

**M. G. Science Institute, Ahmedabad  
(Autonomous)**

**Affiliated to Gujarat University, Ahmedabad**  
(Managed by The Ahmedabad Education Society)

**Department of Botany**

**Bachelor of Science (Hons.) in Botany**

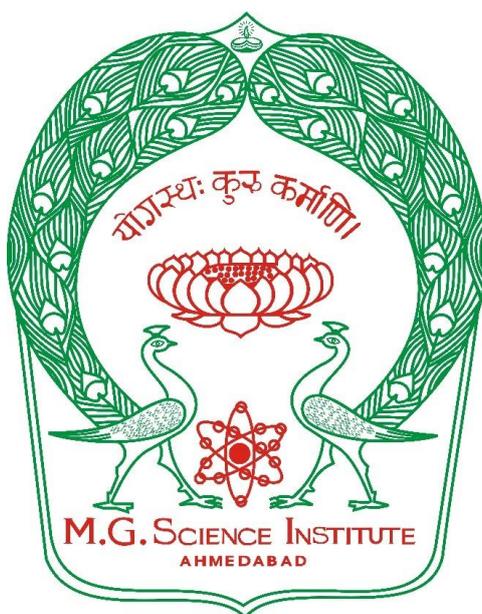
**B.Sc. (Hons.) Botany**

**4 Year, 8 Semesters Full-Time Programme**

**Choice Based Credit System (CBCS) & Grading System**

**Outcome-Based Education Pattern**

**(Effective from Academic Year 2024-25)**



|      |   |    |
|------|---|----|
| 1.0  | Preamble  | 4  |
| 2.0  | Definitions   | 4  |
|      | Bachelor Degree   | 4  |
|      | Bachelor Degree (Hons.)   | 4  |
|      | Choice Based credit System  | 4  |
|      | Credit  | 4  |
|      | SGPA  | 4  |
|      | CGPA  | 4  |
|      | Course  | 4  |
|      | Course Announcement   | 5  |
|      | Course Registration   | 5  |
|      | Course Outcomes   | 5  |
|      | Grading System  | 5  |
|      | Graduate Attributes   | 5  |
|      | Learning Outcomes   | 5  |
|      | Outcome Based Education (OBE) Approach  | 6  |
|      | Outcome-Based Assessment  | 6  |
|      | Programme Educational Objectives  | 6  |
|      | Programme Outcomes  | 6  |
|      | Programme Specific Outcomes   | 6  |
|      | Semester  | 6  |
|      | Teaching and Learning Activities  | 6  |
| 3.0  | B.Sc. Programme Focus   | 7  |
|      | Programme Educational Objectives (PEOs)   | 7  |
|      | Programme Specific Outcomes (PSOs)  | 8  |
| 4.0  | B.Sc. Programme Course Types and Evaluation Pattern                               | 8  |
|      | Course, Types, Definitions  | 8  |
| 5.0  | B.Sc. Programme Structure   | 9  |
|      | Details of Programme  | 10 |
| 6.0  | Multiple Entry-Exit Option  | 10 |
| 7.0  | Internship Project  | 10 |
| 8.0  | Comprehensive Internal Evaluation (CIE)/Comprehensive Concurrent Evaluation (CCE) | 11 |
| 9.0  | End-Semester Evaluation   | 11 |
| 10.0 | Passing Standard  | 11 |
|      | Grading System  | 12 |
|      | Scaling Down of the CIE Score   | 13 |
|      | Degree Requirements   | 13 |
|      | Maximum Duration for Completion of the Programme                                  | 13 |
|      | Grade Improvement   | 14 |
| 11.0 | Attendance  | 14 |
| 12.0 | Medium of Instruction   | 14 |
| 13.0 | Detailed Course List (Annexure-1)   | 15 |
| 14.0 | Detailed Syllabus for each course (Annexure -2)                                   | 17 |

## 1.0 Preamble

Botany is one of the most important subjects of life sciences. Plants have a unique position as a source of oxygen, food, fuel, medicines and almost all our daily necessities. Their role in the environment is unquestionable. This makes plant science a very interesting study with innumerable scopes. A B.Sc degree in Botany opens doors to a myriad of career opportunities in fields such as plant science research, agriculture, environmental consulting, pharmaceuticals, biotechnology, conservation, education, and beyond. It provides a solid foundation for understanding and appreciating the fundamental role of plants in shaping our world.

The Botany department at this Institute has facilities of smart class, two laboratories as well as a Plant Tissue Culture laboratory, seed bank, herbaria, a botanical garden and Biodiversity Park with rare medicinal and economically important plants. The department conducts regular study tours, field studies, garden visits and industrial visits to impart knowledge on the basic and applied aspects of the subject. Through various experiments, projects, hands-on trainings and workshops; Biodiversity trails and tree-walks students develop critical thinking, problem-solving, and analytical skills. Botany graduates are equipped to address pressing global challenges such as food security, biodiversity conservation, climate change, and sustainable resource management.

Three of the five department faculties are Ph.Ds. The HoD Dr. Shukla is involved in Research projects of more than Rs 2 crores in collaboration with SAC-ISRO.

## 2.0 Definitions

### Bachelor Degree

Bachelor's Degree is designed to offer the undergoing students a broad foundation necessary for a science-based career with a special focus on multidisciplinary learning.

### Bachelor Degree (Hons.)

Bachelor's Degree (Hons.) aims at providing advanced and specialized theoretical and research skills in the chosen science subject, along with the overall knowledge in the sciences, to provide the students a strong platform for an advanced academic or professional career.

### Choice Based Credit System

The Choice Based Credit System (CBCS) provides an opportunity for the students to choose courses from the prescribed courses comprising Core, minor, multi-disciplinary, or skill-based courses.

### Credit

Credits means the value assigned to a course which indicates the level of instruction:

1 hour lecture per week equals 1 credit

2 hours practical per week equals 1 credit

Credit for a practical could be proposed as part of a course or as a separate practical course.

### SGPA

SGPA means Semester Grade Point Average calculated for individual semesters.

### CGPA

CGPA means Cumulative Grade Point Average calculated for all courses completed by the students at any point of time. CGPA is calculated for each year for both semesters clubbed together.

## Course

A course is a specific subject in the academic programme taught in a particular semester for the specifically assigned number of credits.

## Course Announcement

The college shall announce the elective courses it proposes to offer to the students out of the wider course basket. It is not mandatory to offer all the electives. The decision of the principal shall be final in this case. However, in the spirit of Choice Based Credit System, the college should offer choices to the students for the elective courses and not offer only the minimum number of electives.

## Course Registration

It is mandatory for every student, to register every semester, for the elective courses opted for that semester. Each student, on admission, shall be assigned to a Faculty Advisor who shall advise him/her about the academic programs and counsel on the choice of courses considering the student's profile, career goals, and courses taken in the earlier semesters. With the advice and consent of the Faculty Advisor, the student shall register for a set of courses he/she plans to take up for the Semester. Students shall have to register for the courses for the semester within the first week of Semester I and immediately after the conclusion of the preceding term for subsequent Semesters II, III, IV, V, VI, VII, and VIII.

## Course Outcomes

Course outcomes are the specific and measurable attributes defining the knowledge, skill and attitude of the learners are expected to demonstrate by the completion of the course.

## Grading System

The Grading System is the 10-point standard scale system defined by the UGC comprising of the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA).

| Letter Grade      | Grade Point |
|-------------------|-------------|
| O (Outstanding)   | 10          |
| A+ (Excellent)    | 9           |
| A (Very Good)     | 8           |
| B+ (Good)         | 7           |
| B (Above Average) | 6           |
| C (Average)       | 5           |
| P (Pass)          | 4           |
| F (Fail)          | 0           |
| Ab (Absent)       | 0           |

## Graduate Attributes

The Graduate Attributes are the generic abilities, attitudes and approaches expected to be demonstrated by the learner in the world around him/her in a longer period of the life time.

## Learning Outcomes

Learning outcomes describe the measurable skills, abilities, knowledge, or values that students should be able to demonstrate as a result of completing a course.

## **Outcome Based Education (OBE) Approach**

OBE is the approach focusing on the performance outcome comprising of the following:

- a. The performer – the student (learner), not only the teacher.
- b. The performable (thus demonstrable or assessable) to perform
- c. The performance outcome, not the activity or task to be performed.

## **Outcome-Based Assessment**

An assessment system that asks course teachers to first identify what it is that we expect students to be able to do once they have completed a course or program. It then asks course teachers to provide evidence that they are able to do so. In other words, how will each learning outcome be assessed? What evidence of student learning is most relevant for each learning outcome and what standard or criteria will be used to evaluate that evidence? Assessment is therefore a key part of outcome-based education and used to determine whether or not a qualification has been achieved.

## **Programme Educational Objectives**

Programme Educational Objectives are a set of broad future-focused student performance outcomes that explicitly identify what students will be able to do with what they have learned, and what they will be like after they leave school and are living full and productive lives. Thus, PEOs are what the programme is preparing graduates for in their career and professional life (to attain within a few years after graduation).

## **Programme Outcomes**

Programme Outcomes are a set of narrow statements that describe what learners of the programme are expected to know and be able to perform or attain by the time of graduation.

## **Programme Specific Outcomes**

The PSOs are a set of narrow statements that describe what the learners of a particular specialization of the programme are expected to know and be able to perform or attain by the time of graduation. PSOs are also a function of the various course combinations offered by the college.

## **Semester**

The Semester means the one half of the academic year comprising of the teaching days and examination & evaluation days as per the UGC/ University norms.

## **Teaching and Learning Activities**

The set of **pedagogical tools and techniques** or the teaching and learning activities that aim to **help students to attain** the intended learning outcomes and engage them in these learning activities through the teaching process.

### **3.0 B.Sc. Programme Focus**

#### **3.1. Programme Educational Objectives (PEOs)**

**PEO 1** Our students will have an all-round, holistic development to emerge as responsible global citizens serving the society, the Nation and the entire world in the “VasudhaivaKutumbakam” ideology.

**PEO 2** Our students will inculcate a set of knowledge as well as skills to help them embark upon further studies and have successful careers in academics, research, industry or the government and civil services.

**PEO 3** Our graduates will have enough exposure to develop problem solving, critical thinking and analytical abilities to not only work in a team but also to lead a team.

**PEO 4** Our Graduates will develop an ethical attitude, in personal and professional lives. They will learn to question, think out of the box and develop the capability to design and innovate.

#### **3.2. Program Outcomes (POs)**

**Upon completion of this programme, the learner will be able to:**

**PO 1** Demonstrate and apply the fundamental knowledge of science in various applied fields

**PO 2** Apply the knowledge of scientific principles and IKS in sustainable management of our environment. Analyze, interpret and logically come to solutions

**PO3** Apply the knowledge of soft skill and communication skill to tackle issues and communicate effectively

**PO 4** Capable to join advanced multidisciplinary courses and other courses like civil services, management, hotel and hospitality and other allied fields

#### **3.3 Program Specific Outcomes (PSOs)**

**Upon completion of this programme the student will be able to:**

**ACADEMIC PROFICIENCY; PERSONAL AND SOCIAL COMPETENCY:**

##### **PSO1 Knowledge of Plant Biology**

Recall classical biological concepts, especially with focus on plant science, state principles and outline processes underlying the field of botany and its related interdisciplinary subjects. Carry out group projects and individual experiments for personal development and leadership qualities.

##### **PSO2 Experimental and Analytical skill**

Understand and analyse the importance of plants, plant biodiversity and their conservation. Integrate knowledge of pure and applied aspects of botany for conducting experiments and interpreting results. Learn effective presentation and communication skills. Implement self-

learning, discipline and problem-solving ability by developing scientific temper and critical thinking.

### **PSO3 Field work and Observation**

Undertake botanical excursions for studying plant diversity, taxonomic identification, landscaping concepts and preparation of physical as well as digital herbarium.

### **PSO4 Awareness for Conservation and Sustainability**

Associate the impact of anthropogenic pressure on nature and spread the awareness of sustainable development in the society. Learn about rules and laws regarding plant wealth, develop and design innovative projects.

### **PSO5 Interdisciplinary Knowledge and Career Readiness**

Use the principles of Botany to apply appropriate techniques for undertaking higher studies and research. Apply the knowledge of other disciplines like Biochemistry, Biostatistics, Biophysics, Geography, etc in botanical research. Employ the industrial applications of botany for start-up and Entrepreneurial ventures.

## **4. B.Sc. Programme Course Types and Evaluation Pattern**

| <b>Sr. No.</b> | <b>Course Type</b>                              | <b>Credits</b> | <b>Nature</b> | <b>CCE Marks</b> | <b>ECE Marks</b> | <b>Total Marks</b> |
|----------------|---|----------------|---------------|------------------|------------------|--------------------|
| 1              | Major Course                                    | 4              | Compulsory    | 50               | 50               | 100                |
| 2              | Minor Course                                    | 4              | Compulsory    | 50               | 50               | 100                |
| 3              | Multidisciplinary Course                        | 4              | Elective      | 50               | 50               | 100                |
| 4              | Skill Enhancement Course                        | 2              | Elective      | 25               | 25               | 50                 |
| 5              | Ability Enhancement Course                      | 2              | Elective      | 25               | 25               | 50                 |
| 6              | Indian Knowledge System/<br>Value Added Courses | 2              | Elective      | 25               | 25               | 50                 |

### **Courses, Types, Definitions:**

#### **Major Course (DSC-C)**

Discipline-specific course core is a course that a student admitted to a particular programme must successfully complete receiving the degree and which cannot be substituted by any other course.

#### **Minor Course (DSC-M)**

A discipline Specific Minor Course refers to a set of academic courses that form a focused and specialized area of study within a particular discipline. Students have the option to pursue a minor alongside their major allowing them to gain additional expertise in a specific subject.

#### **Multidisciplinary Course (IDC)**

A multidisciplinary course is a course chosen generally from a related discipline/subject, intending to seek exposure in the discipline relating to the core domain of the student.

#### **Skill Enhancement Course**

Skill Enhancement Course is designed to provide students with specific skills or knowledge in addition to their primary academic pursuits. The main purpose of the SEC is to provide students with practical skills, life skills, soft skills, hands-on training, etc. to increase their employability.

#### **Ability Enhancement Course**

The ability enhancement course is designed to improve students' communication, language, and personality development skills. The main purpose of the AEC is to introduce students to the theory, fundamentals, and tools of communication and to develop in them vital communication skills that should be integral to personal, social, and professional interactions.

#### **Indian Knowledge System**

Indian Knowledge System refers to the rich and diverse heritage of knowledge, wisdom, and traditions that have evolved over millennia within the Indian subcontinent.

### **5. B.Sc. Programme Structure**

B.Sc (Hons.) Botany is a four-year programme divided into eight semesters. A student is required to complete 176 credits for the completion of the programme and the award of B.Sc (Hons.) Botany degree.

The B.Sc (Hons.) Botany programme is aligned with the NEP-2020 structure as given in below Table.

| <b>Courses</b> | <b>No. of Papers</b> | <b>Credits Each</b> | <b>Total Credits</b> |
|----------------|----------------------|---------------------|----------------------|
| DSC-Major      | 23                   | 4                   | 92                   |
| DSC-Minor      | 7                    | 4                   | 28                   |
| MDC-Multi      | 3                    | 4                   | 12                   |
| AEC            | 5                    | 2                   | 10                   |
| SEC            | 5                    | 2                   | 10                   |
| Internship     | 1                    | 4                   | 4                    |
| IKS            | 4                    | 2                   | 8                    |
| OJT/RP         | 2                    | 6                   | 12                   |
|                |                      | <b>Total</b>        | <b>176</b>           |

## Details of Programme

| Year                    | Semester       | Course Type<br>(Credits) |                 |                 |                |                |                   |              |
|-------------------------|----------------|--------------------------|-----------------|-----------------|----------------|----------------|-------------------|--------------|
|                         |                | 1 <sup>st</sup><br>Year  | Sem-I           | Major-1<br>(4)  | Major-2<br>(4) | Minor-1<br>(4) | MDC-1<br>(4)      | AEC-1<br>(2) |
| Sem-II                  | Major-3<br>(4) |                          | Major-4<br>(4)  | Minor-2<br>(4)  | MDC-2<br>(4)   | AEC-2<br>(2)   | SEC-2<br>(2)      | VAC-1<br>(2) |
| 2 <sup>nd</sup><br>Year | Sem-III        | Major-5<br>(4)           | Major-6<br>(4)  | Major-7<br>(4)  | MDC-3<br>(4)   | AEC-3<br>(2)   | SEC-3<br>(2)      | IKS-2<br>(2) |
|                         | Sem-IV         | Major-8<br>(4)           | Major-9<br>(4)  | Major-10<br>(4) | Minor-3<br>(4) | AEC-4<br>(2)   | SEC-4<br>(2)      | VAC-2<br>(2) |
| 3 <sup>rd</sup><br>Year | Sem-V          | Major-11<br>(4)          | Major-12<br>(4) | Major-13<br>(4) | Minor-4<br>(4) | Minor-5<br>(4) | SEC-5<br>(2)      | -            |
|                         | Sem-VI         | Major-14<br>(4)          | Major-15<br>(4) | Major-16<br>(4) | Minor-6<br>(4) | AEC-5<br>(2)   | Internship<br>(4) | -            |
| 4 <sup>th</sup><br>Year | Sem-VII        | Major-17<br>(4)          | Major-18<br>(4) | Major-19<br>(4) | Minor-7<br>(4) | -              | OJT/RP-1<br>(6)   | -            |
|                         | Sem-VIII       | Major-20<br>(4)          | Major-21<br>(4) | Major-22<br>(4) | Minor-8<br>(4) | -              | OJT/RP-2<br>(6)   | -            |

**Total Credits for the Bachelor's degree programme: 132**

**Total Credits for the Bachelor's degree (Hons.) programme: 176**

### 6. Multiple Entry-Exit Option

The B.Sc. in Botany programme is fully compliant with the Curriculum and Credit Framework for Undergraduate Programmes issued by the UGC. Accordingly, the programme provides the exit option to the learners at the end of the first year with UG Certificate awarded, at the end of the second year with UG Diploma awarded, at the end of the third year with UG Degree awarded and at the end of the fourth year with UG Honors Degree awarded. The learners choosing to exit the programme at the end of the first year or at the end of the second year will be allowed to, subject to successful completion of the relevant portion of the curriculum, shall be allowed to re-enter within a period of three years and complete the degree programme within a period of maximum seven years from the year of the first admission. All the other details are as provided in Sec.3.2.3 of the Curriculum and Credit Framework for Undergraduate Programmes issued by the UGC in December 2022.

### 7. Internship Project

Every learner must undergo and complete the internships/apprenticeships in a firm/industry/organization or training in labs with faculty or researchers in their own or other college/institute/research institution during the summer term. Completion of the Summer Internship shall be mandatory for every learner choosing to exit at the end of the first year with a UG Certificate or at the end of the second year with a UG Diploma. The Internship Project shall carry the weightage of 4 credits. Since the internship is categorized as Practice, every learner will have to actually produce the work for 120 hours during the internship.

#### **Evaluation of the Internship Project:**

It is mandatory for the student to seek advance written approval from the faculty guide and the HOD for the internship and organization before commencing the internship.

- a. It is mandatory for the student to seek advance written approval from the faculty guide and the Director of the Institute about the topic and organization before commencing the SIP.
- b. Students shall also seek a formal evaluation of their Internship Project from the external guide. The formal evaluation by the external guide shall be done for 50 marks and comment on the nature and quantum of work undertaken by the student, the effectiveness and overall professionalism. The learning outcomes of the Internship Project and utility of the project to the host organization must be specifically highlighted in the formal evaluation by the external guide. The Internship Project evaluation sheet duly signed and stamped by the external guide shall be included in the final Internship report.
- c. The completion of the SIP shall be certified by the respective Faculty Guide & approved by the Director of the Institute.
- d. The college level evaluation shall be for 50 marks through the Viva-Voce conducted by the faculty guide and HOD of the respective department.
- e. Copies of SIP report and records of evaluation shall be maintained by the college for a period of 5 academic years.

## **8. Comprehensive Internal Evaluation (CIE)/Comprehensive Concurrent Evaluation (CCE)**

1. The course teacher shall prepare the scheme of Comprehensive Concurrent Evaluation (Formative Assessment) before commencement of the term. The scheme of Comprehensive Concurrent Evaluation shall explicitly state the linkages of each CCE with the Course Outcomes and define the targeted attainment levels for each CO.
2. The Head of the Department shall approve the scheme of Comprehensive Concurrent Evaluation with or without modifications.
3. The course teacher shall display, on the notice board/ ERP, the approved CCE scheme of the course and the same shall also be hosted on the website, not later than the first week of the term.
4. Each CCE item shall be of minimum 25 marks.
5. For a 4 Credit Course there shall be a MINIMUM of three CCE items. The final scores shall be converted to 50, using an average or best two out of three formulae.
6. For 2 Credit Course there shall be a MINIMUM of two CCE items. The final scores shall be converted to 50.
7. CCE shall be spread through the duration of course and shall be conceptualized, executed, assessed and documented by the course teacher along with student-wise and class-wise attainment levels of the COs and the attainment levels of the course.
8. The assessment outcome of each CCE shall be duly signed by the course teacher & the programme coordinator / HOD of the college.
9. A copy of the duly signed CCE outcome shall be displayed on the notice boards/ ERP, within a week of the assessment and course teachers shall guide the students on a need basis.
10. The college may conduct additional make up / remedial CCE items at its discretion.

11. At the end of the term aggregate CCE scores/grades shall be calculated and the CO attainment levels shall be calculated by the course teacher. The same shall be displayed on the notice board/ ERP.
12. Records of CCE shall be retained for 5 years from the completion of the Academic Year. i.e. **Current Academic Year (CAY) + 4 years.**

The comprehensive internal evaluation shall be conducted by the college once a semester. The maximum marks for 4 credit courses shall be 50 and for 2 credit courses shall be 25 marks.

## 9. End-Semester Evaluation

1. The End Semester Evaluation (Summative Evaluation) for all the courses shall be conducted by the Examination Department/Committee of the college headed by a full-time regular faculty member nominated by the Principal as Controller of the Examination.
2. The ESE for each course shall have the weightage as follows:
  - For a 4 Credit Course: 50 marks
  - For a 2 Credit Course: 25 marks
3. The ESE for each course shall have 5 questions each of 10 marks. In case of 2 Credit courses the aggregate marks out of 50 shall be converted to the level proportionate to 25 marks.
4. All questions shall be compulsory with internal choice within the questions.
5. The broad structure of the ESE question paper shall be as follows:

| Question Number | COGNITIVE ABILITIES EVALUATED | Nature                               |
|-----------------|-------------------------------|--------------------------------------|
| Q.1             | REMEMBERING                   | Answer any 5 out of 8 (2 marks each) |
| Q.2             | UNDERSTANDING                 | Answer any 2 out of 3 (5 marks each) |
| Q.3             | APPLYING                      | Answer 3 (a) or 3 (b) (10 marks)     |
| Q.4             | ANALYSING                     | Answer 4 (a) or 4 (b) (10 marks)     |
| Q.5             | EVALUATING                    | Answer 5 (a) or 5 (b) (10 marks)     |
|                 | CREATING                      |                                      |

## 10. Passing Standard

A learner shall be said to have earned the credits for a course if he/she earns minimum 36% marks.

Formative Evaluation and Summative Evaluation shall be separate head of passing.

### Grading System

The Indirect and Absolute Grading System shall be used, i.e. the assessment of individual Courses in the concerned examinations will be on the basis of marks. However, the marks shall later be converted into Grades by a defined mechanism wherein the overall performance of the learners can be reflected after considering the Credit Points for any given course. The overall evaluation shall be designated in terms of Grade. The 10-point standard scale mandated by UGC shall be used.

The performance of a student will be evaluated in terms of two indices, viz.

- Semester Grade Point Average (SGPA) which is the Grade Point Average for a semester
- Cumulative Grade Point Average (CGPA) which is the Grade Point Average for all the completed semesters at any point in time.

| Letter Grade             | Grade Point |
|--------------------------|-------------|
| <b>O (Outstanding)</b>   | 10          |
| <b>A+ (Excellent)</b>    | 9           |
| <b>A (Very Good)</b>     | 8           |
| <b>B+ (Good)</b>         | 7           |
| <b>B (Above Average)</b> | 6           |
| <b>C (Average)</b>       | 5           |
| <b>P (Pass)</b>          | 4           |
| <b>F (Fail)</b>          | 0           |
| <b>Ab (Absent)</b>       | 0           |

Grade Point ( $G_i$ ) (10 points scale) = Marks of each paper out of 100 / 10

| Marks out of 100  | Grade Point Range ( $G_i$ ) | Letter Grade | Classification |
|-------------------|-----------------------------|--------------|----------------|
| <b>96.0-100</b>   | 10                          | O            | Outstanding    |
| <b>86.0-95.9</b>  | 9                           | A+           | Excellent      |
| <b>76.0-85.9</b>  | 8                           | A            | Very Good      |
| <b>66.0-75.9</b>  | 7                           | B+           | Good           |
| <b>56.0-65.9</b>  | 6                           | B            | Above Average  |
| <b>46.0-55.9</b>  | 5                           | C            | Average        |
| <b>36.0-45.9</b>  | 4                           | P            | Pass           |
| <b>Below 36.0</b> | 0                           | F            | Fail           |
| <b>Absent</b>     | 0                           | Ab           | Absent         |

The Semester Grade Point Average (SGPA) is the ratio of the sum of the product of the number of credits with the grade point scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA (S_i) = \frac{\sum (C_i \times G_i)}{\sum C_i}$$

where  $C_i$  is the number of credits of the  $i^{\text{th}}$  course and  $G_i$  is the grade point scored by the student in the  $i^{\text{th}}$  course.

The cumulative grade point average (CGPA) is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.,

$$CGPA = \frac{\sum (C_i \times S_i)}{\sum C_i}$$

where  $S_i$  is the SGPA of the  $i^{\text{th}}$  semester and  $C_i$  is the total number of credits in that  $i^{\text{th}}$  semester.

The SGPA and CGPA shall be rounded off to 2 decimal points.

### **Scaling Down of the CIE Score**

The marks obtained by the student for the CCE shall be scaled down, to the required extent, if percentage of the marks of CCE exceeds the percentage of marks scored in the ESE (End Semester University Examination) by 25% for the respective course.

### **Degree Requirements**

The degree requirements for the B.Sc. Botany programme are completion of minimum 132 credits and 176 credits in case of Honours degree.

### **Maximum Duration for Completion of the Programme**

The program of the study is four years of eight semesters. A candidate shall complete his/her degree within **seven (7)** academic years from the date of his/her admission to the first semester.

### **Grade Improvement**

There shall be a provision for candidates to reappear for the examination for the concerned course of theory papers only (subject) in which the candidate wishes for improvement of his/her grade point of SGPA in general and CGPA in a total of the program subject to the condition that:

- a. The candidate shall be eligible to reappear for improvement of grade points only after successfully passing the program.
- b. The candidate may opt for the examination for any number of courses (subject/paper) of the programme for improvement of grade points but not more than three times for each course (subject/paper) as per the prevailing syllabus of the examination conducted in the regular schedule of University examinations.
- c. All such provisions are there within 04 years from successful completion of the programme, but not exceeding the period of 08 years of the duration of completion of the programme.
- d. In all such cases grade points are considered if there is a progress in such improvements, otherwise, original grade points shall be retained.
- e. No such candidates shall be eligible for the award of Rank, Gold Medal, Cash Prize, etc.
- f. The validity of credits earned will be for a maximum period of seven years or as specified by the Academic Bank of Credits (ABC).

### **11. Attendance**

The student must meet the requirement of 75% attendance per semester per course for grant of the term. The college may condone the shortage in attendance in exceptional circumstances, up to a maximum of 10%. The college shall have the right to withhold the student from appearing for examination of a specific course if the above requirement is not fulfilled.

### **12. Medium of Instruction**

The medium of instruction and evaluation shall be English.

### **13. Detailed Course List (Annexure-1)**

Detailed course list is available in Annexure-1

#### 14. Detailed Syllabus for Each Course (Annexure-2)

Detailed syllabus for each course is available in Annexure-2

#### Annexure 1: Detailed Course List for B.Sc. (Hons.) BOTANY

| Year | Sem    | Course Type | Course Code | Course Title                        | Credits |   | Total |
|------|--------|-------------|-------------|-------------------------------------|---------|---|-------|
|      |        |             |             |                                     | T       | P |       |
| 1    | Sem-I  | DSC-Core    | BOT-MJ-111  | Basic Plant Science                 | 3       | 1 | 4     |
|      |        | DSC-Core    | BOT-MJ-112  | Practical based on BOT 111          | 3       | 1 | 4     |
|      |        | DSC-Minor   | BOT-MN-113  | General Botany                      | 3       | 1 | 4     |
|      |        | IDC/Multi   | BOT-MD-114  | Fundamentals of Biological Sciences | 3       | 1 | 4     |
|      |        | AEC         | AEC115      | Communicative English               | 2       | - | 2     |
|      |        | SEC         | BOT-SEC116  | Home Gardening                      | 1       | 1 | 2     |
|      |        | VAC/IKS     | IKS117      | Environmental Studies               | 2       | - | 2     |
|      | Sem-II | DSC-Core    | BOT-MJ-121  | Essentials of Botanical Science     | 3       | 1 | 4     |
|      |        | DSC-Core    | BOT-MJ-122  | Practical based on BOT 121          | 3       | 1 | 4     |
|      |        | DSC-Minor   | BOT-MN-123  | Foundations of Botany               | 3       | 1 | 4     |
|      |        | DSC-Multi   | BOT-MD-124  | Elementary Plant Science            | 3       | 1 | 4     |
|      |        | AEC         | AEC-125     | Communicative English               | 2       | - | 2     |
|      |        | SEC         | BOT-SEC126  | Organic Farming                     | 1       | 1 | 2     |
|      |        | VAC/IKS     | IKS127      | Understanding India                 | 2       | - | 2     |

**Exit Option:** Students exiting the programme after securing **44** credits will be awarded an **Advanced UG Certificate in BOTANY** provided they secure **4** credits in work-based vocational courses offered by the institute during the summer term.

| Year | Sem     | Course Type | Course Code | Course Title                                | Credits |   | Total |
|------|---------|-------------|-------------|---|---------|---|-------|
|      |         |             |             |   | T       | P |       |
| 2    | Sem-III | DSC-Core    | BOT-MJ-231  | Cryptogams, Plant Pathology & Anatomy       | 3       | 1 | 4     |
|      |         | DSC-Core    | BOT-MJ-232  | Plant physiology, Ecology & Economic Botany | 3       | 1 | 4     |
|      |         | DSC-Core    | BOT-MJ-233  | Practical based on BOT 231, 232             | 3       | 1 | 4     |
|      |         | IDC/Multi   | BOT-MD-234  | Plant Diseases & Environment                | 3       | 1 | 4     |
|      |         | AEC         | AEC235      | Communicative English                       | 2       | - | 2     |
|      |         | SEC         | BOT-SEC236  | Nursery Management                          | 1       | 1 | 2     |
|      |         | VAC/IKS     | IKS237      | Environmental Studies                       | 2       | - | 2     |
|      | Sem-IV  | DSC-Core    | BOT-MJ-241  | Angiosperms & Palaeobotany                  | 3       | 1 | 4     |
|      |         | DSC-Core    | BOT-MJ-242  | Plant Embryology, Cytogenetics & Geobotany  | 3       | 1 | 4     |
|      |         | DSC-Core    | BOT-MJ-243  | Practical based on BOT 241, 242             | 3       | 1 | 4     |

|  |         |            |  |   |   |   |
|--|---------|------------|--|---|---|---|
|  | DSC-M   | BOT-MN-244 | Cell Biology, Genetics & Plant Geography | 3 | 1 | 4 |
|  | AEC     | AEC-245    | Communicative English                    | 2 | - | 2 |
|  | SEC     | BOT-SEC246 | Basics of Remote Sensing                 | 1 | 1 | 2 |
|  | VAC/IKS | IKS247     | Understanding India                      | 2 | - | 2 |

**Exit Option:** Students exiting the programme after securing **88** credits will be awarded a **UG Diploma in BOTANY** provided they secure **4** credits in skill-based courses offered by the institute during 1<sup>st</sup> year or 2nd-year summer term.

| Year | Sem    | Course Type | Course Code | Course Title                              | Credits T | P | Total |
|------|--------|-------------|-------------|---|-----------|---|-------|
| 3    | Sem-V  | DSC-Core    | BOT-MJ-351  | Evolution, Agronomy & Advanced Cryptogamy | 3         | 1 | 4     |
|      |        | DSC-Core    | BOT-MJ-352  | Plant Systematics, Ethnobotany & Forestry | 3         | 1 | 4     |
|      |        | DSC-Core    | BOT-MJ-353  | Advanced Plant Physiology                 | 3         | 1 | 4     |
|      |        | DSC-M       | BOT-MN-354  | Biostatistics                             | 3         | 1 | 4     |
|      |        | DSC-M       | BOT-MN-355  | Stress Physiology                         | 3         | 1 | 4     |
|      |        | SEC         | BOT-SEC356  | Basic Plant Tissue Culture                | 1         | 1 | 2     |
|      |        | IKS         | -           | -   | -         | - | -     |
|      | Sem-VI | DSC-Core    | BOT-MJ-361  | Climate change studies                    | 3         | 1 | 4     |
|      |        | DSC-Core    | BOT-MJ-362  | Introductory Phytochemistry               | 3         | 1 | 4     |
|      |        | DSC-Core    | BOT-MJ-363  | Molecular Biology                         | 3         | 1 | 4     |
|      |        | DSC-M       | BOT-MN-364  | Biotechnology                             | 3         | 1 | 4     |
|      |        | AEC         | AEC-365     | Communicative English                     | 2         | - | 2     |
|      |        | SEC         | SEC-        | Plant Breeding                            | 4         | - | 4     |
| IKS  | -      | -           | -           | -   | -         |   |       |

**Exit Option:** Students exiting the programme after securing **132** credits will be awarded **UG Degree B.S. in BOTANY** provided they have satisfied the credit requirements.

| Year | Sem     | Course Type | Course Code | Course Title                 | Credits T | P | Total |
|------|---------|-------------|-------------|------------------------------|-----------|---|-------|
| 4    | Sem-VII | DSC-Core    | BOT-MJ-471  | Advanced Plant Taxonomy      | 3         | 1 | 4     |
|      |         | DSC-Core    | BOT-MJ-472  | Phytoremediation, Toxicology | 3         | 1 | 4     |
|      |         | DSC-Core    | BOT-MJ-473  | Research methodology         | 3         | 1 | 4     |
|      |         | DSC-M       | BOT-MN-474  | Horticultural Practices      | 3         | 1 | 4     |

|  |          |          |            |   |   |   |   |
|--|----------|----------|------------|---|---|---|---|
|  |          | AEC      | -          | -   | - | - | - |
|  |          | SEC      | -          | -   | - | - | - |
|  |          | OJT/RP   | OJT/RP-1   | Student project                               | 6 | - | 6 |
|  | Sem-VIII | DSC-Core | BOT-MJ-481 | Plant Identification and Herbarium Techniques | 3 | 1 | 4 |
|  |          | DSC-Core | BOT-MJ-482 | Plant Tissue Culture                          | 3 | 1 | 4 |
|  |          | DSC-Core | BOT-MJ-483 | Remote sensing Application, GIS & GPS         | 3 | 1 | 4 |
|  |          | DSC-M    | BOT-MN-484 | Herbal Processing                             | 3 | 1 | 4 |
|  |          | AEC      | -          | -   | - | - | - |
|  |          | SEC      | -          | -   | - | - | - |
|  |          | OJT/RP   | OJT/RP-2   | On-the-Job Training/Research Project          | 6 | - | 6 |

Students after securing **176** credits will be awarded a **UG B.S. (Hons.) in BOTANY** provided they have satisfied the credit requirements.

## Annexure 2: Detailed Syllabus for B.Sc. (Hons.) BOTANY

### Semester- I

| Unit No.   | Title of Unit and Contents  | No. of hours |
|------------|---|--------------|
| <b>I</b>   | <p><b><u>Environmental biology</u></b></p> <ul style="list-style-type: none"> <li>-Introduction, Scope and Branches of Ecology</li> <li>-Ecosystems, Kinds of Ecosystems: Natural, Artificial</li> <li>-Components of Ecosystem, Components of Freshwater Ecosystem (Pond), Components of Terrestrial Ecosystem (Grassland)</li> <li>-Food chain, food web, Ecological Pyramids, Productivity of an Ecosystem, Energy flow in an Ecosystem</li> <li>-Biogeochemical Cycles- Nitrogen, Sulphur</li> <li>-Biotic Factors : Symbiosis: Mutualism, Proto-cooperation, Commensalism</li> <li>Antagonism: Predation, Parasitism, Antibiosis, Competition, Saprophytism</li> <li>-Edaphic factor: Importance of soil, Effect of soil on plants</li> <li>-Composition of soil, origin and development of soil, soil profile</li> <li>-Soil composition, Soil texture</li> <li>-Soil water, water holding capacity</li> <li>-Soil-air, soil organisms</li> <li>-Electrical conductivity of soils</li> <li>-Soil erosion</li> <li>-Soil conservation</li> </ul> | <b>15</b>    |
| <b>II</b>  | <p><b><u>Cytology and Molecular biology</u></b></p> <ul style="list-style-type: none"> <li>-Ultra structure of Plant Cell</li> <li>-Structure &amp; Function of Mitochondria and Chloroplast</li> <li>-Structure of Nucleic Acids</li> <li>-Watson and Crick's Model of DNA</li> <li>-Forms of DNA- Z-DNA, Satellite DNA</li> <li>-DNA Replication</li> <li>-Structure and Types of RNA</li> <li>-Genetic Code &amp; its Properties</li> <li>-Protein Synthesis</li> <li>-Regulation of gene expression in prokaryotes – LAC Operon concept</li> </ul>  | <b>15</b>    |
| <b>III</b> | <p><b><u>Diversity of Lower Plants</u></b></p> <ul style="list-style-type: none"> <li>-General account: Habit and habitat of Algae, Fungi. General characters, Pigments, Food reserves, flagella, thallus organization &amp;</li> <li>-Modes of reproduction in Algae.</li> <li>-Life history of the following genera including morphology and reproduction excluding development: (Classification as per G. M. Smith) 1. <i>Spirogyra</i> 2. <i>Nostoc</i> 3. <i>Volvox</i></li> <li>-Importance of Algae in Industry &amp; Agriculture</li> </ul>   | <b>15</b>    |

|           |  |           |
|-----------|--|-----------|
|           | <ul style="list-style-type: none"> <li>-Life history of the following genera including morphology and reproduction, excluding development ( Classification according to Ainsworth) 1. <i>Mucor</i> 2. <i>Agaricus</i></li> <li>-Mushroom Cultivation – Importance</li> <li>-Economic importance of fungi.</li> <li>-Study of Lichens and their types</li> </ul>  |           |
| <b>IV</b> | <p><b><u>Introduction to Plant Biotechnology</u></b></p> <ul style="list-style-type: none"> <li>-Introduction, Brief History, Scope &amp; Types of Plant Biotechnology</li> <li>-Plant Tissue Culture- Laboratory organization</li> <li>-Principles &amp; working of instruments used in Plant tissue Culture- Autoclave, Laminar air flow, Balance, Hot air oven, Water distillation unit, pH meter</li> <li>-Technique of Plant Tissue Culture</li> <li>-Protoplast Culture</li> <li>-Somatic Hybridization</li> <li>-Applications of Plant Tissue Culture in Industries &amp; Forestry</li> <li>-Introduction to Synthetic Seeds</li> <li>-Edible Vaccines</li> </ul> | <b>15</b> |

## Semester- II

| Unit No.  | Title of Unit and Contents   | No. of hours |
|-----------|--|--------------|
| <b>I</b>  | <p><b><u>Morphology and Taxonomy</u></b></p> <ul style="list-style-type: none"> <li>-Plant Morphology</li> <li>-Phyllotaxy and Types of leaves</li> <li>-Types of stipules and their modifications</li> <li>-Bracts: Scaly, Involucral, Foliaceous, Petaloid and Spathe</li> <li>-Inflorescence: Racemose – Raceme, Spike, Catkin, Spadix, Umbel, Capitulum</li> <li>-Cymose – Solitary: terminal and axillary, Uniparous, Biparous, Multiparous cymes.</li> <li>-Types of Flowers based on position of ovary</li> <li>-Aestivation</li> <li>-Placentation</li> <li>-Study plant family: Malvaceae, Amaryllidaceae- Classification with reasons as per Bentham and Hooker, General features, Floral formula and examples of at least two important plants with scientific names</li> </ul> | <b>15</b>    |
| <b>II</b> | <p><b><u>Horticulture and Gardening</u></b></p> <ul style="list-style-type: none"> <li>-Horticulture: Definition, Scope</li> <li>-Branches</li> <li>-Gardening: Introduction, Uses of Gardens,</li> <li>-Types of Gardens (Kitchen, Water and Vertical Gardens)</li> <li>-Garden Equipments: Sprinkler, Hoe, Scissors, Hose pipe, Watering can</li> <li>-Names and flowering times of 5 ornamental flowering trees,</li> </ul>   | <b>15</b>    |

|     |   |    |
|-----|---|----|
|     | shrubs, foliage, climbers<br>-Asexual plant reproduction-Cutting, Layering<br>-Green house, its components and use<br>-Preparation of terrarium<br>-Introduction to hydroponics and its types<br>-Composting and bio fertilizers  |    |
| III | <u><b>Diversity of Lower Plants</b></u><br>-General account: Habit and habitat of Bryophytes, Pteridophytes, Gymnosperms. ·<br>-Life history of the following Bryophyte genus including morphology and reproduction excluding development: (Classification as per G. M. Smith) Riccia<br>-Life history of the following Pteridophytes genus including morphology and reproduction, excluding development (Classification according to G. M. Smith) Nephrolepis<br>-Life history of the following Gymnosperm genus including morphology and reproduction, excluding development (Classification according to Sporne) Cycas   | 15 |
| IV  | <u><b>Plant Physiology</b></u><br>-Plant-Water Relations: Water Potential, Diffusion, Imbibition.<br>-Respiration: Mechanism, Aerobic & anaerobic respiration, significance and factors affecting them.<br>-Photosynthesis: Significance, Historical aspect, Photosynthetic pigments, C3-C4 Pathways.<br>-Physiology of Flowering: Role of temperature in flowering, Vernalization.<br>-Photoperiodism: Role of light in flowering.<br>-Transpiration: Bell-Jar Experiment, types, significance and factors affecting transpiration,<br>-Guttation<br>-Study of monocot and dicot seed structure<br>-Study of seed based on moisture content and its relation with seed viability | 15 |