**Kurukshetra University Kurukshetra**

**(Established by the State Legislature Act XII of 1956; ‘A+’ Grade, NAAC Accredited)**

**Model Curriculum for**

**Bachelor of Technology (B.Tech.) in Bio-Technology**

**General, Course Structure & Scheme&Semester-Wise Credit Distribution**

**(Credit-Based Scheme of Studies/Examination ((2018-19 Onwards in Phased Manner)**

1. **Definition of Credit:**

|  |  |
| --- | --- |
| 1 Hour Lecture (L) per week | 1 credit |
| 1Hour Tutorial (T) per week | 1 credit |
| 1 Hour Practical (P) per week | 0.5 credit |
| 2 Hours Practical (Lab) per week | 1 credit |

**B. Range of credits:**

A total credit of about 160 is required for a student to be eligible to get Under Graduate degree in Biotechnology. A student will be eligible to get Under Graduate degree (B.Tech.) with Honours, if he/she completes an additional 20 credits.These could be acquired through MOOCs at Swayam portal or with in-house examination being conducted. In order to have an Honours degree, a student may choose minimum 20 credits provided that the student must ensure the course is approved by the Competent Authority, Government of India.

**Bachelor of Technology (Biotechnology)**

**Credit-Based**

SCHEME OF STUDIES/EXAMINATIONS

**Semester – III**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S. No. | Course No. | Course Title | Teaching Schedule | Credits | Allotment of Marks | Duration of Exam(Hrs.) |
| L | T | P | Hours/Week | Major Test | Minor Test | Practical | Total |
| 1 | BTE-201A | Cell Biology & Genetics | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 2 | BTE-203A | Microbiology | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 3 | BTE-205A | Biochemistry | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 4 | BTE-207A | Principles of Biostatistics | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 5 | HM-901A | OrganizationalBehavior | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 6 | BTE-209LA | Cell Biology & Genetics Lab | 0 | 0 | 3 | 3 | 1.5 | 0 | 40 | 60 | 100 | 3 |
| 7 | BTE-211LA | Microbiology Lab | 0 | 0 | 3 | 3 | 1.5 | 0 | 40 | 60 | 100 | 3 |
| 8 | BTE-213LA | Biochemistry Lab | 0 | 0 | 3 | 3 | 1.5 | 0 | 40 | 60 | 100 | 3 |
|  |  | **Total** | **15** | **0** | **9** | **24** | **19.5** | **375** | **245** | **180** | **800** |  |
| 9 | BTE-215A | Industrial Training-I | 2 | 0 | 0 | 2 | - | - | 100 | - | 100 | - |
| 10 | \*MC-902A | Constitution of India | 3 | 0 | 0 | 3 |  | 75 | 25 | 0 | 100 | 3 |

**Note:** BTE-215A is a mandatory credit less course in which the students tobe evaluated for the industrial training undergone after 2nd semester and students will be required to get passing marks to qualify.

**\*MC-902A** is a mandatory credit less course in which the student will be required to get passing marks in the major test.

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SCHEME OF STUDIES/EXAMINATIONS

**Semester – IV**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S. No. | Course No. | Course Title | Teaching Schedule | Credits | Allotment of Marks | Duration of Exam(Hrs.) |
| L | T | P | Hours/Week | Major Test | Minor Test | Practical | Total |
| 1 | BTE-202A | Molecular Biology | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 2 | BTE-204A | Bio-analytical Techniques  | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 3 | BTE-206A | Immunology  | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 4 | BTE-208A | Industrial Biotechnology | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 5 | BS-202A | Organic Chemistry  | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 6 | BTE-212LA | Molecular Biology Lab | 0 | 0 | 3 | 3 | 1.5 | 0 | 40 | 60 | 100 | 3 |
| 7 | BTE-214LA | Bio-analytical Techniques Lab | 0 | 0 | 3 | 3 | 1.5 | 0 | 40 | 60 | 100 | 3 |
| 8 | BTE-216LA | Industrial Microbiology Lab | 0 | 0 | 3 | 3 | 1.5 | 0 | 40 | 60 | 100 | 3 |
| 9 | BTE-218LA | Immunology Lab | 0 | 0 | 3 | 3 | 1.5 | 0 | 40 | 60 | 100 | 3 |
|  |  | **Total** | **15** | **0** |  **12** | **27** | **21** | **375** | **285** | **240** | **900** |  |
| 10 | MC-901A\* | Environmental Sciences\* | 3 | 0 | 0 | 3 |  | 75 | 25 | 0 | 100 | 3 |

**\*MC-901A**is a mandatory credit less course in which the student will be required to get passing marks in the major test.

**Note:**All the students have to undergo 4-6 weeks industrial training after IV semester and to be evaluated in V semester.

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SCHEME OF STUDIES/EXAMINATIONS

**Semester – V**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course No.** | **Course Title** | **Teaching Schedule** | **Credits** | **Allotment of Marks** | **Duration of Exam(Hrs.)** |
| **L** | **T** | **P** | **Hours/Week** | **Major Test** | **Minor Test** | **Practical** | **Total** |
| 1 | BTE-301A | Recombinant DNA Tech | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 2 | BTE-303A | Bioprocess Engineering | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 3 | BTE-305A | Downstream Processing | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 4 | BTE-307A | Healthcare Biotechnology | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 5 | OEC-I\* |  | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 6 | BTE-307LA | Recombinant DNA Technology Lab | 0 | 0 | 3 | 3 | 1.5 | 0 | 40 | 60 | 100 | 3 |
| 7 | BTE-309LA | Fermentation & Downstream Processing Lab | 0 | 0 | 3 | 3 | 1.5 | 0 | 40 | 60 | 100 | 3 |
| 8 | OEC-ILA |  | 0 | 0 | 2 | 2 | 1.0 | 0 | 40 | 60 | 100 | 3 |
|  |  | **Total** | **15** | **0** | **10** | **25** | **19** | **375** | **245** | **180** | **800** |  |
| 9 | \*\*MC-903A | Essence of Indian Traditional Knowledge | 3 | 0 | 0 | 3 |  | 100 |  | 0 | 100 | 3 |
| 10 | \*BTE-311A | Industrial Training-II | 0 | 0 | 2 | 2 | 0 | 0 | 100 |  | 100 |  |

**\*\*MC-903A** is a mandatory credit less course in which the student will be required to get passing marks in the major test.

\* BTE-311A is a mandatory credit less course in which the students to be evaluated for the industrial training undergone after 4th semester and students will be required to get passing marks to qualify.

**The course of both Program Elective and Open Elective will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section.**

The students should select one open Elective Courses (OEC) from the following list.

|  |  |
| --- | --- |
| **Course No.** | **OEC-I\*** |
| ES-201A | Essentials of Information Technology  |
| ES-211LA | Information Technology Lab |
|  |
| ES-213A | Python |
| ES-215LA | Python Lab |
|  |
| MOOC-1A | Any one MOCC course with lab through SWAYAM  |

**Bachelor of Technology (Biotechnology)**

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SCHEME OF STUDIES/EXAMINATIONS

**Semester – VI**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course No.** | **Course Title** | **Teaching Schedule** | **Credits** | **Allotment of Marks** | **Duration of Exam****(Hrs.)** |
| **L** | **T** | **P** | **Hours/Week** | **Major Test** | **Minor Test** | **Practical** | **Total** |
| 1 | OEC-IIA |  | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 2 | BTE-304A | Plant Biotechnology | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 3 | BTE-306A | Animal Biotechnology | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 4 | BTE-308A | Food Biotechnology | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 5 | BTE-310A | Environmental Biotechnology& Engineering | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 6 | HM-902A | Business Intelligence & Entrepreneurship  | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 7 | BTE-312LA | Animal Cell Culture Lab | 0 | 0 | 3 | 3 | 1.5 | 0 | 40 | 60 | 100 | 3 |
| 8 | BTE-314LA | Plant Cell Culture Lab | 0 | 0 | 3 | 3 | 1.5 | 0 | 40 | 60 | 100 | 3 |
| 9 | BTE-316LA | Food & Environmental Biotechnology Lab  | 0 | 0 | 3 | 3 | 1.5 | 0 | 40 | 60 | 100 | 3 |
|  |  | **Total** | **18** | **0** | **9** | **27** | **22.5** | **450** | **270** | **180** | **900** |  |

**Note:**All the students have to undergo 4-6 weeks industrial training after VI semester and it will be evaluated in VII semester.

The students should select two open Elective Courses (OEC) from the following list.

**The course of both Program Elective and Open Elective will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Course No.** | **OEC-II** |  | **Course No.** | **OEC-II** |
| OEC-BT-302A | Nano Biotechnology |  | OEC-BT-322A | Introduction to Arts &Aesthetics |
| OEC-BT-318A | Introduction to MEMS |  | MOOC-2A | Anyone MOOC through SWAYAM |
| OEC-BT-320A | Non Conventional Energy Resources |  |  |  |

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SCHEME OF STUDIES/EXAMINATIONS

**Semester – VII**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S. No. | Course No. | Course Title | Teaching Schedule | Credits | Allotment of Marks | Duration of Exam(Hrs.) |
| L | T | P | Hours/Week | Major Test | Minor Test | Practical | Total |
| 1 | BTE-401A | Bioinformatics | 2 | 1 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 2 | BTE-403A | Pharmaceutical Biotechnology | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 3 | \*PE-IA | Program Elective-I\* | 2 | 1 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 4 | \*PE-IIA | Program Elective-II\* | 2 | 1 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 5 | BTE-405LA | Bioinformatics Lab  | 0 | 0 | 3 | 3 | 1.5 | 0 | 40 | 60 | 100 | 3 |
| 7 | BTE-407LA | Project-I\*\* | 0 | 0 | 8 | 8 | 4.0 | 0 | 100 | 100 | 200 | 3 |
|  |  | **Total** | **9** | **3** | **11** | **23** | **17.5** | **300** | **240** | **160** | **700** |  |
| 8 | \*BTE-409A | Industrial Training (Viva-Voce)\*\*\* | 0 | 0 | 2 | 2 | - | 0 | 0 | 100 | 100 |  |

**The course of both Program Elective and Open Elective will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Course No.** | **\*PE-I** |  | **Course No.**  | **\*PE-II** |
| BTE-411A | Biosensor and Bioinstrumentation | BTE-417A | Advanced Management Information System and Information Technology |
| BTE-413A | Biochips and Microarray Technology  | BTE-419A | Stem Cell Technology |
| BTE-415A | Enzyme Technology | BTE-421A | Herbal Drug Technology |

\*\*The project should be initiated by the students in the beginning of VII semester and will be evaluated at the end of the semester on the basis of a presentation and report.

\*BTE-409Ais a mandatory credit less course in which the students to be evaluated for the industrial training undergone after 6th semester and students will be required to get passing marks to qualify.

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SCHEME OF STUDIES/EXAMINATIONS

**Semester – VIII**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S. No. | Course No. | Course Title | Teaching Schedule | Credits | Allotment of Marks | Duration of Exam(Hrs.) |
| L | T | P | Hours/Week | Major Test | Minor Test | Practical | Total |
| 1 | \*PE-IIIA |  | 2 | 1 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 2 | \*PE-IVA |  | 2 | 1 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 3 | BTE-402A | Biocatalysis& Biotransformation | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 4 | \*\*OEC-IIIA |  | 3 | 0 | 0 | 3 | 3.0 | 75 | 25 | 0 | 100 | 3 |
| 5 | BTE-416LA | Project-II | 0 | 0 | 15 | 15 | 7.5 | 0 | 100 | 100 | 200 | 3 |
|  |  | **Total** | **10** | **2** | **15** | **27** | **19.5** | **300** | **200** | **100** | **600** |  |

**The course of both Program Elective and Open Elective will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section.**

\*The student should select two Program Elective Courses (PEC) from the following list.

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No.** | **PE-III** | **Course No.**  | **PE-IV** |
| BTE-404A | Metagenomics | BTE-410A | Developmental Biology |
| BTE-406A | Molecular Modeling and Drug Design | BTE-412A | Protein Engineering |
| BTE-408A | Cancer Biology | BTE-414A | Bioethics, IPR and Bio-safety |

\*The student should select one Open Elective Courses (OEC) from the following list.

|  |  |
| --- | --- |
| **Course No.** | **OEC-III** |
| OEC-BT-418A | Biomedical Electronics |
| OEC-BT-420A | MATLAB & Simulation |
| OEC-BT-422A | History of Science |
| OEC-BT-424A | Internet of things |
| MOOC-3A | Anyone MOOC through SWAYAM |

**Open Elective Course for B. Tech. Students of other Departments**

|  |  |
| --- | --- |
| **Course No.** | **OEC** |
| BTE 401A | Bioinformatics |
| BTE-414A | Bioethics, IPR and Biosafety |