

# **KURUKSHETRA UNIVERSITY KURUKSHETRA**

## **Scheme of Examination and Syllabus for M.Sc. (5-Year Integrated) Biotechnology**

**Under Multiple Entry-Exit, Internship and  
CBCS-LOCF in accordance to NEP-2020 w.e.f.  
2023-24 (in phased manner**

**DEPARTMENT OF BIOTECHNOLOGY, KURUKSHETRA UNIVERSITY, KURUKSHETRA**  
**Scheme of Examination for M.Sc (5-Year Integrated) Biotechnology**  
**Under Multiple Entry-Exit, Internship and CBCS-LOCF in accordance to NEP-2020**  
**w.e.f. 2023-24 (in phased manner), Program: Biotechnology**

**FIRST YEAR: SEMESTER-1**

| Course                           | Paper(s)                                         | Nomenclature of Paper         | Credits | Hours/Week | Internal marks | External Marks | Total Marks | Exam Duration |
|----------------------------------|--------------------------------------------------|-------------------------------|---------|------------|----------------|----------------|-------------|---------------|
| <b>MCC-1</b><br><b>4 credit</b>  | B23-BTY-101                                      | Introduction of Biotechnology | 3       | 3          | 20             | 50             | 70          | 3 hrs.        |
|                                  |                                                  | Practical                     | 1       | 2          | 10             | 20             | 30          | 4 hrs.        |
| <b>MCC-2</b><br><b>4 credit</b>  | B23-BTY-102                                      | Basics of Bio-molecules       | 3       | 3          | 20             | 50             | 70          | 3 hrs.        |
|                                  |                                                  | Practical                     | 1       | 2          | 10             | 20             | 30          | 4 hrs.        |
| <b>MDC-1</b><br><b>3 credits</b> | From Available MDC-1 of 3 credits as per NEP     |                               |         |            |                |                |             |               |
| <b>CC-M1</b><br><b>4 credit</b>  | From Available CC-M1 of 4 credits as per NEP     |                               |         |            |                |                |             |               |
| <b>AEC-1</b><br><b>2 credit</b>  | From Available AEC-1 of two credits as per NEP   |                               |         |            |                |                |             |               |
| <b>SEC-1</b><br><b>3 credit</b>  | From Available SEC-1 of three credits as per NEP |                               |         |            |                |                |             |               |
| <b>VAC-1</b><br><b>2 credit</b>  | From Available VAC-1 of two credits as per NEP   |                               |         |            |                |                |             |               |

**FIRST YEAR: SEMESTER-2**

| Course                           | Paper(s)                                         | Nomenclature of Paper            | Credits | Hours/Week | Internal marks | External Marks | Total Marks | Exam Duration |
|----------------------------------|--------------------------------------------------|----------------------------------|---------|------------|----------------|----------------|-------------|---------------|
| <b>MCC-3</b><br><b>4 credit</b>  | B23-BTY-201                                      | General Microbiology             | 3       | 3          | 20             | 50             | 70          | 3 hrs.        |
|                                  |                                                  | Practical                        | 1       | 2          | 10             | 20             | 30          | 4 hrs.        |
| <b>DSEC-1</b><br><b>4 credit</b> | B23-BTY-202                                      | Diagnostic Laboratory techniques | 3       | 3          | 20             | 50             | 70          | 3 hrs.        |
|                                  |                                                  | Practical                        | 1       | 2          | 10             | 20             | 30          | 4 hrs.        |
| <b>MDC-2</b><br><b>3 credits</b> | From Available MDC-2 of 3 credits as per NEP     |                                  |         |            |                |                |             |               |
| <b>CC-M2</b><br><b>4 credit</b>  | From Available CC-M2 of 4 credits as per NEP     |                                  |         |            |                |                |             |               |
| <b>AEC-2</b><br><b>2 credit</b>  | From Available AEC-2 of two credits as per NEP   |                                  |         |            |                |                |             |               |
| <b>SEC-2</b><br><b>3 credit</b>  | From Available SEC-2 of three credits as per NEP |                                  |         |            |                |                |             |               |
| <b>VAC-2</b><br><b>2 credit</b>  | From Available VAC-2 of two credits as per NEP   |                                  |         |            |                |                |             |               |

**Internship of 4 credits of 4-6 weeks duration after 2<sup>nd</sup> Semester**

**DEPARTMENT OF BIOTECHNOLOGY, KURUKSHETRA UNIVERSITY, KURUKSHETRA**

**SECOND YEAR: SEMESTER-3**

| Course                    | Paper(s)                                         | Nomenclature of Paper | Credits | Hours /Week | Internal marks | External Marks | Total Marks | Exam Duration |
|---------------------------|--------------------------------------------------|-----------------------|---------|-------------|----------------|----------------|-------------|---------------|
| <b>MCC-4</b><br>4 credit  | B23-BTY-301                                      | Cell Biology          | 3       | 3           | 20             | 50             | 70          | 3 hrs.        |
|                           |                                                  | Practical             | 1       | 2           | 10             | 20             | 30          | 4 hrs.        |
| <b>MCC-5</b><br>4 credit  | B23-BTY-302                                      | Genetics              | 3       | 3           | 20             | 50             | 70          | 3 hrs.        |
|                           |                                                  | Practical             | 1       | 2           | 10             | 20             | 30          | 4 hrs.        |
| <b>MDC-3</b><br>3 credits | From Available MDC-3 of 3 credits as per NEP     |                       |         |             |                |                |             |               |
| <b>CC-M3</b><br>4 credits | From Available CC-M3 of 4 credits as per NEP     |                       |         |             |                |                |             |               |
| <b>AEC-3</b><br>2 credit  | From Available AEC-3 of two credits as per NEP   |                       |         |             |                |                |             |               |
| <b>SEC-3</b><br>3 credit  | From Available SEC-3 of three credits as per NEP |                       |         |             |                |                |             |               |
| <b>VAC-3</b><br>2 credits | From Available VAC-3 of two credits as per NEP   |                       |         |             |                |                |             |               |

**SECOND YEAR: SEMESTER-4**

| Course                   | Paper(s)    | Nomenclature of Paper        | Credits | Hours /Week | Internal marks | External Marks | Total Marks | Exam Duration |
|--------------------------|-------------|------------------------------|---------|-------------|----------------|----------------|-------------|---------------|
| <b>MCC-6</b><br>4 credit | B23-BTY-401 | Recombinant DNA Technology-I | 3       | 3           | 20             | 50             | 70          | 3 hrs.        |
|                          |             | Practical                    | 1       | 2           | 10             | 20             | 30          | 4 hrs.        |
| <b>MCC-7</b><br>4 credit | B23-BTY-402 | Bioinformatics-I             | 3       | 3           | 20             | 50             | 70          | 3 hrs.        |
|                          |             | Practical                    | 1       | 2           | 10             | 20             | 30          | 4 hrs.        |
| <b>MCC-8</b><br>4 credit | B23-BTY-403 | Metabolism                   | 3       | 3           | 20             | 50             | 70          | 3 hrs.        |
|                          |             | Practical                    | 1       | 2           | 10             | 20             | 30          | 4 hrs.        |
| <b>DSE-1</b><br>4 credit | B23-BTY-404 | IPR, Biosafety and Bioethics | 3       | 3           | 20             | 50             | 70          | 3 hrs.        |
|                          |             | Practical                    | 1       | 2           | 10             | 20             | 30          | 4 hrs.        |

|                                                                                                             |                                                 |                                       |   |   |    |    |    |        |
|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------|---------------------------------------|---|---|----|----|----|--------|
| <b>Select one option</b>                                                                                    | B23-BTY-405                                     | Foundations of Forensic Biotechnology | 3 | 3 | 20 | 50 | 70 | 3 hrs. |
|                                                                                                             |                                                 | Practical                             | 1 | 2 | 10 | 20 | 30 | 4 hrs. |
| <b>CC-M4(V)</b><br><b>4 credits</b>                                                                         | From Available CC-M4(V) of 4 credits as per NEP |                                       |   |   |    |    |    |        |
| <b>AEC-4</b><br><b>2 credit</b>                                                                             | From Available AEC-3 of two credits as per NEP  |                                       |   |   |    |    |    |        |
| <b>VAC-4</b><br><b>2 credits</b>                                                                            | From Available VAC-4 of two credits as per NEP  |                                       |   |   |    |    |    |        |
| <b>Internship of 4 credits of 4-6 weeks duration after 4th Semester (if not done after second semester)</b> |                                                 |                                       |   |   |    |    |    |        |

**DEPARTMENT OF BIOTECHNOLOGY, KURUKSHETRA UNIVERSITY, KURUKSHETRA**

**THIRD YEAR : SEMESTER-5**

| Course                                          | Paper(s)                                           | Nomenclature of Paper                  | Credits | Hours/Week | Internal marks | External Marks | Total Marks | Exam Duration |
|-------------------------------------------------|----------------------------------------------------|----------------------------------------|---------|------------|----------------|----------------|-------------|---------------|
| <b>MCC-9<br/>4 credit</b>                       | B23-BTY-501                                        | Immunology                             | 3       | 3          | 20             | 50             | 70          | 3 hrs.        |
|                                                 |                                                    | Practical                              | 1       | 2          | 10             | 20             | 30          | 4 hrs.        |
| <b>MCC-10<br/>4 credit</b>                      | B23-BTY-502                                        | Microbial Genetics                     | 3       | 3          | 20             | 50             | 70          | 3 hrs.        |
|                                                 |                                                    | Practical                              | 1       | 2          | 10             | 20             | 30          | 4 hrs.        |
| <b>DSE-2<br/>4 credit<br/>Select one Option</b> | B23-BTY-503                                        | Fundamentals of Enzymology             | 3       | 3          | 20             | 50             | 70          | 3 hrs.        |
|                                                 |                                                    | Practical                              | 1       | 2          | 10             | 20             | 30          | 4 hrs.        |
|                                                 | B23-BTY-504                                        | Fermented foods                        | 3       | 3          | 20             | 50             | 70          | 3 hrs.        |
|                                                 |                                                    | Practical                              | 1       | 2          | 10             | 20             | 30          | 4 hrs.        |
| <b>DSE-3<br/>4 credit<br/>Select one Option</b> | B23-BTY-505                                        | Foundations of Environment and Ecology | 3       | 3          | 20             | 50             | 70          | 3 hrs.        |
|                                                 |                                                    | Practical                              | 1       | 2          | 10             | 20             | 30          | 4 hrs.        |
|                                                 | B23-BTY-506                                        | Foundations of Nano-Biotechnology      | 3       | 3          | 20             | 50             | 70          | 3 hrs.        |
|                                                 |                                                    | Practical                              | 1       | 2          | 10             | 20             | 30          | 4 hrs.        |
| <b>CC-M5 (V)<br/>4 credits</b>                  | From Available CC-M5(V) of 4 credits as per NEP    |                                        |         |            |                |                |             |               |
| <b>Internship<br/>4 credits</b>                 | Internship#4 credit after 4 <sup>th</sup> semester |                                        |         |            |                |                |             |               |

**THIRD YEAR: SEMESTER-6**

| Course                     | Paper(s)    | Nomenclature of Paper     | Credits | Hours/Week | Internal marks | External Marks | Total Marks | Exam Duration |
|----------------------------|-------------|---------------------------|---------|------------|----------------|----------------|-------------|---------------|
| <b>MCC-11<br/>4 credit</b> | B23-BTY-601 | Microbial Technology      | 3       | 3          | 20             | 50             | 70          | 3 hrs.        |
|                            |             | Practical                 | 1       | 2          | 10             | 20             | 30          | 4 hrs.        |
| <b>MCC-12<br/>4 credit</b> | B23-BTY-602 | Bio-analytical Techniques | 3       | 3          | 20             | 50             | 70          | 3 hrs.        |

|                                                                       |                                                        |                                     |   |   |    |    |    |        |
|-----------------------------------------------------------------------|--------------------------------------------------------|-------------------------------------|---|---|----|----|----|--------|
|                                                                       |                                                        | Practical                           | 1 | 2 | 10 | 20 | 30 | 4 hrs. |
| <b>DSE-4</b><br><b>4 credit</b><br><b>Select one</b><br><b>Option</b> | B23-BTY-603                                            | Medical Microbiology                | 3 | 3 | 20 | 50 | 70 | 3 hrs. |
|                                                                       |                                                        | Practical                           | 1 | 2 | 10 | 20 | 30 | 4 hrs. |
|                                                                       | B23-BTY-604                                            | Molecular medicine and gene therapy | 3 | 3 | 20 | 50 | 70 | 3 hrs. |
|                                                                       |                                                        | Practical                           | 1 | 2 | 10 | 20 | 30 | 4 hrs. |
| <b>DSE-5</b><br><b>4 credit</b><br><b>Select one</b><br><b>Option</b> | B23-BTY-605                                            | Biostatistics                       | 3 | 3 | 20 | 50 | 70 | 3 hrs. |
|                                                                       |                                                        | Practical                           | 1 | 2 | 10 | 20 | 30 | 4 hrs. |
|                                                                       | B23-BTY-606                                            | Bio-entrepreneurship                | 3 | 3 | 20 | 50 | 70 | 3 hrs. |
|                                                                       |                                                        | Practical                           | 1 | 2 | 10 | 20 | 30 | 4 hrs. |
| <b>CC-M6(V)</b><br><b>4 credits</b>                                   | <b>From Available CC-M6(V) of 4 credits as per NEP</b> |                                     |   |   |    |    |    |        |
| <b>SEC-4</b><br><b>2 credit</b>                                       | From Available SEC-4 of two credits as per NEP         |                                     |   |   |    |    |    |        |

**DEPARTMENT OF BIOTECHNOLOGY, KURUKSHETRA UNIVERSITY, KURUKSHETRA  
FOURTH YEAR**

**FOURTH YEAR: SEMESTER-7 (FOR HONOURS/HONOURS WITH RESEARCH IN BIOTECHNOLOGY)**

| Course                                           | Paper(s)                                     | Nomenclature of Paper                   | Credits | Hours/Week | Internal marks | External Marks | Total Marks | Exam Duration |
|--------------------------------------------------|----------------------------------------------|-----------------------------------------|---------|------------|----------------|----------------|-------------|---------------|
| <b>CC-H1<br/>4 credit</b>                        | B23-BTY-701                                  | Recombinant DNA Technology-II           | 4       | 4          | 30             | 70             | 100         | 3 hrs.        |
| <b>CC-H2<br/>4 credit</b>                        | B23-BTY-702                                  | Pharmaceutical Biotechnology            | 4       | 4          | 30             | 70             | 100         | 3 hrs.        |
| <b>CC-H3<br/>4 credit</b>                        | B23-BTY-703                                  | Molecular Cell Biology                  | 4       | 4          | 30             | 70             | 100         | 3 hrs.        |
| <b>DSE-H1<br/>4 credit<br/>Select one Option</b> | B23-BTY-704                                  | Molecular diagnostics                   | 4       | 4          | 30             | 70             | 100         | 3 hrs.        |
|                                                  | B23-BTY-705                                  | Biotechnology in Environment Protection | 4       | 4          | 30             | 70             | 100         | 3 hrs.        |
| <b>PC-H1<br/>4 credit</b>                        | B23-BTY-706                                  | Practical                               | 4       | 8          | 30             | 70             | 100         | 6 hrs.        |
| <b>CC-HM1<br/>4 credit</b>                       | From Available Minor of 4 credits as per NEP |                                         |         |            |                |                |             |               |

**SEMESTER-8 (FOR HONOURS IN BIOTECHNOLOGY)**

| Course                                           | Paper(s)                                     | Nomenclature of Paper                         | Credits | Hours/Week | Internal marks | External Marks | Total Marks | Exam Duration |
|--------------------------------------------------|----------------------------------------------|-----------------------------------------------|---------|------------|----------------|----------------|-------------|---------------|
| <b>CC-H4<br/>4 credit</b>                        | B23-BTY-801                                  | <i>In vitro</i> culture techniques - Animal   | 4       | 4          | 30             | 70             | 100         | 3 hrs.        |
| <b>CC-H5<br/>4 credit</b>                        | B23-BTY-802                                  | <i>In vitro</i> culture techniques - Plant    | 4       | 4          | 30             | 70             | 100         | 3 hrs.        |
| <b>CC-H6<br/>4 credit</b>                        | B23-BTY-803                                  | Enzyme Technology                             | 4       | 4          | 30             | 70             | 100         | 3 hrs.        |
| <b>DSE-H2<br/>4 credit<br/>Select one option</b> | B23-BTY- 804                                 | Bioinformatics-II                             | 4       | 4          | 30             | 70             | 100         | 3 hrs.        |
|                                                  | B23-BTY- 805                                 | Mathematics and calculations in Biotechnology | 4       | 4          | 30             | 70             | 100         | 3 hrs.        |
| <b>PC-H2<br/>4 credit</b>                        | B23-BTY- 806                                 | Practical                                     | 4       | 8          | 30             | 70             | 100         | 6 hrs.        |
| <b>CC-HM2<br/>4 credit</b>                       | From Available Minor of 4 credits as per NEP |                                               |         |            |                |                |             |               |

**OR SEMESTER-8 (FOR HONOURS WITH RESEARCH IN BIOTECHNOLOGY)**

| <b>Course</b>                                  | <b>Paper(s)</b>                              | <b>Nomenclature of Paper</b>                   | <b>Credits</b> | <b>Hours/Week</b> | <b>Internal marks</b> | <b>External Marks</b> | <b>Total Marks</b> | <b>Exam Duration</b> |
|------------------------------------------------|----------------------------------------------|------------------------------------------------|----------------|-------------------|-----------------------|-----------------------|--------------------|----------------------|
| <b>CC-H4<br/>4 credit</b>                      | B23-BTY- 801                                 | <i>In vitro</i> culture techniques<br>- Animal | 4              | 4                 | 30                    | 70                    | 100                | 3 hrs.               |
| <b>CC-H5<br/>4 credit</b>                      | B23-BTY- 802                                 | <i>In vitro</i> culture techniques<br>- Plant  | 4              | 4                 | 30                    | 70                    | 100                | 3 hrs.               |
| <b>Project/<br/>Dissertation<br/>12 credit</b> | B23-BTY- 807                                 | Project/Dissertation                           | 8+4            | -                 | -                     | -                     | <b>300</b>         | -                    |
| <b>CC-HM2<br/>4 credit</b>                     | From Available Minor of 4 credits as per NEP |                                                |                |                   |                       |                       |                    |                      |



**DEPARTMENT OF BIOTECHNOLOGY, KURUKSHETRA UNIVERSITY, KURUKSHETRA  
FIFTH YEAR**

**FIFTH YEAR: SEMESTER-9**

| <b>Course</b>                            | <b>Paper(s)</b>                              | <b>Nomenclature of Paper</b>            | <b>Credits</b> | <b>Hours/Week</b> | <b>Internal marks</b> | <b>External Marks</b> | <b>Total Marks</b> | <b>Exam Duration</b> |
|------------------------------------------|----------------------------------------------|-----------------------------------------|----------------|-------------------|-----------------------|-----------------------|--------------------|----------------------|
| CC-PG1<br>4 credit                       | B23-BTY-901                                  | Plant Biotechnology                     | 4              | 4                 | 30                    | 70                    | 100                | 3 hrs.               |
| CC-PG2<br>4 credit                       | B23-BTY-902                                  | Genomics, Proteomics and Metabolomics   | 4              | 4                 | 30                    | 70                    | 100                | 3 hrs.               |
| CC-PG3<br>4 credit                       | B23-BTY-903                                  | Molecular Genetics                      | 4              | 4                 | 30                    | 70                    | 100                | 3 hrs.               |
| DSE-PG1<br>4 credit<br>Select one Option | B23-BTY-904/704                              | Molecular Diagnostics                   | 4              | 4                 | 30                    | 70                    | 100                | 3 hrs.               |
|                                          | B23-BTY-905/705                              | Biotechnology in Environment Protection | 4              | 4                 | 30                    | 70                    | 100                | 3 hrs.               |
| PC-PG1<br>4 credit                       | B23-BTY-906                                  | Practical                               | 4              | 8                 | 30                    | 70                    | 100                | 6 hrs.               |
| CC-HM3<br>4 credit                       | From Available Minor of 4 credits as per NEP |                                         |                |                   |                       |                       |                    |                      |

**SEMESTER-10 (FOR STUDENTS WHO HAVE DONE HONOURS IN BIOTECHNOLOGY IN FOURTH YEAR)**

| <b>Course</b>                         | <b>Paper(s)</b>                              | <b>Nomenclature of Paper</b> | <b>Credits</b> | <b>Hours/Week</b> | <b>Internal marks</b> | <b>External Marks</b> | <b>Total Marks</b> | <b>Exam Duration</b> |
|---------------------------------------|----------------------------------------------|------------------------------|----------------|-------------------|-----------------------|-----------------------|--------------------|----------------------|
| CC-PG 4<br>4 credit                   | B23-BTY-1001                                 | Food Biotechnology           | 4              | 4                 | 30                    | 70                    | 100                | 3 hrs.               |
| CC-PG 5<br>4 credit                   | B23-BTY-1002                                 | Animal Biotechnology         | 4              | 4                 | 30                    | 70                    | 100                | 3 hrs.               |
| Project/<br>Dissertation<br>12 credit | B23-BTY-1003                                 | Project/<br>Dissertation     | 12             | -                 | -                     | -                     | 300                | -                    |
| CC-HM4<br>4 credit                    | From Available Minor of 4 credits as per NEP |                              |                |                   |                       |                       |                    |                      |

**OR SEMESTER-10 (FOR STUDENTS WHO HAVE DONE HONOURS WITH RESEARCH IN BIOTECHNOLOGY IN FOURTH YEAR)**

| <b>Course</b>      | <b>Paper(s)</b> | <b>Nomenclature of Paper</b> | <b>Credits</b> | <b>Hours/Week</b> | <b>Internal marks</b> | <b>External Marks</b> | <b>Total Marks</b> | <b>Exam Duration</b> |
|--------------------|-----------------|------------------------------|----------------|-------------------|-----------------------|-----------------------|--------------------|----------------------|
| CC-PG4<br>4 credit | B23-BTY-1001    | Food Biotechnology           | 4              | 4                 | 30                    | 70                    | 100                | 3 hrs.               |

|                                            |                                              |                                                           |   |   |    |    |     |        |
|--------------------------------------------|----------------------------------------------|-----------------------------------------------------------|---|---|----|----|-----|--------|
| CC-PG 5<br>4 credit                        | B23-BTY-1002                                 | Animal<br>Biotechnology                                   | 4 | 4 | 30 | 70 | 100 | 3 hrs. |
| CC-PG6<br>4credits                         | B23-BTY-1004/803                             | Enzyme<br>Technology                                      | 4 | 4 | 30 | 70 | 100 | 3 hrs. |
| DSE-PG 2<br>4 credits<br>Select any<br>one | B23-BTY-1005/804                             | Bioinformatics-II                                         | 4 | 4 | 30 | 70 | 100 | 3 hrs. |
|                                            | B23-BTY-1006/805                             | Mathematics<br>and<br>calculations<br>in<br>Biotechnology | 4 | 4 | 30 | 70 | 100 | 3 hrs. |
| PC-PG2                                     | B23-BTY-1007                                 | Practical                                                 | 4 | 8 | 30 | 70 | 100 | 6 hrs. |
| CC-HM2<br>4 credit                         | From Available Minor of 4 credits as per NEP |                                                           |   |   |    |    |     |        |