Cell Biochemistry and Nucleic Acids |
| BC 141: Proteins: Structure and Functions                           | CC-102: Proteins: Structure and Functions  |
| BC 142: Biomolecules  | CC-103: Biomolecules   |
| BSI 141: Biostatistics and Bioinformatics with Computer Orientation | CC-104: Biostatistics and Computer Applications  |
| <b>Semester II</b>  |  |
| BC 241: Enzymology  | CC-201: Enzymology   |
| MB 241: Molecular Biology   | CC-202: Molecular Biology  |
| BC 242: Bioenergetics   | CC-203: Bioenergetics  |
| TB 241: Tools and Techniques in Biosciences                         | CC-204: Tools and Techniques in Biosciences  |
| <b>Semester III</b>   |  |
| GE 341: Genetic Engineering   | CC-301: Genetic Engineering  |
| IC 341: Immunochemistry   | DSE-304: Immunology  |
| EEE 341: Basics of Ecology, Ecotoxicology and Ecochemistry          | CCS-302: Basics of Ecology, Ecotoxicology and Ecochemistry   |
| FT 341: Fermentation Technology I                                   | CCS-303: Fermentation Technology I   |
| <b>Semester IV</b>  |  |
| EPC 441: Environmental Pollution and Control                        | CC-401: Environmental Monitoring and Risk Assessment   |
| EB 441: Environmental Biotechnology                                 | CCS-402: Environmental Biotechnology   |
| BIBB 441: Biodiversity, IPR, Biosafety and Bioethics                | DSE-404: Biodiversity, IPR, Biosafety and Bioethics  |
| FT 441: Fermentation Technology II                                  | DSE-404A: Fermentation Technology II (M. Sc. Biochemistry Sem IV)*   |

\* Under Horizontal Mobility Programme of Department of Biochemistry

## Department of Biotechnology (GE)

### Department of Environmental Biotechnology (GE)

|                | <b>GE 407 :Generic Elective: Research Methodology and Entrepreneurship</b>  | <b>30 Hrs</b> |
|----------------|---|---------------|
| <b>Unit I</b>  | <b>Research methodology</b><br>Aims and objectives of research, Types of research – basic, novel and applied research. Tools for searching research topic – books, journals, internet, discussions etc.<br>Research hypothesis, Steps in research design. Research Aptitude, Qualities of a researcher, Ethics in research – plagiarism<br><b>Intellectual Property Rights</b><br>Copyright, Trademark, geographical indicators, design, Patent, Role of patent in R & D, Criteria for patentability, Indian patent act, Provisional and final patent filing, writing claims, procedure for patent granting | <b>15 Hrs</b> |
| <b>Unit II</b> | <b>Entrepreneurship Development</b><br>Definitions, types, characteristics of Entrepreneur, Basics of Start-Ups, Definition of micro, small and medium scale industries, government facilities and subsidies/financial institutes supporting Start-Ups, Steps in setting up a business, selecting a business idea, market survey, information, market segmentation, market trends, SWOT analysis,<br><b>Preparation of a Project Report</b><br>Executive summary, Project description, Marketing plan, Capital structure and operating cost, Management/Financial/Technical plan, Project implementation.   | <b>15 Hrs</b> |