



HSNC UNIVERSITY, MUMBAI

BOARD OF STUDIES IN FACULTIES OF SCIENCE & TECHNOLOGY BOARD OF STUDIES IN BOTANY SUBJECT

- 1) Name of Chairperson/Co-Chairperson/Coordinator: -
 - a. **Dr. Sagarika Damle (Associate Professor, Head, Department of Life Sciences, K C College, Churchgate)** sagarika.damle@kccollege.edu.in
9820360383
- 2) Two to five teachers each having minimum five years teaching experience amongst the full-time teachers of the Departments, in the relevant subject.
 - a. **Dr. Suvarna Sharma (Assistant Professor, Department of Life Sciences, K C College, Churchgate)** suvarna.sharma@kccollege.edu.in 9869525362
 - b. **Dr. Mona Kejriwal (Associate Professor, Department of Botany, R. D. National College, Bandra)** monakejriwal@rdnational.ac.in 9702040004
- 3) One Professor / Associate Professor from other Universities or professor / Associate Professor from colleges managed by Parent Body; nominated by Parent Body; -
 - a. **Dr. Aparna Saraf (Associate Professor, Department of Botany, Homi Bhabha University)** draparnasaraf@yahoo.co.in 9869357636
- 4) Four external experts from Industry / Research / eminent scholar in the field relevant to the subject nominated by the Parent Body;
 - a. **Professor Dr. Sunita Shailajan (Retired Head Department of Botany, R. Ruia College, Matunga)** sunitashailajan@gmail.com 9821863676
 - b. **Dr. Devangi Chachad (Associate Professor, Department of Botany, Jai Hind College, Churchgate)** Devangi.chachad@jaihindcollege.edu.in
9870941656
 - c. **Dr. Pallavi Latkar (Environmental Architect, Grassroots Pvt. Ltd)**

pallavilatkar@gmail.com 9820451922

d. Dr. Shilpa Vora (Head, R & D, Global Lifebuoy and Skin cleansing)
shilpa.vora@unilever.com 9538029800

5) Top rankers of the Final Year Graduate and Final Year Post Graduate examination of previous year of the concerned subject as invitee members for discussions on framing or revision of syllabus of that subject or group of subjects for one year.

a. Mr. Sumeet Kabra (Entrepreneur, NewYou – Education Consultant)
Sumeet.kabra@gmail.com 9765556854

b. Mr. Atul Kotian (Research fellow, University of Buffalow)
Atulkotian94@gmail.com 9768552075

Part –I

Outline of Choice Based Credit System as outlined by University Grants Commission:

R. ****: The Definitions Of the Key Terms Used in The Choice Based Credit System And Grading System Introduced From The Academic Year 2020-2021 Are As Under:

1. **Core Course:** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.
2. **Elective Course:** Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.
 - 2.1 **Discipline Specific Elective (DSE) Course:** Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).
 - 2.2 **Dissertation/Project:** An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called dissertation/project. A Project/Dissertation work would be of 6 credits. A Project/Dissertation work may be given in lieu of a discipline specific elective paper.
 - 2.3 **Generic Elective (GE) Course:** An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective.

P.S.: A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective.
3. **Choice Base Credit System:** CBCS allows students to choose inter- disciplinary, intra-disciplinary courses, skill-oriented papers (even from other disciplines according to their learning needs, interests and aptitude) and more flexibility for students.
4. **Honours Program:** To enhance employability and entrepreneurship abilities among the learners, through aligning Inter Disciplinary / Intra Disciplinary

courses with Degree Program. Honors Program will have 40 additional credits to be undertaken by the learner across three years essentially in Inter / Intra Disciplinary course.

A learner who joins Regular Undergraduate Program will have to opt for Honours Program in the first year of the Program. However, the credits for honours, though divided across three years can be completed within three years to become eligible for award of honors Degree.

5. **Program:** A Program is a set of course that are linked together in an academically meaningful way and generally ends with the award of a Degree Certificate depending on the level of knowledge attained and the total duration of study, B.Sc. Programs.
6. **Course:** A 'course' is essentially a constituent of a 'program' and may be conceived of as a composite of several learning topics taken from a certain knowledge domain, at a certain level. All the learning topics included in a course must necessarily have academic coherence, i.e. there must be a common thread linking the various components of a course. A number of linked courses considered together are in practice, a 'program'.
7. **Bridge Course:** Bridge course is visualized as Pre semester preparation by the learner before commencement of regular lectures. For each semester the topics, whose knowledge is considered as essential for effective and seamless learning of topics of the Semester, will be specified. The Bridge Course can be conducted in online mode. The Online content can be created for the Bridge Course Topics.
8. **Module and Unit:** A course which is generally an independent entity having its own separate identity, is also often referred to as a 'Module' in today's parlance, especially when we refer to a 'modular curricular structure'. A module may be studied in conjunction with other learning modules or studied independently. A topic within a course is treated as a Unit. Each course should have exactly 3 Units.
9. **Self-Learning: 20% of the topics will be marked for Self-Learning.** Topics for Self-Learning are to be learned independently by the student, in a time- bound manner, using online and offline resources including online lectures, videos, library, discussionforums, fieldwork, internships etc.

Evaluative sessions (physical/online), equivalent to the credit allocation of the Self Learning topics, shall be conducted, preferably, every week for each course. Learners are to be evaluated real time during evaluative sessions. The purpose of evaluative sessions is to assess the level of the students' learning achieved in the topics earmarked for Self-Learning.

The teacher's role in these evaluative sessions will be that of a Moderator and Mentor, who will guide and navigate the discussions in the sessions, and offer concluding remarks, with proper reasoning on the aspects which may have been missed by the students, in the course of the Self-Learning process.

The modes to evaluate self-learning can be a combination of the various methods such as written reports, handouts with gaps and MCQs, objective tests, case studies and Peer learning. Groups can be formed to present self-learning topics to peer groups, followed by Question and Answer sessions and open discussion. The marking scheme for Self-Learning will be defined under Examination and Teaching. The topics stipulated for self-learning can be increased or reduced as per the recommendations of the Board of Studies and Academic Council from time to time. All decisions regarding evaluation need to be taken and communicated to the stakeholders preferably before the commencement of a semester. Some exceptions may be made in exigencies, like the current situation arising from the lockdown, but such ad hoc decisions are to be kept to the minimum possible.

10. **Credit Point:** Credit Point refers to the 'Workload' of a learner and is an index of the number of learning hours deemed for a certain segment of learning. These learning hours may include a variety of learning activities like reading, reflecting, discussing, attending lectures / counseling sessions, watching especially prepared videos, writing assignments, preparing for examinations, etc. Credits assigned for a single course always pay attention to how many hours it would take for a learner to complete a single course successfully. A single course should have, by and large a course may be assigned anywhere between to 8 credit points wherein 1 credit is construed as corresponding to approximately 30 to 40 learning hours.
11. **Credit Completion and Credit Accumulation:** Credit completion or Credit acquisition shall be considered to take place after the learner has successfully cleared all the evaluation criteria with respect to a single course. Thus, a learner who successfully completes a 4 CP (Credit Point) course may be considered to have collected or acquired 4 credits. learner level of performance above the minimum prescribed level (viz. grades / marks obtained) has no bearing on the number of credits collected or acquired. A learner keeps on adding more and more credits as he completes successfully more and more courses. Thus, the learner 'accumulates' course wise credits.
12. **Credit Bank:** A Credit Bank in simple terms refers to stored and dynamically updated information regarding the number of Credits obtained by any given learner along with details regarding the course/s for which Credit has been given, the course-level, nature, etc. In addition, all the information regarding the number of Credits transferred to different programs or credit exemptions given may also

be stored with the individual's history.

13. **Credit Transfer:** (performance transfer) When a learner successfully completes a program, he/she is allowed to transfer his/her past performance to another academic program having some common courses and Performance transfer is said to have taken place.
14. **Course Exemption:** Occasionally, when two academic programs offered by a single university or by more than one university, may have some common or equivalent course-content, the learner who has already completed one of these academic programs is allowed to skip these 'equivalent' courses while registering for the new program. The Learner is 'exempted' from 'relearning' the common or equivalent content area and from re-appearing for the concerned examinations. It is thus taken for granted that the learner has already collected in the past the credits corresponding to the exempted courses.

Part-II

O*** The fees for transfer of credits or performance will be based on number of credits that a learner has to complete for award of the degree.**

The Scheme of Teaching and Examination:

The performance of the learners shall be evaluated in two components: Internal Assessment with 40% marks by way of continuous evaluation and by Semester End Examination with 60% marks by conducting the theory examination.

INTERNAL ASSESSMENT:- It is defined as the assessment of the learners on the basis of continuous evaluation as envisaged in the credit based system by way of participation of learners in various academic and correlated activities in the given semester of the programme.

**A). Internal Assessment – 40%
40 marks**

B). Practical's (internal Components of the Practical Course

1. For Theory Courses

Sr. No.	Particulars	Marks
1	ONE class test / online examination to be conducted in the given semester	15 Marks
2	One assignment based on curriculum (to be assessed by the teacher Concerned	10 Marks
3	Self-Learning Evaluation	10 Marks
4	Active participation in routine class instructional deliveries	05 Marks

2. For Courses with Practicals

Each practical course can be conducted out of 50 marks with 20 marks for internal and 30 marks for external

Practical's (Internal component of the Practical Course)

Sr. No	Evaluation type	Marks
1	Two Best Practicals /Assignments/Presentation /Preparation of models/ Exhibits Or One Assignment/ project/presentation to be assessed by teacher concerned	10
2	Journal	05
3	Viva	05

The semester end examination (external component) of 60 % for each course will be as follows:

i) **Duration – 2 Hours** ii) **Theory Question Paper Pattern:** -

1. There shall be four questions each of 15 marks. On each unit there will be one question and the fourth one will be based on entire syllabus.

2. All questions shall be compulsory with internal choice within the questions. (Each question will be of 20 to 23 marks with options.)

3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depend on the weightage of the topic.

The marks will be given for all examinations and they will be converted into grade (quality) points. The semester-end, final grade sheets and transcripts will have only credits, grades, grade points, SGPA and CGPA.

3. Project and Assignment:

- Project or Assignment, which can in the following forms
 - Case Studies
 - Videos
 - Blogs
 - Research paper (Presented in Seminar/Conference)
 - Field Visit Report
 - Presentations related to the subject (Moot Court, Youth Parliament, etc.)
 - Internships (Exposition of theory into practice)
 - Open Book Test
 - any other innovative methods adopted with the prior approval of Director Board of Examination and Evaluation.

4. Self-Learning Evaluation

14.1 20% OF THE TOPICS OF CURRICULUM ARE LEARNED BY THE STUDENT THROUGH SELF LEARNING USING ONLINE / OFFLINE ACADEMIC RESOURCE SPECIFIED IN THE CURRICULUM.

14.2 HENCE 20% OF THE LECTURES SHALL BE ALLOCATED FOR EVALUATION OF STUDENTS ON SELF LEARNING TOPICS

14.3 The identified topics in the syllabus shall be learnt independently by the students in a time bound manner preferably from online resources. Evaluative sessions shall be conducted by the teachers and will carry 10 Marks.

CLUB The self-learning topics into 3-4 GROUPS OF TOPICS ONLY FOR EVALUATION.

• PRESCRIBE TIME DURATION (IN DAYS) FOR COMPLETION OF EACH GROUP OF TOPIC AND EARMARK SELF LEARNING EVALUATION LECTURES IN THE TIMETABLE. HENCE EACH GROUP OF TOPIC CAN BE ASSIGNED 3 REGULAR LECTURES FOR THIS EVALUATION FOR ENTIRE CLASS

3 Sub Topics

Each evaluative session shall carry 3 Marks (3 x 3 Units = 9 Marks). Students who participate in all evaluative sessions shall be awarded 1 additional Mark.

4 Sub Topics

Each evaluative session shall carry 2.5 Marks (2.5 x 4 Units = 10 Marks)

EVALUATION OF SELF LEARNING TOPICS CAN COMMENCE IN REGULAR LECTURES ASSIGNED FOR SELF LEARNING EVALUATION IN THE TIMETABLE

15. Evaluative sessions

Each evaluative session shall carry 3 Marks (3 x 3 = 9 Marks). Students who participate in all evaluative sessions shall be awarded 1 additional Mark.

16. Evaluative sessions

Each evaluative session shall carry 2.5 Marks (2.5 x 4 = 10 Marks).

Methods for Evaluation of Self-learning topics:

16.1 Seminars/presentation (PPT or poster), followed by Q&A - Objective questions /Quiz / Framing of MCQ questions.

16.2 Debates

- Group discussion
- You-Tube videos (Marks shall be based on the quality and viewership)
- Improvisation of videos
- Role Play followed by question-answers

TEACHERS CAN FRAME OTHER METHODS OF EVALUATION ALSO PROVIDED THAT THE METHOD, DULY APPROVED BY THE COLLEGE EXAMINATION COMMITTEE, IS NOTIFIED TO THE STUDENTS AT LEAST 7 DAYS BEFORE THE COMMENCEMENT OF THE EVALUATION SESSION AND IS FORWARDED FOR INFORMATION AND NECESSARY ACTION AT LEAST 3 DAYS BEFORE THE COMMENCEMENT OF THE EVALUATION SESSION

- Viva Voce
- Any other innovative method

SEMESTER END EXAMINATION: - It is defined as the examination of the learners on the basis of performance in the semester end theory / written examinations.

B. Semester End Examination- 60 % - 60 Marks

- 1) Duration – These examinations shall be of 2 Hours duration.
 - 2) Question Paper Pattern: -
 - i. There shall be four questions each of 15 marks. ii. All questions shall be compulsory with internal choice within the questions.
 - iii. Question may be sub-divided into sub-questions a, b, c, d & e only and the allocation of marks depends on the weightage of the topic.
- THE MARKS OF THE INTERNAL ASSESSMENT SHOULD NOT BE DISCLOSED TO THE STUDENTS TILL THE RESULTS OF THE CORRESPONDING SEMESTER IS DECLARED.



HSNC University, Mumbai

(2020-2021)

Ordinances and Regulations

With Respect to

Choice Based Credit System

(CBCS)

For the Programmes Under

The Faculty of Science and Technology

For the Course

Botany

Curriculum – First Year Undergraduate

Programmes

Semester-I and Semester-II

2020-2021

Section C

Botany

Part 1- Preamble

Plants are an integral and important part of earth's biosphere. Human development is closely interlinked with the plant-human interactions. Therefore, the knowledge of plant systems, is essential as a basic unit of studies in Biological Sciences. Study of plant diversity, conservation and sustainable management of plant species at undergraduate level, would give the students, an insight about the importance of plants as a major component of our ecosystem.

This course has two theory papers and two practical papers in each of the semesters. With the introduction of Choice Based Grading System, there will be a continuous evaluation throughout the year in the form of Internal Assessment and Term End Assessment.

1.Course Objectives

- The course aims at providing an alluring, interesting, and rewarding career options to the students of this University in the form of the subject of Botany at the undergraduate level, in alignment with their vocation.
- The main objective of designing this syllabus is to give students a strong basis of classical botany, along with applications, extensions, and relevance of the subject in relation to all other living organisms.
- The curriculum framework focuses holistic coverage of the subject. It is rooted in a realistic approach wherein the practical applications of theoretical concepts of the subject are taught with generous exposure to practical and field work.
- The curriculum further aims at equipping the graduates of the course with the necessary and essential skill-set as well as expertise for botany related careers - in life sciences, bio-technology and biology-based aspects and for higher education in botany and allied subjects.
- Above all, the syllabus has been constructed with a holistic approach and aims at moulding the young minds to have adequate expertise in reflective thinking, rational scepticism, scientific temperament, and digital literacy so that students are equipped to contribute to contemporary scientific queries and fight immediate social issues apropos to Indian milieu.

2. Process Adopted For Curriculum Designing

- This curriculum for the First Year Students of Botany has been developed by maintaining a student centric learning pedagogical

approach, which has been further aimed at being outcome-oriented and curiosity-driven.

- Using creative and bloom-based approach, 'learning-by-rote' approach has been avoided and imaginative abilities of the students have been fostered. The curriculum has been designed to be more inclined towards self-discovery of concepts.
- Feedback from various stakeholders, including the students, subject experts, parents, alumni and industry partners, has been actively sought and considered in the updation of the syllabus.
- Modifications and changes have been done in the syllabus with respect to the current needs and requirements of the professionals in the industrial sectors of the subject.

3. Salient features, how it has been more relevant:

- The syllabus aims to provide curriculum and an environment that ensures cognitive development of students in a holistic manner.
- Moreover, it would foster a dialogue about plants and their significance in various walks of human life rather than just being a didactic monologue on mere theoretical aspects.
- The syllabus has been made more relevant by addition of latest topics pertaining to botany, in both theory and practicals, so as to encourage core competencies and discovery-based learning.
- Syllabus would provide sufficient competency in the field for the students to undertake further discipline-specific studies, and target domain-related employment opportunities.

4. Learning Outcomes:

- Students will learn about the simple plant forms starting from *algae*. Learning their life cycles will give them a better understanding about the various aspects of these simple plants.
- Studying examples from different groups of plants, in relation to their complexity and functions, will help students to learn more about evolution and function.
- Applications of these primary groups of plants in various fields will help students to take up/think about related research projects.
- Students will gain knowledge about cell organelles and their role in cell functions.
- Understanding of environmental biology and energy conversions in biosphere.
- Understanding the basis of heredity and functioning of genes.
- Students will learn about the structure and functionality of land plants.

- Students will also learn about reproduction of land plants and their significance.
- Students will understand diversity of plant parts and how these can be helpful in identification of plants.
- Understanding the internal structure of plant parts and their biochemistry.
- Understanding of life functions of plants (physiology).
- Students will learn the basics of medicinal botany, in addition will learn about Economic and Applied Medicinal Botany as hands-on practicals.

5. Input from stakeholders:

- Based on the inputs from stakeholders of the department, relevant topics have been included.
- In addition to an introduction to *fungi*, it will be taught in more detail - such as general characteristics, ecology and significance, range of thallus, nutrition, classification and reproduction.
- A topic on palaeobotany has been introduced which shall enrich the students' knowledge of plant evolution
- More hands-on and skill-based practical sessions have been added in the syllabus.
- In view of medicinal botany as an important branch from future career prospects, phytochemistry, active principles and testing of all metabolites are incorporated in practicals.
- Modification of syllabus to make students industry-ready (Pharmaceutical, Taxonomy – Plant Identification & Medicinal Botany)
- Entrepreneurial practicals are now made more engaging so that students can prepare the plant products on their own.

**Part 2 - The Scheme of Teaching and Examination
Semester – I**

Sr. No.	Choice Based Credit System		Subject Code	Remarks
1	Core Course (Botany)		US-FBO-101 US-FBO-102 US-FBO-P1 US-FBO-P2	-
2	Elective Course	Discipline Specific Elective (DSE) Course	-	-
		2.1 Interdisciplinary Specific Elective (IDSE) Course	-	-
		2.2 Dissertation/Project	-	-
		2.3 Generic Elective (GE) Course	-	-
3	Ability Enhancement Courses (AEC)		US-FFC	-
	Skill Enhancement Courses (SEC)		-	-

Sr. No.	Subject Code	Subject Title	Periods Per Week						Seasonal Evaluation Scheme				Total Marks
			Units	S. L. % *	L	T	P	Credit	S. L. E	CT	T A	SE E	
1	US-FBO-101	Plant Diversity I	3	20 % *	3	0	2	2	10	20	10	60	100
2	US-FBO-102	Form and Function, I	3	20 % *	3	0	2	2	10	20	10	60	100
3	US-FBO-P1	Practicals Based US-FBO-101 + Practicals Based US-FBO-102	3	20 %	3	0	2	2				100 (80+20)	100
Total Hours / Credit						06			Total Marks				300

***One to two lectures to be taken for CONTINUOUS self-learning Evaluation.**

1st Year Semester – I; Units – Topics – Teaching Hours

S. N	Subject Code	Subject Unit Title		Hours /Lect ures	Total No. of hours/ lecture s	Credit	Tot al Mark s
1	US-FBO-101	I	Algae	15	45 L	2	100 (60+ 40)
		II	Fungi	15			
		III	Bryophytes	15			
2	US-FBO-102	I	Cell Biology	15	45L	2	100 (60+ 40)
		II	Ecology	15			
		III	Genetics and Biostatistics	15			
3	US-FBO-P1	I	Practicals based on US-FBO-P101	3	45x2=90L lecture s per batch	2	100 (80+ 10+1 0)
		II	Practicals based on US-FBO-P102	3			
		TOTAL				6	300

- **Lecture Duration – 48 Minutes**
- **One Credit =15 class room teaching hours**

Part 3: Detail Scheme Theory

Course Code US-FBO-101

Curriculum Topics along with Self-Learning topics - to be covered, through self-learning mode along with the respective Unit. Evaluation of self-learning topics to be undertaken before the concluding lecture instructions of the respective UNIT

Unit	Content	No. of Lectures
1	1. Algae 1.1 Life cycle of <i>Nostoc</i> 1.2 Life cycle of <i>Spirogyra</i> 1.3 Economic importance of Algae 1.4 Smith's Classification	15
2	2. Fungi 2.1 General characters, classification, Ecology and significance 2.2 Life cycle of <i>Rhizopus</i> 2.3 Life cycle <i>Aspergillus</i> 2.4 Economic importance of Fungi 2.5 Mode of Nutrition in Fungi, structure of fungal cell wall	15
3	3. Bryophytes 3.1. General characters of Bryophyta and class Hepaticae / Bryopsida 3.2. Life cycle of <i>Riccia</i> / <i>Funaria</i> 3.3. Ecological and economic importance of Bryophyta 3.4. Economic Botany: Plant Resource Utilization	15

Self-Learning topics (Unit wise)

Unit	Topics
1	1.4 Biogeography: Geographical distribution of Algae
2	2.6 Biogeography: Geographical distribution of Fungi
3	3.5 Biogeography: Geographical distribution of Bryophytes

Online Resources

For Algae, Fungi and Bryophytes use National Digital Library <http://ndl.iitkgp.ac.in> and CEC-UGC Youtube channel

1.	Unit – 1	Ganguly and Kar, 2001. College Botany Vol I and II. Books and Allied Press Ltd. Kolkata.
2.	Unit – 2	Alexopoulos C.J., Mims, C.W. & Blackwell, M. 1996. Introductory Mycology. 4th edition. John Wiley& Sons Inc.
3.	Unit – 3	Ganguly and Kar, 2001. College Botany Vol I and II. Books and Allied Press Ltd. Kolkata.

Reference Books US-FBO-101

Course Code: US-FBO-102

Unit	Content	No. of Lectures
I	1. Cell Biology 1.1. General structure of plant cell: cell wall, plasma membrane (lipid bilayer and Fluid mosaic model, membrane proteins and their functions), cell inclusions 1.2. Ultrastructure and functions of Endoplasmic reticulum, Chloroplast and mitochondria 1.3. Cell membrane and cellular transport 1.4. Cell wall 1.5. Chloroplast and Mitochondria 1.6. Endoplasmic reticulum structure and role	15
II	2. Ecology 2.1 Energy flow in an Ecosystem Organization, plant categories based on habitat, plant succession 2.2 Types of Ecosystems (aquatic and terrestrial) applied field in ecological studies, vegetation mapping, endemism 2.3 Ecosystem organisation 2.4 Energy flow in Ecosystem 2.5 Aquatic Ecosystem 2.6 Terrestrial Ecosystems and impact of urbanisation	15
III	3. Genetics and Biostatistics 3.1 Phenotype / Genotype, Post Mendelian interactions, Incomplete dominance, codominance, multiple allelism, epistatic interactions and epistatic effects-	15

	dominant and recessive	
3.2	Epistatic and non-epistatic interactions; multiple alleles	
3.3	Biostatistics calculations – mean, median and mode	
3.4	Calculation of standard deviation, frequency distribution, Graphical representation of data, frequency polygon, Histogram, Pie chart	

Self-Learning topics (Unit wise)

Unit	Topics
1	1.4 Cell wall – a comparative study across plant groups
1	1.5 Chloroplast and mitochondria – A endosymbiont study
1	1.6 ER structure and role – Role of organelle in protein transport
2	2.7 Progressive changes in earth's atmospheric, geographic, and climatic conditions, and its correlation to the evolutionary development of the plant kingdom

Online Resources

For 1.4- Modules 8-10, 1.5- Module 12, 1.6-Module 18 of <http://epgp.inflibnet.ec.in>

For 2.7- <http://ndl.iitkgp.ac.in/> ck-12

Reference Books US-FBO-102

1.	Unit 1	1. C. B. Powar, 2010. Cell Biology, Himalaya Publishing House. 2. P.S. Verma and V. K. Agrawal, 2008. Cell biology, genetics, molecular biology, Evolution and Ecology. S. Chand Publications, New Delhi.
2.	Unit 2	3. E. P. Odum, 1983. Basic Ecology. Saunders, Philadelphia
3.	Unit 3	4. P. J. Russel, 2010, iGenetics, Pearson Publications. Inc.

Part 4 : Practicals

Paper-I-Practical

Total Credit: 01

Title of Paper: Plant Diversity I

Course Code: US-FBO-P101			
Unit	Content	No. of Lectures	Reference Books
I	1. Study of stages in the life cycle of <i>Nostoc</i> from fresh/ preserved material and permanent slides. 2. Study of stages in the life cycle of <i>Spirogyra</i> from fresh/ preserved material permanent slides. 3. Economic importance of Algae eg. <i>Gelidium</i> , <i>Spirulina</i> , <i>Ulva</i> , <i>Sargassum</i>	03 Lectures per Practical per Batch	Reference No. 1,9
II	4. Study of stages in the life cycle of <i>Rhizopus</i> from fresh/ preserved material permanent slides. 5. Study of stages in the life cycle of <i>Aspergillus</i> from fresh/ preserved material permanent slides. 6. Economic importance of Fungi eg. Mushroom, Yeast, Wood rotting fungus (any Bracket fungus)		
III	7. Study of stages in the life cycle of <i>Riccia</i> / <i>Funaria</i> from fresh/ preserved material permanent slides.		

Paper-II-Practical

Total Credit: 01

Title of Paper: Form and Function I

Course Code: US-FBO-P102			
Unit	Content	No. of Lectures	Reference Books
I	1. Study of cell inclusions starch (Potato and Rice), Aleurone layer (Maize), Cystolith (<i>Ficus</i>), Raphides (<i>Pistia</i> , <i>Colocasia</i> , <i>Pothos</i>), Sphaeraphides (<i>Opuntia</i>) 2. Identification of cell organelles with photomicrograph Chloroplast, Amyloplast, Endoplasmic Reticulum, Nucleus	03 Lectures per Practical per Batch	Reference No. 4, 9
II	3. Identification of plants adapted to different environmental conditions: Hydrophytes: Floating: Free floating (<i>Pistia</i> / <i>Euchronia</i>); Rooted floating (<i>Nymphaea</i>); Submerged (<i>Hydrilla</i>) 4. Preparation of Terrarium 5. Mesophytes (any common plant); Hygrophytes (<i>Typha</i> / <i>Cyperus</i>)		

	<p>6. Xerophytes: Succulent (<i>Opuntia</i>); Woody Xerophyte (<i>Nerium</i>); Halophyte (<i>Avicennia pneumatophore</i>)</p> <p>No sections in ecology, only identification and description of specimens' Morphological adaptations only.</p>		
III	<p>7. Examining various stages of Mitosis using root tip of Onion (<i>Allium</i>)</p> <p>8. Biostatistics Calculation of mean, median, mode.</p> <p>9. Calculation of Standard Deviation, Frequency distribution, graphical representation of Data – Frequency polygon, histogram, pie chart</p>		

Reference Books US-FBO-P101 and US-FBO-P102

1.	Alexopoulos C.J., Mims, C.W. & Blackwell, M. 1996. Introductory Mycology. 4th edition. John Wiley& Sons Inc.
2.	Ganguly and Kar, 2001. College Botany Vol I and II. Books and Allied Press Ltd. Kolkata.
3.	C.R. Kothari, Research Methodology: Methods And Techniques, 4 th Ed. New Age International Publishers.

Part 5
1st Year Semester – II
Summary

Sr. No.	Choice Based Credit System		Subject Code	Remarks
1	Core Course (Botany)		US-FBO-201 US-FBO-202 US-FBO-P1 US-FBO-P2	-
2	Elective Course	Discipline Specific Elective (DSE) Course	-	-
		2.1 Interdisciplinary Specific Elective (IDSE) Course	-	-
		2.2 Dissertation/Project	-	-
		2.3 Generic Elective (GE) Course	-	-
3	Ability Enhancement Courses (AEC)		US-FFC	-
	Skill Enhancement Courses (SEC)		-	-

First year Semester -II Internal and External Assessment
Detail Scheme

Sr. No.	Subject Code	Subject Title	Periods Per Week						Credit	Seasonal Evaluation Scheme				Total Marks
			Units	S. L.	L	T	P	S. L. E		CT	T A	SE E		
1	US-FBO-201	Plant Diversity II	3	20 % *	3	0	2	2	10	20	10	60	100	
2	US-FBO-202	Form and Function - II	3	20 % *	3	0	2	2	10	20	10	60	100	
3	US-FBO-P2	Practical Based on US-FBO-P201 + Practical Based on US-FBO-P202	3	20 %	3	0	2	2				100 (80+20)	100	
Total Hours / Credit									06	Total Marks				300

***One to two lectures to be taken for self-learning Evaluation.**

I Year Semester – II Units – Topics – Teaching Hours

S. N	Subject Code	Subject Unit Title		Hours /Lectures	Total No. of hours/lectures	Credit	Total Marks
1	US-FBO-201	I	Pteridophyta	15	45	2	100 (60+40)
		II	Gymnosperms	15			
		III	Angiosperms	15			
2	US-FBO-202	I	Anatomy	15	45	2	100 (60+40)
		II	Physiology	15			
		III	Medicinal Botany	15			
3	US-FBO-P2	I	Practicals based on US-FBO-P201	3	45x2=90 lectures per batch	2	100 (80+10+10)
		II	Practicals based on US-FBO-P202	3			
TOTAL						6	300

Part 6: Detail Scheme Theory

Course Code: US-FBO-201

Curriculum Topics along with Self-Learning topics - to be covered, through self-learning mode along with the respective Unit. Evaluation of self-learning topics to be undertaken before the concluding lecture instructions of the respective UNIT

Unit	Content	No. of Lectures
I	1. Pteridophyta 1.1 General characters, fossil plants - <i>Rhynia</i> 1.2 Structure, Life cycle and systematic position and alteration of generation in <i>Nephrolepis</i> 1.3 Stellar evolution in plants	15
II	2 Gymnosperms 2.1 General characters, outline of Chamberlin's classification. 2.2 Structure, Life cycle and systematic position and alteration generation in <i>Cycas</i> 2.3 Economic importance of Gymnosperms	15
III	3 Angiosperms 3.1 Brief introduction to evolution of Angiosperms	15

	<p>3.2 Types of classification systems of Angiosperms, Bentham & Hooker's system of classification-Schematic</p> <p>3.3 Study of Inflorescence</p> <p>1. Study of following families: Malvaceae, Papilionaceae, Fabaceae, Mimosae, Asteraceae, Amaryllidaceae</p>	
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Self-Learning topics (Unit wise)

Unit	Topics
1	1.1 Significance of fossil plants in plant evolution
3	3.1 Introduction of leaf morphology

Online Resources

For Unit 1 and Unit 3--swayam.gov.in / ndl.iitkgp.ac.in

Reference Books US-FBO-201

1.	Unit 1	1. Ganguly and Kar, 2001. College Botany Vol I and II. Books and Allied Press Ltd. Kolkata.
2.	Unit 2	2. M. R. Almeida, Flora of Maharashtra Vol.I – Vol III 3. Flora of Bombay Presidency – Theodor Cook Volume I,II,III
3.	Unit 3	4. Sporne, K.R, 1975. The Morphology of Angiosperms, Hutchinson's University Press. 5. Textbook of Systemic Botany - By R.N.Sutaria 2 nd edition

Course Code: US-FBO-202

Unit	Content	No. of Lectures
I	<p>1. Anatomy</p> <p>1.1 Simple and complex tissues</p>	15

	<p>1.2 Primary structure of Dicot and Monocot root, stem and leaf</p> <p>1.3 Epidermal tissue system: Epidermal outgrowths, Dicot and Monocot stomata</p>	
II	<p>2 Physiology</p> <p>2.1 Factors affecting rate of photosynthesis</p> <p>2.2 Photosynthetic light and dark reaction</p> <p>2.3 Photosynthesis in C₃, C₄ and CAM plants</p> <p>2.4 Photophosphorylation and Photorespiration</p> <p>2.5 Significance of Photosynthesis</p>	15
III	<p>3 Medicinal Botany</p> <p>3.1 History of Medicinal Botany with various Traditional medicinal practices</p> <p>3.2 Pharmacopeia and its relevance in quality control of herbal drugs</p> <p>3.3 Concept of primary and secondary metabolites, differences between primary and secondary metabolites</p> <p>3.4 Pharmacognosy and Phytochemistry: Concept and overview, Active principles with few examples Qualitative testing of – alkaloids, steroids, tannins, glycosides, volatile oils,</p> <p>3.5 Grandma's pouch: Following plants have to be studied with respect to botanical source, parts of the plant used, active constituents present and medicinal uses- <i>Aloe vera</i>, <i>Ocimum sanctum</i>, <i>Adathoda vasica</i>, <i>Zingiber officinale</i>, <i>Curcuma longa</i>, <i>Santalum album</i>, <i>Azadiracta indica</i>, <i>Mentha piperita</i></p>	15

Self-Learning topics (Unit wise)

Unit	Topics
1	1.1 Structure and function- Simple and Complex tissues
2	2.2 Mineral Nutrition: Essential elements, their role in plants, deficiency symptoms
2	2.3 Plant biotechnology and its applications

Online Resources

For Unit 1--<http://ugcmoocs.inflibnet.ac.in> /ndl.iitkgp.ac.in

For Unit 2-- <http://ugcmoocs.inflibnet.ac.in> / ndl.iitkgp.ac.in

Reference Books US-FBO-202

1.	Unit 1	<ol style="list-style-type: none"> 1. B. P. Pandey, 2001. Plant Anatomy. S. Chand Publications, New Delhi 2. Forester, A.S. 1960. Practical Plant Anatomy. D. Van Nostrand Company Inc. 3. Mauseth, J.D. 1988. Plant Anatomy - The Benjamin Cumming Publishing Co. 4. B. P. Pandey, 2001. Plant Anatomy. S. Chand Publications, New Delhi
2.	Unit 2	<ol style="list-style-type: none"> 5. Noggle and Fritz, 2002. Introduction to Plant Physiology, Prentice Hall Publisher 6. Lincoln Taiz and Eduardo Zeiger, 2002. Plant Physiology 2nd edition, Sinauer Associates, Inc. Publishers Sunderland, Massachusetts. 7. Salisbury and Ross 2002. Plant Physiology 3rd edition CBS publishers and distributors.
3.	Unit 3	<ol style="list-style-type: none"> 8. Quality standards of medicinal plants (ICMR, New Delhi) Vol: 1-11. 9. Chaudhary R.R. 1994. Herbal Medicines for human health. CBS Publishers New Delhi 10. Verma V. 2009. Textbook of Economic Botany, Ane Books pvt. Ltd.

Part 7 : Practicals

Paper-I-Practical

Total Credit: 01

Title of Paper: Plant Diversity II

Course Code: US-FBO-P201			
Unit	Content	No. of Lectures	Reference Books

I	1. Study of stages in the life cycle of <i>Nephrolepis</i> , mounting of ramentum, hydathode, T.S. of rachis, T.S. of Pinna passing through sorus 2. Stellar evolution with the help of permanent slides: Protostele- haplostele, actinostele, plectostele, mixed protostele; Siphnostele- ectophloic, amphiphloic, Dictyostele, Eustele, Atactostele 3. <i>Cycas</i> : mounting T.S. of Pinna, Specimens - male cone, microsporophyll, megasporophyll, ovule, V.S. of ovule, seed, V.S. of seed	03 Lectures per Practical per Batch	Reference No. 7,9,11,2 0
II	4. Economic importance of Gymnosperms		
III	5. Study of family and their economic importance I) Malvaceae, Papilionaceae, Fabaceae, Mimosae, II) Asteraceae, Amaryllidaceae		

Paper-II-Practical

Total Credit: 01

Title of Paper: Form and Function II

Course Code: US-FBO-P202			
Unit	Content	No. of Lectures	Reference Books
I	1. Primary structure of Dicot and Monocot root 2. Primary structure of Dicot and Monocot stem, 3. Dicot and Monocot stomata 4. Mountings of Epidermal outgrowths- Unicellular-Cotton/Radish, multicellular-Lantana/Sunflower, Peltate-Thespesia, Stellate- <i>Erythrina/Sida acuta/Solanum/Helicteris</i> , T-shaped- <i>Avicennia</i>	03 Lectures per Practical per Batch	Reference No. 2,5, 8, 21
II	5. Separation of photosynthetic pigments by paper chromatography 6. Change in colour because of change in pH- Anthocyanin Purple cabbage/black grapes 7. Tests for tannins 8. Tests for alkaloids		

III	9. Identification of plants from Grandma's pouch as per theory and their products		
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Reference Books US-FBO-P201 and US-FBO-P202

1.	Ganguly and Kar, 2001. College Botany Vol I and II. Books and Allied Press Ltd. Kolkata.
2.	M. R. Almeida, Flora of Maharashtra Vol.I – Vol III
3.	Sporne, K.R, 1975. The Morphology of Angiosperms, Hutchinson's University Press.
4.	M. R. Almeida, Flora of Maharashtra Vol.I – Vol III
5.	Textbook of Systemic Botany - By R.N.Sutaria 2 nd edition
6.	B. P. Pandey, 2001. Plant Anatomy. S. Chand Publications, New Delhi
7.	Chaudhary R.R. 1994. Herbal Medicines for human health. CBS Publishers New Delhi
8.	Forester, A.S. 1960. Practical Plant Anatomy. D. Van Nostrand Company Inc.
9.	Verma V. 2009. Textbook of Economic Botany, Ane Books pvt. Ltd.

L: Lecture: Tutorials P: Practical Ct-Core Theory, Cp-Core Practical, CT-Commutative Test, TA-Teacher Assistant