



**M S RAMAIAH  
UNIVERSITY OF APPLIED SCIENCES**

## **Programme Specifications**

*(Revised in August 2019 and applicable from 2018 batch onwards)*

### **B.Sc. (Hons) –Biotechnology**

**Faculty of Life and Allied Health Sciences**

**Ramaiah University of Applied Sciences**

**University House, New BEL Road, MSR Nagar, Bengaluru – 560 054**

**[www.msruas.ac.in](http://www.msruas.ac.in)**

| <b>Programme Specifications: B.Sc. (Hons)-Biotechnology</b> |  |
|---|--|
| <b>Faculty</b>  | Faculty of Life and Allied Health Sciences |
| <b>Programme</b>  | B.Sc. (Hons)-Biotechnology                 |
| <b>Dean</b>   |  |

**1. Title of the Award**

B.Sc. (Hons)-Biotechnology

**2. Modes of study**

Full-Time

**3. Awarding Institution / Body**

M.S.Ramaiah University of Applied Sciences – Bengaluru, India

**4. Joint Award**

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**5. Teaching Institution**

Faculty of Life and Allied Health Sciences

**6. Date of Programme Specifications**

February 2018

**7. Date of Programme Approval by the Academic Council of MSRUAS**

April 2018 (Revised in July 2019)

**8. Next Review Date**

May 2021

**9. Programme Approving Regulatory Body and Date of Approval**

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**10. Programme Accrediting Body and Date of Accreditation**

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**11. Grade Awarded by the Accreditation Body**

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**12. Programme Accreditation Validity**

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**13. Programme Benchmark**

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#### 14. Rationale for the Programme

Biotechnology is a technology based on biology – biotechnology harnesses cellular and bimolecular processes to develop technologies and products that help improve our lives and the health of our planet. Biotechnology deals with cell structures and dynamics, genetics, macromolecular structure, microbiology, chemistry, biochemistry, biophysics, biomathematics, bio-informatics as applied to medical, animal, plant, environmental and industrial biotechnology products and human genome project.

B.Sc. Honours in Biotechnology is an undergraduate degree programme designed to create motivated, energetic, thinking and creative graduates to fill the roles of research assistants/associates, marketing executives, maintenance engineers, computational analysts and even administrators. With additional qualification and training they can seek employment as teachers, professors, scientists, professionals, independent practitioners and entrepreneurs.

Indian economy is experiencing an upward growth right from the beginning of 21<sup>st</sup> century. The average GDP growth rate is varying from 6.5% to 9%. There are 630 million people are below 25 years of age or younger. Many of these youth would like to work as research associates, marketing executives, maintenance engineers, computational analysts and even as administrators, teachers, professors, scientists and professionals in the growing and promising areas of biotechnology. A large number of youth in the age group of 18 or below who are for university education are considering biotechnology programme for career prospects. RUAS, a young and progressive University with excellent teaching and learning resources and faculty base would like to offer B.Sc. (Hons) in Biotechnology as an undergraduate programme to these aspiring youngsters. The proposed B.Sc. (Hons) programme designed will act as a foundation and first degree to prepare research assistants/associates, marketing executives, maintenance engineers, computational analysts and even administrators in biotechnology industries. With additional qualification and training the graduates can seek employment as teachers, professors, scientists, professionals and administrators to meet the challenges of growing economy as well as to meet the growing aspirations of the youth.

The B.Sc. (Hons)-Biotechnology programme at Faculty of Biological and Life Sciences, RUAS has been developed by the members of the faculty based on interactions with various universities, research establishments and industries in India and abroad.

The curriculum is outcome based and it imbibes required theoretical concepts and practical skills in the domain. By undergoing this programme, students develop critical, analytical thinking and problem solving abilities for a smooth transition from academic to real-life work environment. Opportunities are provided for the students to do internship in organizations involved in research & development and also execute a well-defined project in a team to enhance practical skills and problem solving abilities. The students are required to submit a well written project report as partial fulfilment for the award of the degree, which will help develop skills of documenting scientific work.

In addition students are trained in communication skills and interdisciplinary topics to enhance their scope. The various new features like undergoing internship and executing a full-fledged academic project in the programme make the students more versatile generating wide range of opportunities including registering for Masters and Ph.D. programme in a chosen subject area, if one wishes to be considering teaching in a university or working for a research Laboratory as a scientist. The programme embeds requisite knowledge and training for a graduate to become an entrepreneur if he/she wishes to.

The above mentioned features of the programme, advanced teaching and learning resources, and experience of the faculty members with their strong connections with industry and research organizations makes this programme unique.

### 15. Programme Mission

The purpose of the programme is creation of knowledgeable human resources to work in Government, Semi-Government, Private and Public sector owned Biotechnology organisations and also to assume administration positions. With further progression in education, graduates should be able to undertake teaching and research in colleges and universities as well as in scientific organisations.

### 16. Graduate Attributes

1. Ability to apply fundamental knowledge of Biology, Chemistry, Mathematics, Statistics and computer to solve real life problems in their chosen domain
2. Ability to perform administrative duties in government, semi-government, private and public sector organizations
3. Ability to teach in schools, colleges and universities with additional qualification and training
4. Ability to understand and solve scientific problems by conducting experimental investigations
5. Ability to apply appropriate tools, techniques and understand utilization of resources appropriately in various Laboratories
6. Ability to apply basic programming concepts in their chosen domains
7. Ability to understand the effect of scientific solutions on legal, cultural, social and public health and safety aspects
8. Ability to develop sustainable solutions and understand their effect on society and environment
9. Ability to apply ethical principles to scientific practices and professional responsibilities
10. Ability to work as a member of a team, to plan and to integrate knowledge of various disciplines and to lead teams in multidisciplinary settings
11. Ability to make effective oral presentations and communicate technical ideas to a broad audience using written and oral means
12. Ability to adapt to the changes and advancements in science and engage in independent and life-long learning

### 17. Programme Goal

The programme acts as a foundation degree and helps to develop critical, analytical and problem solving skills at first level. The foundation degree makes the graduates employable in scientific organisations and also to assume administrative positions in various types of organisations. With additional qualifications and training help the graduates to pursue a career in academics or scientific organisations as a researcher.

## 18. Programme Objectives

The Bachelor of Science honours degree programme in Biotechnology imparts knowledge and understanding of biological systems and their behaviour for various inputs/stimuli originating from the surrounding environment. The Programme also provides sufficient understanding and cognitive abilities to design, develop and incorporate scientific methods, techniques, and processes for biological systems of study to achieve the desired results. In addition, the programme imparts knowledge and training to develop transferable skills and entrepreneurship abilities.

The objectives of the programme are to enable the students to:

1. To impart knowledge of biology, chemistry and mathematics essential for study of biotechnology
2. To impart knowledge and understanding of biotechnology systems-medical, animal, plant, environmental and industrial
3. To train on computational techniques that are essential for design and analysis of biotechnological systems
4. To train students on use of various instrumentation for the study and observation of biological systems and record their behaviour
5. To model, simulate and analyze the behaviour of biotechnology systems
6. To observe problems encountered in biological systems and propose possible solutions
7. To train students to conduct scientific experiments and document scientific investigations
8. To use commercial software tools for scientific simulations and documentation
9. To educate on professional ethics, economics, social sciences, inter personal and communication skills relevant to professional practice
10. To provide a general perspective on lifelong learning and opportunities for a career in industry, scientific organization, education, business and commerce

## 19. Intended Learning Outcomes of the Programme

The Intended Learning Outcomes (ILOs) are listed under four headings:

1. Knowledge and Understanding, 2. Cognitive Skills 3. Practical Skills and 4. Capability / Transferable Skills.

### 1. Knowledge and Understanding

After undergoing this programme, a student will be able to:

- KU1:** Explain with illustrations structure, function and behaviour of human, animal, plant, industrial and environmental biological systems
- KU2:** Explain biomolecular structures and interactions in various biological systems
- KU3:** Recognise tools, techniques and processes followed in biotechnology industries
- KU4:** Collate data required for design and analysis of biotechnological products

### 2. Cognitive Skills

After undergoing this programme, a student will be able to:

- CS1:** Compare and Contrast various biological systems from biotechnology perspective
- CS2:** Model biological systems and their interactions from biotechnology perspective
- CS3:** Analyse biomolecular interactions and factors affecting such interactions to design effective biotechnology products
- CS4:** Process Bioinformatics data to draw meaningful conclusions

### 3. Practical Skills

After undergoing this programme, a student will be able to:

- PS1:** Choose appropriate instrumentation system for observation and evaluation of biological systems
- PS2:** Conduct experiments on biological systems as per the standards and protocols
- PS3:** Use commercially available software tools for modelling, simulation and analysis of defined biological systems
- PS4:** Operate systems that are used in biotechnology industries

### 4. Capability / Transferable Skills

After undergoing this programme, a student will be able to:

- TS1:** Manage information, develop scientific reports and make presentations
- TS2:** Build, Manage and Lead a team to successfully complete a project and Communicate across teams and organizations to achieve professional objectives
- TS3:** Work under various constraints to meet project targets
- TS4:** Adopt to the chosen profession by continuously upgrading his/her knowledge and understanding through Life-long Learning philosophy

**Programme Structure****SEMESTER 1**

| S. No.  | Code      | Course Title                                      | Theory (h/W/S)  | Tutorials (h/W/S) | Practical (h/W/S) | Total Credits | Max. Marks |
|---|-----------|---|-----------------|-------------------|-------------------|---------------|------------|
| 1   | 18BTC101A | Macromolecular Structure and Analysis             | 3               |                   |                   | 3             | 100        |
| 2   | 18BTC102A | Biophysics and Instrumentation                    | 3               |                   |                   | 3             | 100        |
| 3   | 18BTC103A | Cell Structure and Dynamics                       | 3               |                   |                   | 3             | 100        |
| 4   | 18BTC104A | Chemistry-I                                       | 3               |                   |                   | 3             | 100        |
| 5   | 18BTC105A | Biomathematics                                    | 2               | 2                 |                   | 3             | 100        |
| 6   | 18CSN106A | Computers and Programming with C                  | 2               | 2                 |                   | 3             | 100        |
| 7   | 18BTL107A | Biochemistry Laboratory                           |                 |                   | 2                 | 1             | 50         |
| 8   | 18BTL108A | Basic Instrumentation and Cell Biology Laboratory |                 |                   | 2                 | 1             | 50         |
| 9   | 18BTL109A | Chemistry-I Laboratory                            |                 |                   | 2                 | 1             | 50         |
| 10  | 19HST103A | Communication Skills-1                            | 3               |                   |                   | 3             | 100        |
| <b>Total</b>                                  |           |   | <b>19</b>       | <b>4</b>          | <b>6</b>          | <b>24</b>     | <b>850</b> |
| <b>Total number of contact hours per week</b> |           |   | <b>29 hours</b> |                   |                   |               |            |
| <b>Number of credits can be registered</b>    |           |   | <b>Minimum</b>  | <b>19</b>         | <b>Maximum</b>    | <b>24</b>     |            |

**SEMESTER 2**

| S. No.  | Code      | Course Title                               | Theory (h/W/S)  | Tutorials (h/W/S) | Practical (h/W/S) | Total Credits | Max. Marks |
|---|-----------|--|-----------------|-------------------|-------------------|---------------|------------|
| 1   | 18BTC110A | Organic Mechanisms in Biology              | 3               |                   |                   | 3             | 100        |
| 2   | 18BTC111A | Principle of Transmission Genetics         | 3               |                   |                   | 3             | 100        |
| 3   | 18BTC112A | Principles of Microbiology                 | 3               |                   |                   | 3             | 100        |
| 4   | 18BTC113A | Biostatistics                              | 3               | 2                 |                   | 4             | 100        |
| 5   | 18BTC114A | Chemistry-II                               | 3               |                   |                   | 3             | 100        |
| 6   | 18BTL115A | Cytogenetic Techniques Laboratory          |                 |                   | 2                 | 1             | 50         |
| 7   | 18BTL116A | Microbiology Laboratory                    |                 |                   | 2                 | 1             | 50         |
| 8   | 18BTL117A | Chemistry-II Laboratory                    |                 |                   | 2                 | 1             | 50         |
| 9   | 18BTL118A | Mathematical Tools and Techniques (MatLab) |                 |                   | 2                 | 1             | 50         |
| 10  | 19HST104A | Communication Skills-2                     | 3               |                   |                   | 3             | 100        |
| <b>Total</b>                                  |           |  | <b>18</b>       | <b>2</b>          | <b>8</b>          | <b>23</b>     | <b>800</b> |
| <b>Total number of contact hours per week</b> |           |  | <b>28 hours</b> |                   |                   |               |            |
| <b>Number of credits can be registered</b>    |           |  | <b>Minimum</b>  | <b>18</b>         | <b>Maximum</b>    | <b>23</b>     |            |

**SEMESTER 3**

| S. No.  | Code      | Course Title  | Theory (h/W/S)  | Tutorials (h/W/S) | Practical (h/W/S) | Total Credits | Max. Marks |  |
|---|-----------|---|-----------------|-------------------|-------------------|---------------|------------|--|
| 1   | 18BTC201A | Molecular Genetics  | 3               |                   |                   | 3             | 100        |  |
| 2   | 18BTC202A | Principles of Immunology                                    | 3               |                   |                   | 3             | 100        |  |
| 3   | 18BTC203A | Molecular Biology   | 3               |                   |                   | 3             | 100        |  |
| 4   | 18BTC204A | Plant and Animal Tissue culture techniques and Applications | 3               |                   |                   | 3             | 100        |  |
| 5   | 18BTC205A | Chemistry-III   | 3               |                   |                   | 3             | 100        |  |
| 6   | 18CSN206A | Computer Data Structures and Computer Organization          | 2               | 2                 |                   | 3             | 100        |  |
| 7   | 18BTL207A | Immunology & Molecular Biology Laboratory                   |                 |                   | 2                 | 1             | 50         |  |
| 8   | 18BTL208A | Tissue Culture Laboratory                                   |                 |                   | 4                 | 2             | 50         |  |
| 9   | 18BTL209A | Chemistry-III Laboratory                                    |                 |                   | 2                 | 1             | 50         |  |
| 10  | 19HST101A | Elements of Social Science and Ethics                       | 2               |                   |                   | 2             | 50         |  |
| 11  | 18BTN201A | Environmental Studies                                       | 2               |                   |                   | 2             | 50         |  |
| <b>Total</b>                                  |           |   | <b>21</b>       | <b>2</b>          | <b>8</b>          | <b>26</b>     | <b>850</b> |  |
| <b>Total number of contact hours per week</b> |           |   | <b>31 hours</b> |                   |                   |               |            |  |
| <b>Number of credits can be registered</b>    |           |   | <b>Minimum</b>  | <b>20</b>         | <b>Maximum</b>    |               | <b>26</b>  |  |

**SEMESTER 4**

| S. No.  | Code      | Course Title                             | Theory (h/W/S)  | Tutorials (h/W/S) | Practical (h/W/S) | Total Credits | Max. Marks |  |
|---|-----------|--|-----------------|-------------------|-------------------|---------------|------------|--|
| 1   | 18BTC210A | Recombinant DNA Technology               | 3               |                   |                   | 3             | 100        |  |
| 2   | 18BTC211A | Plant Biotechnology                      | 3               |                   |                   | 3             | 100        |  |
| 3   | 18BTC212A | Animal Biotechnology                     | 3               |                   |                   | 3             | 100        |  |
| 4   | 18BTC213A | Biodiversity & Taxonomy                  | 3               |                   |                   | 3             | 100        |  |
| 5   | 18BTC214A | Chemistry-IV                             | 3               |                   |                   | 3             | 100        |  |
| 6   | 18BTC215A | Computational Biology and Bioinformatics | 3               |                   |                   | 3             | 100        |  |
| 7   | 18BTL216A | Recombinant DNA Technology Laboratory    |                 |                   | 2                 | 1             | 50         |  |
| 8   | 18BTL217A | Chemistry-IV Laboratory                  |                 |                   | 2                 | 1             | 50         |  |
| 9   | 18BTL218A | Bioinformatics Laboratory                |                 |                   | 4                 | 2             | 50         |  |
| 10  | 19HST201A | Constitution, Human Rights and Law       | 2               |                   |                   | 2             | 50         |  |
| <b>Total</b>                                  |           |  | <b>20</b>       |                   | <b>8</b>          | <b>24</b>     | <b>800</b> |  |
| <b>Total number of contact hours per week</b> |           |  | <b>28 hours</b> |                   |                   |               |            |  |
| <b>Number of credits can be registered</b>    |           |  | <b>Minimum</b>  | <b>18</b>         | <b>Maximum</b>    |               | <b>24</b>  |  |



**SEMESTER 5**

| S. No.  | Code                       | Course Title  | Theory (h/W/S)  | Tutorials (h/W/S) | Practical (h/W/S) | Total Credits  | Max. Marks |
|---|----------------------------|---|-----------------|-------------------|-------------------|----------------|------------|
| 1   | 18BTC301A                  | Genomics & Proteomics   | 3               |                   |                   | 3              | 100        |
| 2   | 18BTC302A                  | Research Methodology  | 3               |                   |                   | 3              | 100        |
| 3*  | 18BDTSE301A<br>18BDTSE302A | 1. Environmental Biotechnology<br>2. Agricultural Biotechnology                       | 4               |                   |                   | 4              | 100        |
| 4*  | 18BDTSE303A<br>18BDTSE304A | 1. Industrial Biotechnology<br>2. Pharmaceutical Biotechnology                        | 4               |                   |                   | 4              | 100        |
| 5*  | 18BDDEL305A<br>18BDDEL306A | 1. Environmental Biotechnology Laboratory<br>2. Agricultural Biotechnology Laboratory |                 |                   | 4                 | 2              | 50         |
| 6*  | 18BDDEL307A<br>18BDDEL308A | 1. Industrial Biotechnology Laboratory<br>2. Pharmaceutical Biotechnology Laboratory  |                 |                   | 4                 | 2              | 50         |
| 7   | 18BTIS307A<br>18BTIS308A   | i. Internship<br>ii. Seminar<br>(Choose any)  |                 |                   | 6                 | 3              | 50         |
| 8   | 18BTL309A                  | Industrial Visit  |                 |                   | 6                 | 3              | 50         |
| 9   | 18OEE31XA                  | Open Elective -1  | 3               |                   |                   | 3              | 100        |
| <b>Total</b>                                  |                            |   | <b>17</b>       |                   | <b>20</b>         | <b>27</b>      | <b>700</b> |
| <b>Total number of contact hours per week</b> |                            |   | <b>37 hours</b> |                   |                   |                |            |
| <b>Number of credits can be registered</b>    |                            |   | <b>Minimum</b>  |                   | <b>21</b>         | <b>Maximum</b> | <b>27</b>  |

**SEMESTER 6**

| S. No.  | Code      | Course Title                                    | Theory (h/W/S)  | Tutorials (h/W/S) | Practical (h/W/S) | Total Credits | Max. Marks |
|---|-----------|---|-----------------|-------------------|-------------------|---------------|------------|
| 1   | 18BTC310A | Medical Biotechnology                           | 3               |                   |                   | 3             | 100        |
| 2   | 18BTC311A | Bioethics, IPR and Biosafety                    | 3               |                   |                   | 3             | 100        |
| 3   | 18MCN311A | Introduction to Management and Entrepreneurship | 3               |                   |                   | 3             | 100        |
| 4   | 18OEE32XA | Open Elective -2                                | 3               |                   |                   | 3             | 100        |
| 5   | 18BTP312A | Project Work                                    |                 |                   | 24                | 12            | 100        |
| <b>Total</b>                                  |           |   | <b>12</b>       |                   | <b>24</b>         | <b>24</b>     | <b>500</b> |
| <b>Total number of contact hours per week</b> |           |   | <b>36 hours</b> |                   |                   |               |            |
| <b>Number of credits can be registered</b>    |           |   | <b>Minimum</b>  | <b>18</b>         | <b>Maximum</b>    |               | <b>24</b>  |

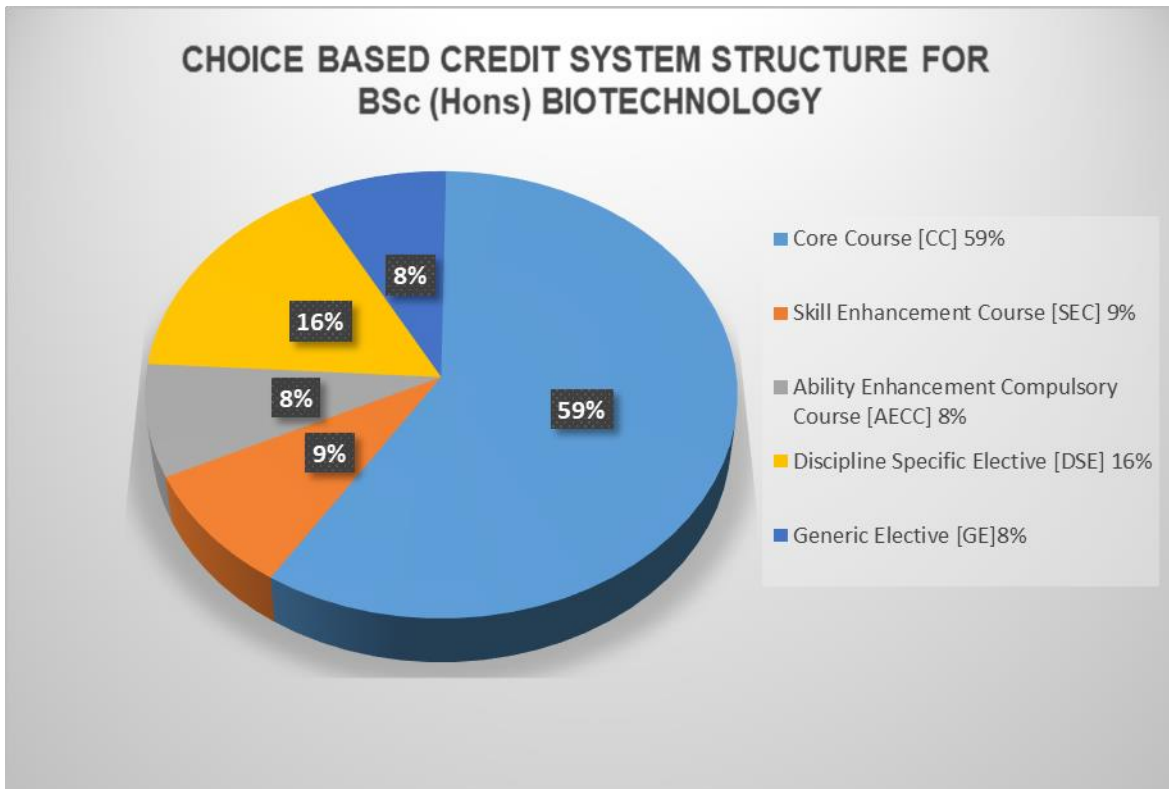
\* **Discipline Specific Electives:** Students should choose one course out of the choices given

**Open Elective Courses:**

A number of electives from faculty of Mathematical and Physical Sciences, Engineering, Management and Commerce, Art and Design, Hospitality Management and Catering Technology, Pharmacy, Dental Sciences will be announced one semester prior to the scheduled semester

| Proposed Choice Based Credit System Structure for B.Sc. (Hons)-Biotechnology |   |  |  |   |  |   |  |  | Total Credits |
|--|---|--|--|---|--|---|--|--|---------------|
| <b>Core Course [CC]</b>  | 18BTC101A<br>Macromolecular Structure and Analysis<br>Credits =3                                      | 18BTC102A<br>Biophysics and Instrumentation<br>Credits = 3   | 18BTC103A<br>Cell Structure and Dynamics<br>Credits = 3  | 18BTC104A<br>Chemistry-I<br>Credits = 3   | 18BTL107A<br>Biochemistry Laboratory<br>Credits = 1                        | 18BTL108A<br>Basic Instrumentation and Cell Biology Laboratory<br>Credits = 1 | 18BTL109A<br>Chemistry-I Laboratory<br>Credits = 1   | 18BTC110A<br>Organic Mechanisms in Biology<br>Credits =3 | <b>87</b>     |
|  | 18BTC111A<br>Principle of Transmission Genetics<br>Credits =3   | 18BTC112A<br>Principles of Microbiology<br>Credits =3  | 18BTC113A<br>Biostatistics<br>Credits = 4  | 18BTC114A<br>Chemistry-II<br>Credits =3   | 18BTL115A<br>Cytogenetic Techniques Laboratory<br>Credits = 1              | 18BTL116A<br>Microbiology Laboratory<br>Credits = 1                           | 18BTL117A<br>Chemistry-II Laboratory<br>Credits = 1  | 18BTC201A<br>Molecular Genetics<br>Credits =3            |               |
|  | 18BTC202A<br>Principles of Immunology<br>Credits =3   | 18BTC203A<br>Molecular Biology<br>Credits =3   | 18BTC204A<br>Plant and Animal Tissue culture techniques and Applications<br>Credits =3                                       | 18BTC205A<br>Chemistry-III<br>Credits =3  | 18BTL207A<br>Immunology & Molecular Biology Laboratory<br>Credits = 1      | 18BTL208A<br>Tissue Culture Laboratory<br>Credits = 2                         | 18BTL209A<br>Chemistry-III Laboratory<br>Credits = 1 | 18BTC210A<br>Recombinant DNA Technology<br>Credits =3    |               |
|  | 18BTC211A<br>Plant Biotechnology<br>Credits =3  | 18BTC212A<br>Animal Biotechnology<br>Credits =3  | 18BTC213A<br>Biodiversity & Taxonomy<br>Credits =3   | 18BTC214A<br>Chemistry-IV<br>Credits =3   | 18BTC215A<br>Computational Biology and Bioinformatics<br>Credits =3        | 18BTL216A<br>Recombinant DNA Technology Laboratory<br>Credits = 1             | 18BTL217A<br>Chemistry-IV Laboratory<br>Credits = 1  | 18BTL218A<br>Bioinformatics Laboratory<br>Credits = 2    |               |
|  | 18BTC301A<br>Genomics & Proteomics<br>Credits =3  | 18BTC302A<br>Research Methodology<br>Credits =3  | 18BTC310A<br>Medical Biotechnology<br>Credits =3   | 18BTC311A<br>Bioethics, IPR and Biosafety<br>Credits =3   |  |   |  |  |               |
| <b>Skill Enhancement Courses [SEC]</b>                                       | 18BTC105A<br>Biomathematics<br>Credits =3   | 18CSN106A<br>Computers and Programming with C<br>Credits = 3   | 18BTL118A<br>Mathematical Tools and Techniques (MatLab)<br>Credits = 1   | 18CSN206A<br>Computer Data Structures and Computer Organization<br>Credits =3   | 18MCN311A<br>Introduction to Management and Entrepreneurship<br>Credits =3 |   |  |  | <b>13</b>     |
| <b>Discipline Specific Courses [DSE]</b>                                     | 18BTDSE301A<br>Environmental Biotechnology<br>18BTDSE302A<br>Agricultural Biotechnology<br>Credits =4 | 18BTDSE303A<br>Industrial Biotechnology<br>18BTDSE304A<br>Pharmaceutical Biotechnology<br>Credits =4 | 18BTDSE305A<br>Environmental Biotechnology Laboratory<br>18BTDSE306A<br>Agricultural Biotechnology Laboratory<br>Credits = 2 | 18BTDSE307A<br>Industrial Biotechnology Laboratory<br>18BTDSE308A<br>Pharmaceutical Biotechnology Laboratory<br>Credits = 2 | 18BTP312A<br>Project Work<br>Credits = 12                                  |   |  |  | <b>24</b>     |
| <b>Ability Enhancement Compulsory Course [AECC]</b>                          | 19HST103A<br>Communication Skills-1<br>Credits =3   | 19HST104A<br>Communication Skills-2<br>Credits =3  | 19HST101A<br>Elements of Social Science and Ethics<br>Credits =2   | 18BTN201A<br>Environmental Studies<br>Credits =2  | 19HST201A<br>Constitution, Human Rights and Law<br>Credits =2              |   |  |  | <b>12</b>     |
| <b>Generic Elective [GE]</b>   | 18BTIS307A<br>Internship<br>18BTIS308A<br>Seminar<br>Credits =3                                       | 18BTL309A<br>Industrial Visit/ Institutional Visit<br>Credits =3                                     | 18OEE31XA<br>Open Elective -1<br>Credits =3  | 18OEE32XA<br>Open Elective -2<br>Credits =3   |  |   |  |  | <b>12</b>     |
| <b>CC= 87; SEC= 13; DSE= 24; AECC = 12; GE = 12</b>                          |   |  |  |   |  |   |  |  |               |
| <b>TOTAL CREDITS =</b>   |   |  |  |   |  |   |  |  | <b>148</b>    |

| Structure                                       | Credits |
|---|---------|
| Core Course [CC] 59%                            | 87      |
| Skill Enhancement Course [SEC] 9%               | 13      |
| Ability Enhancement Compulsory Course [AECC] 8% | 12      |
| Discipline Specific Elective [DSE] 16%          | 24      |
| Generic Elective [GE]8%                         | 12      |



## 20. Programme Delivery

As per Time Table

## 21. Teaching and Learning Methods

The module delivery comprises of a combination of few or all of the following:

1. Face to face lectures using audio-visuals
2. Workshops-group discussions, debates, presentations
3. Demonstrations
4. Guest lectures
5. Laboratory-work/Field work/Workshop
6. Industry visit
7. Seminars
8. Group Exercises
9. Project Work
10. Project Exhibitions
11. Technical Events

## 22. Assessment and Grading

1. Every course will be assessed for a weight of 100
2. There are two components- Component-1 and Component-2
3. Component-1 carries a weight of 50% and Component -2 carries a weight of 50%
4. **Theory Courses:**

**Component-1** (CE – Continuous evaluation) is subdivided in to mid-term test, assignment and attendance. However, the weightage of subcomponents such as mid-term test and assignment will be at the discretion of the course leader.

The attendance of the student will be evaluated as follows: 10 marks will be awarded to the student > 75% as a part of Continuous Evaluation. The marks will be awarded as follows:

- 75-80% =2 marks
- 81-85%= 4 marks
- 86-90%= 6 marks
- 91-95%= 8 marks
- 96-100%= 10 marks
- < 75%= 0

**Component-2** is a written examination(SEE – Semester End Examination) carrying 50% weight

5. **Laboratory Courses:**
  - Component-1:**(CE): Conduction of Laboratory Exercises and Submission of Report: 50% weight
  - Component-2:** SEE (Semester End Laboratory Examination): 50% weight
6. A minimum of overall 40% is required for a pass. Attending SEE is mandatory.
7. The marks distribution for each course is given in the programme structure- section 20
8. Other flexibilities (exceptions) are as per the Academic Regulations of B.Sc. (Hons)-Biotechnology programme.

## 23. Attendance

A minimum of 75% attendance is compulsory.

## 24. Award of Class

As per the Academic Regulations for B.Sc. (Hons)-Biotechnology Programme

**25. Student Support for Learning**

Students are given the following support:

1. Course notes
2. Reference books in the library
3. Magazines and Journals
4. Internet facility
5. Computing facility
6. Laboratory facility
7. Workshop facility
8. Staff support
9. Lounges for discussions
10. Any other support that enhances their learning

**26. Quality Control Measures**

Following are the Quality Control Measures:

1. Review of course notes
2. Review of question papers and assignment questions
3. Student Feedback
4. Moderation of assessed work
5. Opportunities for the students to see their assessed work
6. Review by external examiners and external examiners reports
7. Staff Student Consultative Committee meetings
8. Student exit feedback
9. Subject Assessment Board (SAB)
10. Programme Assessment Board (PAB)

## 27. Curriculum Map

| Course Code | Intended Learning Outcomes  |     |     |     |  |     |     |     |                  |     |     |     |
|-------------|-----------------------------|-----|-----|-----|--|-----|-----|-----|------------------|-----|-----|-----|
|             | Knowledge and Understanding |     |     |     | Cognitive (Thinking) Skills<br>(Critical, Analytical, Problem Solving) |     |     |     | Practical skills |     |     |     |
|             | KU1                         | KU2 | KU3 | KU4 | CS1  | CS2 | CS3 | CS4 | PS1              | PS2 | PS3 | PS4 |
| 18BTC101A   | X                           | X   |     |     | X  |     | X   |     |                  |     |     |     |
| 18BTC102A   |                             | X   | X   |     |  |     | X   |     |                  |     |     |     |
| 18BTC103A   | X                           | X   |     |     |  | X   | X   |     |                  |     |     |     |
| 18BTC104A   | X                           | X   | X   |     |  |     |     | X   |                  |     |     |     |
| 18BTC105A   | X                           |     | X   |     |  |     |     | X   |                  |     |     |     |
| 18CSN106A   | X                           |     |     | X   |  |     |     | X   | X                |     |     |     |
| 18BTL107A   |                             |     |     |     |  |     | X   |     | X                | X   | X   |     |
| 18BTL108A   |                             |     |     |     |  |     | X   |     | X                | X   | X   |     |
| 18BTL109A   |                             |     |     |     |  |     | X   |     | X                | X   | X   |     |
| 19HST103A   |                             |     | X   |     |  | X   | X   |     | X                |     | X   |     |
| 18BTC110A   |                             | X   | X   |     |  | X   | X   |     |                  |     |     |     |
| 18BTC111A   | X                           | X   |     |     |  | X   | X   | X   |                  |     |     |     |
| 18BTC112A   | X                           | X   |     |     | X  | X   |     |     |                  |     |     |     |
| 18BTC113A   | X                           | X   |     |     | X  | X   | X   | X   |                  |     | X   | X   |
| 18BTC114A   | X                           |     | X   |     |  |     | X   | X   |                  |     |     |     |
| 18BTL115A   |                             |     |     |     |  |     | X   | X   | X                | X   |     |     |
| 18BTL116A   |                             |     |     |     |  |     | X   | X   | X                | X   |     |     |
| 18BTL117A   |                             |     |     |     |  |     | X   |     | X                | X   | X   |     |
| 18BTL118A   |                             |     |     |     |  |     | X   | X   | X                | X   | X   | X   |
| 19HST104A   |                             |     | X   |     |  | X   | X   |     | X                |     | X   |     |
| 18BTC201A   | X                           | X   |     |     | X  | X   | X   |     |                  |     |     |     |
| 18BTC202A   | X                           | X   | X   |     | X  |     | X   |     |                  |     |     |     |
| 18BTC203A   | X                           | X   |     |     | X  | X   | X   |     |                  |     |     |     |
| 18BTC204A   | X                           | X   | X   |     | X  |     | X   |     |                  |     |     |     |
| 18BTC205A   | X                           |     | X   |     |  |     | X   | X   |                  |     |     |     |
| 18CSN206A   | X                           |     |     | X   |  |     | X   | X   | X                | X   | X   | X   |
| 18BTL207A   |                             |     |     |     |  |     | X   | X   | X                | X   | X   |     |
| 18BTL208A   |                             |     | X   |     |  |     | X   |     | X                | X   | X   | X   |
| 18BTL209A   |                             |     |     |     |  |     | X   |     | X                | X   | X   |     |
| 18BTN201A   | X                           | X   | X   |     | X  |     | X   |     |                  |     |     |     |
| 19HST101A   |                             |     | X   |     |  | X   | X   |     | X                |     | X   |     |
| 18BTC210A   | X                           | X   | X   | X   |  | X   | X   |     |                  |     |     |     |
| 18BTC211A   | X                           | X   | X   | X   |  | X   | X   |     |                  |     |     |     |
| 18BTC212A   | X                           | X   | X   | X   |  | X   | X   |     |                  |     |     |     |
| 18BTC213A   | X                           | X   | X   |     | X  | X   | X   |     |                  |     |     |     |
| 18BTC214A   | X                           |     | X   |     |  |     | X   | X   |                  |     |     |     |
| 18BTC215A   | X                           | X   | X   | X   |  |     | X   | X   |                  |     |     |     |
| 18BTL216A   |                             |     |     |     |  |     | X   | X   | X                | X   | X   |     |
| 18BTL217A   |                             |     | X   |     |  |     | X   |     | X                | X   | X   | X   |
| 18BTL218A   |                             |     |     |     |  |     | X   | X   | X                | X   | X   | X   |
| 19HST201A   | X                           | X   |     |     | X  | X   | X   |     |                  |     |     |     |
| 18BTC301A   | X                           | X   |     |     |  | X   | X   | X   |                  |     |     |     |
| 18BTC302A   | X                           | X   |     |     | X  | X   | X   |     |                  |     |     |     |
| 18BTC303A   | X                           |     | X   | X   |  | X   | X   |     |                  |     |     |     |
| 18BTC304A   | X                           |     |     | X   |  |     |     | X   |                  |     |     |     |
| 18BTL305A   |                             |     |     |     |  |     | X   |     | X                | X   | X   | X   |
| 18BTL306A   |                             |     |     |     |  |     | X   |     | X                | X   | X   | X   |
| 18BTIS307A  |                             |     | X   | X   |  |     | X   | X   |                  | X   | X   | X   |
| 18BTIS308A  |                             |     | X   | X   |  | X   | X   | X   |                  |     |     |     |
| 18BTL309A   | X                           |     | X   | X   |  |     | X   |     |                  |     |     | X   |
| 18OEE30XA   | X                           | X   | X   | X   | X  | X   | X   | X   | X                | X   | X   | X   |
| 18BTC310A   | X                           | X   | X   | X   |  |     | X   |     |                  |     |     |     |
| 18BTC311A   | X                           |     | X   | X   |  |     | X   | X   |                  |     |     |     |
| 18BTP312A   | X                           | X   | X   | X   | X  | X   | X   | X   | X                | X   | X   | X   |
| 18MCN311A   | X                           | X   |     |     |  | X   | X   |     |                  |     |     |     |
| 18OEE31XA   | X                           | X   | X   | X   | X  | X   | X   | X   | X                | X   | X   | X   |

**28. Capability / Transferable Skills Map**

| Course Code | Skills |    |    |    |   |   |    |    |   |
|-------------|--------|----|----|----|---|---|----|----|---|
|             | GK     | SL | WC | OC | P | B | IM | PM | L |
| 18BTC101A   |        | X  | X  |    | X |   |    |    |   |
| 18BTC102A   |        | X  | X  |    | X |   |    |    |   |
| 18BTC103A   |        | X  | X  |    | X |   |    |    |   |
| 18BTC104A   |        | X  | X  |    | X |   |    |    |   |
| 18BTC105A   |        | X  | X  |    | X |   |    |    |   |
| 18CSN106A   | X      | X  | X  |    | X | X |    |    |   |
| 18BTL107A   | X      | X  | X  | X  | X |   |    |    |   |
| 18BTL108A   | X      | X  | X  | X  | X |   |    |    |   |
| 18BTL109A   | X      | X  | X  | X  | X |   |    |    |   |
| 19HST103A   | X      | X  | X  | X  | X | X | X  | X  |   |
| 18BTC110A   |        | X  | X  |    | X |   |    |    |   |
| 18BTC111A   |        | X  | X  |    | X |   |    |    |   |
| 18BTC112A   |        | X  | X  |    | X |   |    |    |   |
| 18BTC113A   |        | X  | X  |    | X |   |    |    |   |
| 18BTC114A   |        | X  | X  |    | X |   |    |    |   |
| 18BTL115A   | X      | X  | X  | X  | X | X |    |    |   |
| 18BTL116A   | X      | X  | X  | X  | X | X |    |    |   |
| 18BTL117A   | X      | X  | X  | X  | X | X |    |    |   |
| 18BTL118A   | X      | X  | X  | X  | X |   |    |    |   |
| 19HST104A   | X      | X  | X  | X  | X | X | X  | X  |   |
| 18BTC201A   |        | X  | X  |    | X | X |    |    |   |
| 18BTC202A   |        | X  | X  |    | X | X |    |    |   |
| 18BTC203A   |        | X  | X  |    | X | X |    |    |   |
| 18BTC204A   |        | X  | X  |    | X | X |    |    |   |
| 18BTC205A   |        | X  | X  |    | X | X |    |    |   |
| 18CSN206A   | X      | X  | X  |    | X | X | X  |    |   |
| 18BTL207A   | X      | X  | X  | X  | X | X | X  |    |   |
| 18BTL208A   | X      | X  | X  | X  | X | X | X  |    |   |
| 18BTL209A   | X      | X  | X  | X  | X | X | X  |    |   |
| 19HST101A   | X      | X  | X  | X  | X | X | X  | X  |   |
| 18BTN201A   | X      | X  | X  | X  | X | X | X  | X  |   |
| 18BTC210A   |        | X  | X  |    | X | X | X  |    |   |
| 18BTC211A   |        | X  | X  |    | X | X | X  |    |   |
| 18BTC212A   |        | X  | X  |    | X | X | X  |    |   |
| 18BTC213A   |        | X  | X  |    | X | X | X  |    |   |
| 18BTC214A   |        | X  | X  |    | X | X | X  |    |   |
| 18BTC215A   |        | X  | X  |    | X | X | X  |    |   |
| 18BTL216A   | X      | X  | X  | X  | X | X | X  |    |   |
| 18BTL217A   | X      | X  | X  | X  | X | X | X  |    |   |
| 18BTL218A   | X      | X  | X  | X  | X | X | X  |    |   |
| 19HST201A   | X      | X  | X  | X  | X | X | X  | X  |   |
| 18BTC301A   |        | X  | X  |    | X | X | X  |    |   |
| 18BTC302A   |        | X  | X  |    | X | X | X  |    |   |
| 18BTC303A   |        | X  | X  |    | X | X | X  |    |   |
| 18BTC304A   |        | X  | X  |    | X | X | X  |    |   |
| 18BTL305A   | X      | X  | X  | X  | X | X | X  |    |   |
| 18BTL306A   | X      | X  | X  | X  | X | X | X  |    |   |
| 18BTIS307A  |        |    |    |    |   |   |    |    |   |
| 18BTL309A   | X      | X  | X  | X  | X | X | X  |    |   |
| 18OEE31XA   | X      | X  | X  | X  | X | X | X  | X  | X |
| 18BTC310A   |        | X  | X  |    | X | X |    |    |   |
| 18BTC311A   | X      | X  | X  |    | X | X |    |    |   |
| 18MCN311A   | X      | X  | X  | X  | X | X | X  | X  | X |
| 18OEE32XA   | X      | X  | X  | X  | X | X | X  | X  | X |
| 18BTP312A   | X      | X  | X  | X  | X | X | X  | X  | X |

GK: Group Work; SL: Self Learning; WC: Written Communication; OC: Oral Communication P: Presentation; B: Behavioural; IM: Information Management; PM: Personal Management L: Leadership

**29. Co-curricular Activities**

Students are encouraged to take part in co-curricular activities like seminars, conferences, symposium, paper writing, attending industry exhibitions, project competitions and related activities to enhance their knowledge and network.

**30. Cultural and Literary Activities**

To remind and ignite the creative endeavours annual cultural festivals held and the students are made to plan and organize the activities.

**31. Sports and Athletics**

Students are encouraged to develop a habit of taking part in outdoor and indoor games on regular basis.

