ST. TERESA'S COLLEGE
(AUTONOMOUS)
ERNAKULAM

CURRICULUM FOR BACHELOR'S PROGRAMMEIN BOTANY

Under Choice Based Credit & Semester System

(2014 Admission)

As prescribed by M G University

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ST. TERESA'S COLLEGE, (AUTONOMOUS), ERNAKULAM, BACHELOR'S PROGRAMME IN BOTANY

PREAMBLE

The Board of Studies of Bachelor's Programme in Botany recognizes that the curriculum, course content and assessment of scholastic achievement play mutually complementary roles in education. The restructured Curriculum for the Undergraduate Programme of Botany envisages Undergraduate Education as a combination of general and specialized knowledge, simultaneously introducing the concepts of breadth and depth in learning. It stresses on learning to learn rather than going through bland specific lessons. We attempt to prepare students for a life-long learning experience by drawing attention to the vast world of knowledge of plants and introducing them to the methodology of systematic academic enquiry. With this in mind, we aim to provide not only a firm foundation in every aspect of Botany but also to explain a broad spectrum of modern trends and to develop experimental, observational and computational skills which mould them as ambassadors of sustainable development for our country.

GRADUATE ATTRIBUTES

The Bachelors Programme in Botany seeks to develop graduates of high distinction by providing high quality education. The programme aims to encourage students to take responsibility for developing themselves throughout their studies at our institution. It encourages students to reflect on the broader purpose of their education. The students who are completing B.Sc. Programme in Botany will reflect the following graduate attributes.

1. Comprehensive knowledge and understanding about the importance of the discipline
2. Capacity to apply the achieved basic objectives of education in practical life
3. Open minded and curious attitude
4. Ability to work hard and be outstanding members of the society
5. Factual and functional knowledge about the diversity amongst life forms
6. Skill in practical work, experiments, use of advanced biological tool and techniques
7. Expertise in statistical analyses of biological data for better interpretations
8. Critical thinking and problem solving capacity
9. Spirit of teamwork and effective communication skills
10. Confidence to apply the acquired knowledge in practical life so as to make our country self reliant
11. Curiosity and enthusiasm in Botany and related biological sciences
12. Interest in seeking higher studies in this discipline
13. Ability to appreciate and practice ethical principles in research and studies in the field of biological science
14. Awareness about the natural environment and realization of the importance of its conservation.
15. Ability to suggest innovative programme to care for nature and life for sustainable development.
16. Concern for fellow beings and care for the marginalized
17. Self-awareness and emotional intelligence

OBJECTIVES OF THE PROGRAMME

The curriculum for the B. Sc. Programme in Botany has been designed with an aim of encouraging the broad instructional goals and to support the growing demands and challenging trends in the educational scenario. It targets at providing an environment that encourages, promotes and stimulates the intellectual, professional and personal development of the student. The curriculum caters to the all-round development of the student, rolling out globally ready individuals into the fast pacing world. The specific objectives of the program are as follows:

- Know the importance and scope of the discipline
- Inculcate interest in and love of nature with its myriad living forms
- Impart knowledge of Science as the basic objective of Education
- Create a scientific attitude to make students open minded, critical and curious
- Develop the ability to work hard and make students fit for society
- Expose students to the diversity amongst life forms
- Develop skill in practical work, experiments, equipments and laboratory use along with collection and interpretation of biological materials and data
- Make them aware of natural resources and environment and the importance of conserving it.
- Develop the ability for the application of acquired knowledge in various fields of life so as to make our country self sufficient
- Appreciate and apply ethical principles to biological science research and studies

STRUCTURE OF BACHELOR'S PROGRAMME IN BOTANY

The B.Sc. programme in Botany includes (a) Common courses, (b) Core courses, (c) Complementary Courses, (d) Open Courses and (e) Project. No course shall carry more than 5 credits. The student shall select any one of the Choice based core course offered by the department, depending on the availability of teachers and infrastructure facilities, in the institution. Open course shall be offered in any subject and the student shall have the option to do courses offered by other departments.

The programme contains 33 courses in six semesters. The total credit of the programme is 120. The programme should contain 12 compulsory core courses and 1 choice based course from the frontier area of the core courses, 8 complementary courses from the relevant subjects for complementing the core of study, 1 open course and a project. There should be 10 common courses which includes the first and second language of study.

OPEN COURSES OFFERED FOR OTHER STREAMS

All students are expected to do one open course of their choice from any discipline other than Botany. Department of Botany offers the open course "Horticulture and Nursery Management" to other streams during the fifth semester.

CORE CHOICE BASED COURSE

The students of Botany Programme can select any one of the three choice based core courses offered by the Department in the sixth semester, subject to the availability of facility and infrastructure in the Department. The choice based core courses offered by the Department of Botany are 1. Phytochemistry and Pharmacognosy, 2. Agribusiness and 3. Plant Genetic Resources Management.

PROJECT WORK

All students have to do a project work and must submit the dissertation for evaluation in the sixth semester. Project work shall be completed by working outside the regular teaching hours. Project work shall be carried out under the supervision of a teacher in the concerned department. A candidate may, however, in certain cases be permitted to work on the project in an industrial/research organization on the recommendation of the supervisor.

The Programme also includes test papers, assignments, seminars and Viva voce.

SEMESTER WISE DETAILS OF COURSES OFFERED

No.	Course	Subject Code	Title of paper	Course details (Core/ Comple/ Common/ Lang.
SEMESTER 1				
1	English	ENG1CSE	Communication Skills in English	Common Course
2	English	ENG1RLE	Reading Literature in English	Common Course
3	French	FRE1FLCS	French Language & Communication Skills - I	Addl. Lang
4	Hindi	HIN1POAP	Prose And One Act Play	Language
5	Malayalam	MAL1KN	Katha, Novel	Language
6	Botany	BOT1MPIP	Methodology and Perspectives of Science and Introduction to the World of Plant diversity	Core theory
7	*Botany Practical	BOT2 MPSIWP(P)	Methodology and Perspectives of Science and Introduction to the World of Plant Diversity & General Informatics and Methodologies in Plant Sciences	Core Practical
8	Chemistry	CHE1BTAC	Basic theoretical and Analytical chemistry	Complementary theory
9	*Chemistry Practical	CHE2VA(P)	Volumetric Analysis	Complementary Practical
10	Zoology	ZOO1ADNC	Animal Diversity – Non Chordata	Complementary theory
11	*Zoology Practical	ZOO2AD(P)	Animal Diversity	Complementary Practical
*Practical exams only in even semesters				

SEMESTER II				
1	English	ENG2CTAWP	Critical Thinking, Academic Writing and Presentation	Common Course
2	English	ENG2MVI	Musings on Vital Issues	Common Course
3	French	FRE2FLCS	French Language & Communicative Skills – II	Addl. Lang
4	Hindi	HIN2TCA	Translation, Communication Skills and Applied Grammar	Language
5	Malayalam	MAL2KAV	Kavitha	Language
6	Botany	BOT2GIMPS	General Informatics and Methodologies in Plant Sciences	Core Theory
7	Botany Practical	BOT2 MPSIWP(P)	Methodology and Perspectives of Science and Introduction to the World of Plant Diversity & General Informatics and Methodologies in Plant Sciences	Core Practical
8	Chemistry	CHE2BOC	Basic Organic Chemistry	Complementary theory
9	Chemistry Practical	CHE2VA(P)	Volumetric Analysis	Complementary Practical
10	Zoology	ZOO2ADC	Animal Diversity-Chordata	Complementary theory
11	Zoology Practical	ZOO2AD(P)	Animal Diversity	Complementary Practical
SEMESTER III				
1	English	ENG3RISSE	Reflections On Indian Polity, Secularism & Sustainable Environment	Common Course

2	French	FRE3ACF	An Advanced Course in French I	Addl. Lang
3	Hindi	HIN3PF	Poetry and Fiction	Language
4	Malayalam	MAL3AP	Arangum Porulum	Language
5	Botany	BOT3MP	Microbiology and Phycology	Core Theory
6	*Botany Practical	BOT4MPARA(P)	Microbiology, Phycology, Anatomy and Reproductive Botany of Angiosperms	Core Practical
7	Chemistry	CHE3AOC	Advanced Inorganic and Organic chemistry	Complementary theory
8	*Chemistry Practical	CHE4OC(P)	Organic Chemistry Practical	Complementary Practical
9	Zoology	ZOO3HPI	Human Physiology and Immunology	Complementary theory
10	*Zoology Practical	ZY4CO2U (P)	Human Physiology, Immunology & Applied Zoology	Complementary Practical
*Practical exams only in even semesters				
SEMESTER IV				
1	English	ENG4EPS	Evolution of the Philosophy of Science:	Common Course
2	French	FRE4ACF	An Advanced Course in French – II	Addl. Lang
3	Hindi	HIN4CCI	Culture and Civilization of India	Language
4	Malayalam	MAL4GRP	Gadyam, Rachana Parichayam	Language
5	Botany	BOT4ARB	Anatomy and Reproductive Botany of Angiosperms	Core Theory
6	Botany Practical	BOT4MPARA(P)	Microbiology, Phycology, Anatomy and Reproductive Botany of Angiosperms	Core Practical

7	Chemistry	CHE4ABOC	Advanced Bio – organic chemistry	Complementary theory
8	Chemistry Practical	CHE4OC(P)	Organic Chemistry Practical	Complementary Practical
9	Zoology	ZOO4AZ	Applied Zoology	Complementary theory
10	Zoology Practical	ZY4CO2U (P)	Human Physiology, Immunology & Applied Zoology	Complementary Practical
SEMESTER V				
1	Botany theory	BOT5MLP	Mycology, Lichenology and Pathology	Core theory
2	Botany theory	BOT5ESE	Environmental Studies and Ecotourism	Core theory
3	Botany theory	BOT5GPH	Genetics, Plant Breeding and Horticulture	Core theory
4	Botany theory	BOT5CME	Cell and Molecular Biology and Evolution	Core theory
5	Botany theory	BOT5HNM(O)	Horticulture And Nursery Management	Open Course
6	Botany Practical	BOT6EEEPB(P)	Environmental Science and Ecotourism & Plant Physiology and Biochemistry	Core practical
7	Botany Practical	BOT6CEBB(P)	Cell Molecular Biology and Evolution & Biotechnology and Bioinformatics	Core practical
8	Botany Practical	BOT6MLBP(P)	Mycology, Lichenology and Plant Pathology & Bryophytes, Pteridophytes, Gymnosperms and Paleobotany	Core practical
9	Botany Practical	BOT6ASGP(P)	Angiosperm Morphology, Systematic Botany and Economic Botany & Genetics, Plant Breeding and Horticulture	Core practical
*Combined SEM 5&6 Practical exams only in even semesters				
SEMESTER VI				

1	Botany core theory	BOT6PPB	Plant Physiology and Biochemistry	Core Theory
2	Botany core theory	BOT6BPGP	Bryology, Pteridology, Gymnosperms and Paleobotany	Core Theory
3	Botany core theory	BOT6AMSE	Angiosperm Morphology, Systematic Botany and Economic Botany	Core Theory
4	Botany core theory	BOT6BB	Biotechnology and Bioinformatics	Core Theory
5	Botany choice based theory	BOT6PP	Phytochemistry and Pharmacognosy	Core Theory
6	Botany choice based theory	BOT6AB	Agribusiness	Core Theory
7	Botany choice based theory	BOT6PGRM	Plant Genetic Resources Management	Core Theory
8	Botany Practical	BOT6EEEPB(P)	Environmental Science and Ecotourism & Plant Physiology and Biochemistry	Core Practical
9	Botany Practical	BOT6CEBB(P)	Cell Molecular Biology and Evolution & Biotechnology and Bioinformatics	Core Practical
10	Botany Practical	BOT6MLBP(P)	Mycology, Lichenology and Plant Pathology & Bryophytes, Pteridophytes, Gymnosperms and Paleobotany	Core Practical
11	Botany Practical	BOT6ASGP(P)	Angiosperm Morphology, Systematic Botany and Economic Botany & Genetics, Plant Breeding and Horticulture	Core Practical

DETAILS OF COURSES OFFERED BY BOTANY DEPARTMENT

No.	Course	Subject Code	Title of paper	Course details (Core/ Comple/ Common/ Lang.
SEMESTER I				
1	Botany core theory	BOT1MPIP	Methodology and Perspectives of Science and Introduction to the World of Plant diversity	Core theory
2	*Botany Practical	BOT2 MPSIWP(P)	Methodology and Perspectives of Science and Introduction to the World of Plant Diversity & General Informatics and Methodologies in Plant Sciences	Core Practical
3	Complementary Botany	BOT1CGPP	Cryptogams, Gymnosperms And Plant Pathology	Complementary theory (for B.Sc. Zoology)
4	*Botany Practical	BOT2CGPP(P)	Cryptogams, Gymnosperms and Plant pathology & Plant Physiology	Complementary practical (for B.Sc. Zoology)
*Practical exams only in even semesters				
SEMESTER II				
1	Botany core theory	BOT2GIMPS	General Informatics and Methodologies in Plant Sciences	Core Theory
2	Botany Practical	BOT2 MPSIWP(P)	Methodology and Perspectives of Science and Introduction to the World of Plant Diversity & General Informatics and Methodologies in Plant Sciences	Core Practical

3	Complementary Botany	BOT2 PP	Plant Physiology	Complementary theory (for B.Sc. Zoology)
4	Botany Practical	BOT2CGPP(P)	Cryptogams, Gymnosperms and Plant pathology & Plant Physiology	Complementary practical (for B.Sc. Zoology)
SEMESTER III				
1	Botany core theory	BOT3MP	Microbiology and Phycology	Core Theory
2	*Botany Practical	BOT4MPARA(P)	Microbiology, Phycology,Anatomy and ReproductiveBotany of Angiosperms	Core Practical
3	Complementary Botany	BOT3ATE	Angiosperm Taxonomy And Economic Botany	Complementary theory (for B.Sc. Zoology)
4	*Botany Practical	BOT4ATEAAB(P)	Angiosperm Taxonomy,Economic Botany, Anatomy and Applied Botany	Complementary practical (for B.Sc. Zoology)
*Practical exams only in even semesters				
SEMESTER IV				
1	Botany core theory	BOT4ARB	Anatomy andReproductiveBotany of Angiosperms	Core Theory
2	Botany Practical	BOT4MPARA(P)	Microbiology, Phycology,Anatomy and ReproductiveBotany of Angiosperms	Core Practical
3	Complementary Botany	BOT4AAB	Anatomy and Applied Botany	Complementary theory (for B.Sc. Zoology)
4	Botany Practical	BOT4ATEAAB(P)	Angiosperm Taxonomy,Economic Botany, Anatomy and Applied Botany	Complementary practical (for B.Sc. Zoology)
SEMESTER V				

1	Botany core theory	BOT5MLP	Mycology, Lichenology and Pathology	Core Theory
2	Botany core theory	BOT5ESE	Environmental Studies and Ecotourism	Core Theory
3	Botany core theory	BOT5GPH	Genetics, Plant Breeding and Horticulture	Core Theory
4	Botany core theory	BOT5CME	Cell and Molecular Biology and Evolution	Core Theory
5	Botany Practical	BOT6EEPB(P)	Environmental Science and Ecotourism & Plant Physiology and Biochemistry	Core practical
6	Botany Practical	BOT6CEBB(P)	Cell Molecular Biology and Evolution & Biotechnology and Bioinformatics	Core practical
7	Botany Practical	BOT6MLBP(P)	Mycology, Lichenology and Plant Pathology & Bryophytes, Pteridophytes, Gymnosperms and Paleobotany	Core practical
8	Botany Practical	BOT6ASGP(P)	Angiosperm Morphology, Systematic Botany and Economic Botany & Genetics, Plant Breeding and Horticulture	Core practical
9	Botany core theory	BOT5HNM(O)	Horticulture And Nursery Management	Open Course
*Practical exams only in even semesters				
SEMESTER VI				
1	Botany core theory	BOT6PPB	Plant Physiology and Biochemistry	Core theory
2	Botany core theory	BOT6BPGP	Bryology, Pteridology, Gymnosperms and Paleobotany	Core theory
3	Botany core theory	BOT6AMSE	Angiosperm Morphology, Systematic Botany and Economic Botany	Core theory
4	Botany core theory	BOT6BB	Biotechnology and Bioinformatics	Core theory
5	Botany choice based theory	BOT6PP	Phytochemistry and Pharmacognosy	Choice based theory

6	Botany Practical	BOT6EEPB(P)	Environmental Science and Ecotourism & Plant Physiology and Biochemistry	Core Practical
7	Botany Practical	BOT6CEBB(P)	Cell Molecular Biology and Evolution & Biotechnology and Bioinformatics	Core Practical
8	Botany Practical	BOT6MLBP(P)	Mycology, Lichenology and Plant Pathology & Bryophytes, Pteridophytes, Gymnosperms and Paleobotany	Core Practical
9	Botany Practical	BOT6ASGP(P)	Angiosperm Morphology, Systematic Botany and Economic Botany & Genetics, Plant Breeding and Horticulture	Core Practical
10.	Project Dissertation	BOT6(PD)	Dissertation cum Viva	Project

CURRICULUM FOR B. Sc. DEGREE BOTANY PROGRAMME

Total Credits 120
Total instructional hours 150

Courses	**Number**	**Credits**
Common Courses	10	38
Core Courses	12	46
Project	1	2
Choice based core	1	3
Complementary Courses I& II	8	28
Open Courses	1	3
Total	33	51 (Core) 28 (Complementary) 3 (Open course) 38 (Common)
Grand Total	33	120

DETAILED DISTRIBUTION OF COURSES FOR BACHELOR'S PROGRAMME IN BOTANY

	Semester l			
No	**Course Title**	**Hrs/ week**	**Total Hours/Sem**	**Credit**
1	Common Course English -1	5	90	4
2	Common Course English -2	4	72	3
3	Common Course Sec. language -1	4	72	4
4	Core Course -1 Methodology and Perspectives of Science & An Introduction to the World of Plant Diversity Core Course -1 Practical	2 2	36 36	2 1
5	1st Complementary – Chemistry	2	36	2
6	1st Complementary – Chemistry- l Practical	2	36	1
7	2nd Complementary- Zoology -1	2	36	2
8	2nd Complementary- Zoology - 1 Practical	2	36	1
	Total	**25**		**20**

	Semester 2			
No	**Course Title**	**Hrs/ week**	**Total Hours/Sem**	**Credit**
1	Common Course -English -3	5	90	4
2	Common Course -English -4	4	72	3
3	Common Course - Second language -2	4	72	4
4	Core Course -2 General Informatics and Methodologies in Plant Sciences Core Course - 2 Practical	2 2	36 36	2 1
5	1st Complementary – Chemistry - 2	2	36	2
6	1st Complementary – Chemistry - 2 Practical	2	36	1
7	2nd Complementary -Zoology -2	2	36	2
8	2nd Complementary Zoology – 2 Practical	2	36	1
	Total	**25**		**20**

	Semester 3			
No	**Course Title**	**Hrs/ Week**	**Total Hours/Sem**	**Credit**
1	Common Course English -5	5	90	4
2	Common Course Sec. language -3	5	90	4
3	Core Course -3 – Microbiology and Phycology	3	54	3
	Core Course -3 Practical	2	36	1
4	1st Complementary - Chemistry - 3	3	54	3
5	1st Complementary - Chemistry - 3 Practical	2	36	1
6	2nd Complementary -Zoology -3	3	54	3
7	2nd Complementary Zoology – 3 Practical	2	36	1
	Total	**25**		**20**

	Semester 4			
No	**Course Title**	**Hrs/ Week**	**Total Hours/Sem**	**Credit**
1	Common Course -English – 6	5	90	4
2	Common Course Sec. language - 4	5	90	4
3	Core Course- 4 - Anatomy and Reproductive Botany of Angiosperms	3	54	3
	Core Course- 4 Practical	2	36	1
4	1st Complementary – Chemistry - 4	3	54	3
5	1st Complementary - Chemistry - 4 Practical	2	36	1
6	2nd Complementary –Zoology - 4	3	54	3
7	2nd Complementary Zoology – 4 Practical	2	36	1
	Total	**25**		**20**

	Semester 5			
No	**Course Title**	**Hrs/ Week**	**Total Hours/Sem**	**Credit**
1	Core Course -5 Mycology, Lichenology and Pathology	4	108	4
	Practical	2	36	1
2	Core Course -6 Environmental Studies and Ecotourism	3	90	3
	Practical	2	36	1
3	Core Course -7 Genetics, Plant Breeding and Horticulture	3	90	3
	Practical	2	36	1
4	Core Course - 8 Cell Molecular Biology and Evolution	3	90	3
	Practical	2	36	1
5	**Open Course** Horticulture and Nursery Management /Agribased Microenterprises/Ecotourism/Biotechnology/Bioinformatics	4	72	3
	Total	**25**		**20**

	Semester 6			
No	**Course Title**	**Hrs/ Week**	**Total Hours/Sem**	**Credit**
1	Core Course – 9 Plant Physiology and Biochemistry	4	108	3
	Practical	2	36	1
2	Core Course -10 Bryology, Pteridology, Gymnosperms and Paleobotany	3	54	3
	Practical	2	36	1
3	Core Course -11 Angiosperm Morphology, Taxonomy and Economic Botany Practical	3 2	54 36	3 1
4	Core Course-12 Biotechnology and Bioinformatics	3	54	3
	Practical	2	36	1
5	**Core Choice based Course**–13 Phytochemistry and Pharmacognosy/ Agribusiness / Plant Genetic Resource Management	3	54	3
6	Project/Viva	1		2
7	**Total**	**25**		2

				1

COURSE CODING

Every course in the programme is coded according to the following criteria.

a. The first three letter from the Programme *ie*., BOT
b. One digit to indicate the semester, *ie*., BO4 (Botany, 4th semester)

c. The remaining letters abbreviate the title of the course

EXAMINATION AND EVALUATION

The evaluation of each course shall contain two parts – Sessional Assessment and Final Assessment. The Sessional and Final Assessments shall be made using a Mark- based Grading system based on a 7-point scale. Overall Sessional: Final ratio will be maintained as 20:80.

A. SESSIONAL EVALUATION

The Sessional evaluation is to be done by continuous assessment of the following components. The components of the evaluation for theory and practical and their marks are as below.

DISTRIBUTION OF MARKS FOR SESSIONAL ASSESSMENTS			
For Theory Courses without Practical (Open Course and Choice based Core Course)		**For Theory Courses with Practical**	
Attendance	5 marks	Attendance	3 marks
Assignment	5 marks	Assignment	2 marks
Test paper	10 marks	Test paper	5 marks
Total	**20 marks**	**Total**	**10 marks**

DISTRIBUTION OF MARKS FOR SESSIONAL ASSESSMENTS OF PRACTICAL COURSES (Even semesters only)	
Attendance	5 marks
Record	10 marks
Lab Involvement	5 marks
Total	**20 marks**

ATTENDANCE

A student should have a minimum of 75% attendance. Those who do not have the minimum requirement for attendance will not be allowed to appear for the Final Examinations.

MARKS FOR ATTENDANCE			
For courses without practical		**For courses with practical**	
90% - 100%	5 marks	90% - 100%	3 marks
85% - 89%	4 marks	80% - 89%	2 marks
80% - 84%	3 marks	75% - 79%	1 marks
75% - 79%	2 marks	Below 75%	0 marks

ASSIGNMENT/SEMINAR/VIVA

Students are expected to do an assignment or seminar lecture for each course during the first to fifth semesters. They should do a seminar lecture for each course in the sixth semester.

TEST PAPER

Students have to appear for two test papers in each semester. Average mark of two sessional examinations shall be taken.

PRACTICAL RECORD

Every student should have to submit a bound certified laboratory record of practical for evaluation. All the experiments of each practical course should be recorded properly with the experiment results.

The evaluation of all components shall be published by the Department and shall be acknowledged by the candidate. All documents of assessments shall be kept in the institution for 2 years and shall be made available for verification. The responsibility of evaluating the assessments is vested in the teacher(s) who teach the course.

GRACE MARKS

Grace marks will be given as per Mahatma Gandhi University norms and regulations.

B. FINAL EVALUATION

The final theory examination of all semesters shall be conducted on the close of each semester. Practical examinations are conducted annually. There will be no supplementary exams. For reappearance/ improvement, students can appear along with the next batch.

PATTERN OF QUESTION PAPER FOR THEORY EXAMINATION

Questions shall be set to assess knowledge acquired, application of knowledge in life situations, critical evaluation of knowledge and the ability to synthesize knowledge. The question setter shall ensure that questions covering all skills are set. He/She shall also submit a detailed scheme of evaluation along with the question paper.

A question paper shall be a judicious mix of very short answer type, short answer type, short essay type / problem solving type and long essay type questions spanning the entire syllabus.

The pattern of questions for core courses and complementary courses are listed below.

1. The duration of examination is 3 hours.
2. Each question paper has four parts A, B, C & D.
3. Part A contains 8 questions of 1 mark each which the candidate has to answer all.
4. Part B contains 10 short answer type questions and the candidate has to answer 6 questions. Each question carries 2 marks.
5. Part C contains 6 problem type questions and the candidate has to answer 4 questions. But, for open courses, Part C contains short essay type questions only. Each question carries 4 marks.
6. Part D contains 4 essay type questions and the candidate has to answer 2 questions. Each question carries 12 marks.

7. The total marks of each core course other than choice based core course in B. Sc. Botany programme is 60.

Courses such as common courses, open course and choice based core course do not contain practical courses. The pattern of questions for the courses without practical are listed below.

1. The duration of examination is 3 hours.
2. Each question paper has four parts A, B, C & D.
3. Part A contains 10 questions of 1 mark each, all of which the candidate has to answer.
4. Part B contains 12 short answer type questions and the candidate has to answer 8 questions. Each question carries 2 marks.
5. Part C contains 8 problem type questions / short essays and the candidate has to answer 6 questions. Each question carries 4 marks. But, for open courses, Part C contains short essay type questions only.
6. Part D contains 4 essay type questions and the candidate has to answer 2 questions. Each question carries 15 marks**.**
7. The total marks for final examination of courses without practical is 80.

PRACTICAL EXAMINATION

The practical examinations for the core and complementary courses are to be conducted at the end of even semesters by the institution. All the experiments listed in the practical course syllabus should be done and recorded. A candidate submitting a certified record alone is eligible for appearing for the Practical Examination.

The examinations shall be conducted by two examiners, one internal and one external. The external examiner shall be selected by the institution. It is the duty of the external examiner to provide the specimens for the examination. The score sheet should be sent to the Controller of Examinations on the same day soon after the evaluation. The scheme of evaluation of the practical examination will be decided by the Board of Studies.

Student strength for practical examination:

The practical examination shall be conducted as batches of not more than 18 students in each laboratory session.

PROJECT EVALUATION

All students have to begin working on the project in the fifth semester and must submit the dissertation for evaluation in the sixth semester. The project can be done individually or as a group of maximum three students. However, the presentation and viva voce on the project should be conducted individually.

The ratio of Sessional to Final evaluation components of the project is 1:4. A Viva voce for 10 marks on the project work should be conducted along with the final evaluation.

The mark distribution of various components of project for assessment is shown below.

Sessional Evaluation of Dissertation		**Final Evaluation of Dissertation**	
Components	**Marks**	**Components**	**Marks**
Punctuality	2	Innovation of topic	5
Experimentation/Data collection	4	Objectives	3
Compilation	2	Review	2
Originality of the work	2	Materials & Methods	5
Total Marks	**10**	Result & Discussion	5
		Presentation	10
		Viva voce	10
		Total Marks	**40**

C. COMPUTATION OF CCPA

Grade and Grade Point given to each course based on the percentage of marks obtained are as follows:

Percentage of Marks	**Grade**	**Grade Point**
90 and above	A+ - Outstanding	10
80-89	A – Excellent	9
70-79	B - Very Good	8
60-69	C - Good	7
50-59	D – Satisfactory	6
40-49	E – Adequate	5
Below 40	F - Failure	4

Note: Decimals are to be rounded to the nearest whole number

CREDIT POINT AND CREDIT POINT AVERAGE

Credit Point (CP) of a course is calculated using the formula

$$\mathbf{CP = C \times GP}$$

Where C = Credit for the course; GP = Grade point

Semester Credit Point Average (SCPA) is calculated as

$$\mathbf{SCPA} = \frac{TCP}{TC}$$

Where TCP = Total Credit Point; TC = Total Credit

Grades for different semesters / programme are given based on the corresponding SCPA on a seven point scale as shown below:

SCPA	Grade
Above 9	A+ - Outstanding
Above 8, but below or equal to 9	A - Excellent
Above 7, but below or equal to 8	B -Very Good
Above 6, but below or equal to 7	C – Good
Above 5, but below or equal to 6	D – Satisfactory
Above 4, but below or equal to 5	E – Adequate
4 or below	F – Failure

Cumulative Credit Point Average for the programme is calculated as follows:

$$\mathbf{CCPA} = \frac{(TCP)_1 + (TCP)_2 + (TCP)_3 + (TCP)_4}{TCP_1 + TC_2 + TC_3 + TC_4}$$

Where $\mathbf{(TCP)_1}$**……..,** $\mathbf{(TCP)_6}$ are the **Total Credit Points** in each semester and $\mathbf{TC_1}$**……..,** $\mathbf{TC_6}$are the **Total Credits** in each semester

Note: A separate minimum of **30% marks** each for Sessionals and Finals (for both theory and practical) and an aggregate minimum of **40 % is** required for the pass of a course. For pass in a programme, a separate minimum of Grade E is required for all the individual courses. If a candidate secures **F** Grade for any one of the courses offered in a Semester/Programme only **F** grade will be awarded for that Semester/Programme until he/she improves this to **E** grade or above within the permitted period. Candidates who secure **E** grade and above will be eligible for higher studies.

SCHEME OF EXAMINATIONS

Theory Examinations will be conducted in the respective semester in which the course is conducted.

SCHEME OF THEORY EXAMINATION -CORE COURSES

semester	Code	Course	Hours	Sessional	Final	Credits
1	BOT1MPIP	Methodology and Perspectives of Science and Introduction to the World of Plant Diversity	3	20%	80%	2
2	BOT2GIMPS	General Informatics and Methodologies in Plant Sciences	3	20%	80%	2
3	BOT3MP	Microbiology and Phycology	3	20%	80%	3
4	BOT4ARB	Anatomy and Reproductive Botany of Angiosperms	3	20%	80%	3
5	BOT5HNM(O)	Horticulture and Nursery Management	2	20%	80%	3
	BOT5MLP	Mycology, Lichenology and Pathology	3	20%	80%	3
	BOT5ESE	Environmental Studies and Ecotourism	3	20%	80%	3
	BOT5GPH	Genetics, Plant Breeding and Horticulture	3	20%	80%	3
	BOT5CME	Cell and Molecular Biology and Evolution	4	20%	80%	4
6	BOT6PPB	Plant Physiology and Biochemistry	3	20%	80%	3
	BOT6BPGP	Bryology, Pteridology, Gymnosperms and Paleobotany	3	20%	80%	3
	BOT6AMSE	Angiosperm Morphology, Systematic Botany and Economic Botany	3	20%	80%	3
	BOT6BB	Biotechnology and Bioinformatics	3	20%	80%	3
	BOT6PP	Choice Based Core Course - Phytochemistry and Pharmacognosy	4	20%	80%	3

SCHEME OF PRACTICAL EXAMINATIONS - CORE COURSES

The practical examinations are carried out at the end of each year (Even semesters only)

SEMESTER	Practical	COURSE TITLE	DURATION OF EXAMINATION	SESSIONAL	FINAL
1 & 2	BOT2MPSIWP	Methodology and Perspectives Of Science and an Introduction to the World of Plant Diversity and General Informatics and Methodologies in Plant Sciences	3 hours	20%	80%
3&4	BOT4MPARA	Microbiology, Phycology, Anatomy and Reproductive Botany of Angiosperms	3 hours	20%	80%
5&6	BOT6EEPB(P)	Environmental Science,Ecotourism, Plant Physiology and Biochemistry.	3 hours	20%	80%
	BOT6CEBB(P)	Cell Molecular Biology and Evolution & Biotechnology and Bioinformatics	3 hours	20%	80%
	BOT6MLPB(P)	Mycology, Lichenology and Plant Pathology, Bryology, Pteridology, Gymnosperms & Paleobotany	3 hours	20%	80%
	BOT6ASGP(P)	Angiosperm Morphology, Systematic Botany and Economic Botany and Genetics, Plant Breeding and Horticulture	3 hours	20%	80%
	Project			20%	80%

COMPLEMENTARY COURSES OFFERED FOR B. Sc. ZOOLOGY PROGRAMME

SCHEME OF EXAMINATION – THEORY COURSES

Theory Examinations will be conducted at the end of the respective semester in which the course is conducted.

SEMESTER	COURSE CODE	TITLE OF THE PAPER	HOURS	SESSIONAL	FINAL	TOTAL CREDIT
1	BOT1CGPP	Cryptogams, Gymnosperms and Plant Pathology	3	20%	80%	2
2	BOT2PP	Plant Physiology	3	20%	80%	2
3	BOT3ATE	Angiosperm Taxonomy and Economic Botany	3	20%	80%	3
4	BOT4AAB	Anatomy and Applied Botany	3	20%	80%	3

SCHEME OF EXAMINATION - PRACTICAL COURSES

The practical examinations are conducted at the end of each year (Even semesters only).

SEMESTER	COURSE CODE	TITLE OF THE PAPER	DURATION OF EXAMINATION	SESSIONAL	FINAL
1 & 2	BOT2CGPP(P)	Cryptogams, Gymnosperms, Plant Pathology & Plant Physiology	3 Hours	20%	80%
3 & 4	BOT4ATEAAB(P)	Angiosperm Taxonomy, Economic Botany, Anatomy and Applied Botany	3 Hours	20%	80%

COMMON COURSES

ENGLISH

Semester	Title of the Course	Number of Hours/week	Number of credits	Total hours/ semester	Duration of examination
1	Common Course English I	5	4	90	3 hours
	Common Course English II	4	3	72	3 hours
2	Common Course English III	5	4	90	3 hours
	Common Course English IV	4	3	72	3 hours
3	Common Course English V	5	4	90	3 hours
4	Common Course English VI	5	4	90	3 hours

SECOND LANGUAGE

Semester	Title of the Course	Number of Hours/ Week	Number of Credits	Total Hours/ Semester	Duration of examination
1	Second Language I	4	4	72	3 hours
2	Second Language II	4	4	72	3 hours
3	Second Language III	5	4	90	3 hours
4	Second Language IV	5	4	90	3 hours

SYLLABUS OF COURSES

The detailed syllabus of the Core courses, Open Course, Choice based Core Courses and Complementary Courses are added in the following sections. Blue prints of model question papers are also appended.

SEMESTER I

B.SC BOTANY PROGRAMME

SEMESTER I **COURSE 1** **BOT1MPIP**

METHODOLOGY AND PERSPECTIVES OF SCIENCE ANDAN INTRODUCTION TO THE WORLD OF PLANT DIVERSITY

(Theory 36 hours, Practical 36 hours) **(Theory Credit 2, Practical credit 1)**

Methodology and Perspectives of Science(Theory 18hours, Practical 18 hours)

Module 1 **8 hours**

Introduction to science and scientific methods

-Introduction to science

-Steps in scientific methods

- observation and thoughts
- formulation of a hypothesis
- designing of experiments
- testing of hypothesis
- formulation of theories
- Revision of scientific theories with the advent of new technologies

Module 2 **10 hours**

Experimentation in science

- Selection of a problem
- Searching the literature
- Selection of variables, study area, and a suitable design
- Necessity of units and dimensions

  Units of length, volume, area, concentration, temperature, pressure
- Setting of hypothesis, Null- hypothesis and alternative hypothesis
- Need of control, treatments and replication
- Analysis, presentation and interpretation of data
- Testing of hypothesis, need of statistical tools (study of specific tools is not required)
- Examples of great experiments in life sciences

- An example of moving from a question to hypothesis and then to an experimental design
- Contributions and the great experiments of Louis Pasteur, and Robert Koch

-Ethics in science

PRACTICAL **18 hours**

1. Design and perform a simple experiment to familiarize with the methodology of science
2. Select an important classical experiment and find out the different elements of scientific method
3. Prepare a biographical sketch of great scientists with special emphasis on the scientific methodology involved in their experiments
4. Prepare $CuSO_4$. H_2O solution of different molarity using a stock solution
5. Determination of the area of different types of leaves using graph paper

An Introduction to the World of Plant Diversity (Theory 18 hours, Practical 18 hours)

Module 1 **3 hours**

- Plants, their uniqueness and importance as
    - Primary producers
    - Source of oxygen
    - Source of materials for food and shelter
    - Medicines and other compounds derived from plants
    - Source of fuel (fossil fuel, biofuel)
    - Recreational value

    (a brief account with examples alone is required)

Module 2. **3 hours**

Unity of living organisms

Unity in,

- Cellular organization
- Cell structure
- Metabolism

- Genetics
- Cell division
- Sexual reproduction (Only a preliminary study about the unity of different live forms in the above mentioned aspects alone is required)

Module 3. **12 hours**

1. Diversity of living organisms (No type study is expected)

- **Prokaryotes**
  - Bacteria – general characteristics, variation in form (bacillus, coccus, vibrio, spirillum)
  - Cyanobacteria / BGA (No type study is intented) – general characteristics, pigments in Cyanobacteria, variation in form
- **Eukaryotes**
  - Eichler's Classification
  - **Cryptogams**

    -Algae:-
    - General characteristics
    - Diversity in thallus morphology (Unicellular, colonial, unbranched filamentous, branched filamentous)
    - Diversity in pigments (Pigments characteristic of Chlorophyceae, Rhodophyceae and Phaeophyceae)

    - Fungi

    General characteristics
    - Diversity in thallus morphology (unicellular forms, aseptate and septate hyphal forms)
  - Lichens

    General characteristics
    - Diversity in thallus morphology (crustose, foliose and fruticose forms)

    - Bryophytes
    - General characteristics
    - Diversity in thallus morphology

- Alternation of generation, prominence of gametophyte
- Concept of embryo

-Pteridophytes

- General characteristics
- Diversity in morphology
- Concept of vasculature (study of different types of steles is not required)
- Alternation of generation, prominence of sporophyte

-Phanerogams

-Gymnosperms

- General characteristics
- Diversity in morphology
- As the first plant group exhibiting seed habit, advantages of seed
- Special structures which contributed to the development of seed (ovule, integuments of ovule, endosperm)

-Angiosperms

- General characteristics
- Diversity in morphology (dicots, monocots, herbs, shrubs, trees, climbers, twiners, branched, unbranched)
- Concept of fruit, advantages of fruit
- Special structures which contributed to the development of fruit (ovary, placenta)

-**Animals**

- Major differences between plants and animals

(Detailed study of different classes not required)

- **Habitat Diversity** (Brief study only)
  - Aquatic:- Fresh water, marine, mangrove
  - Terrestrial:- Evergreen forest, deciduous forest, grass land
  - Epiphytic
- **Evolutionary trends in the plant world** (shift in habitat from aquatic to terrestrial, shift in prominence of gametophyte to sporophyte, shift from thalloid forms to differentiated forms, evolution of conducting tissue; tracheids to vessels, origin of seed and fruit)
- Interactions in the plant world. Examples of,

- Plant – plant interactions (Brief account of Parasitic plants and epiphytes)
- Plant – microbe interactions (Brief account of root nodules and Micorrhiza)
- Plant – animal interactions (Brief account of Leaf and stem galls and mermicophylly)

PRACTICAL **18 hours**

1. Collect, identify, record and submit 3 genera each from algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms. Use appropriate preservation techniques.
2. Study and submit a report on any one of the interactions observed in the plant world
3. Conduct a field visit to any one of the ecosystems/ botanic gardens to experience the plant diversity. Submit a report with photographs.
4. From a lot of given materials identify a particular plant group
5. From a lot of given materials identify plants with vascular elements, plants which can produce seeds, fruits, embryos

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BOT1MPIP- METHODOLOGY AND PERSPECTIVES OF SCIENCE AND AN INTRODUCTION TO THE WORLD OF PLANT DIVERSITY

MODULE	HOURS	PART A 1 MARK (8/8)	PART B 2 MARKS (6/10)	PART C 4 MARKS (4/6)	PART D 12 MARKS (2/4)	TOTAL MARKS
1	8	2	-	-	1	14
2	10	1	3	2	-	15
3	3	2	-	-	-	2
4	3	-	2	-	1	5
5	12	3	5	4	2	53

B. Sc. BOTANY (C.B.C.S.S.) DEGREE EXAMINATION

SEMESTER I CORE COURSE 01

BOT1MPIP- METHODOLOGY AND PERSPECTIVES OF SCIENCE AND AN INTRODUCTION TO THE WORLD OF PLANT DIVERSITY

Time: Three Hours **Maximum: 60 Marks**

Part A (Short Answer Questions)

Answer all questions (Each question carries 1 mark)

1. What is meant by a hypothesis?
2. Differentiate between nucleoside and nucleotide
3. Define thallus
4. What are epiphytes?
5. Name two medicinal compounds obtained from plants
6. What is the need of replications in experiments?
7. What is meant by one percent $CuSO_4$ solution?
8. What is Gaidukov phenomenon?

(8x1=8marks)

Part B (Brief Answer Questions

Answer any six questions (Each question carries 2 marks)

9. Write short note on the significance of sexual reproduction in organisms.
10. Explain the contributions of Gregor Johan Mendel in biology?
11. Distinguish treatment from replication
12. Explain the importance of control in an experiment
13. Write note on cellular totipotency
14. Differentiate gametophyte from sporophyte
15. With labeled diagram, explain the structure of a Cyanophycean cell
16. Explain the general features of Bryophytes
17. Distinguish habit from habitat
18. What are the characters of Mangroves?

(6x2=12 maks)

Part C (Problems/Derivations)

Answer any four questions (Each question carries 4 marks)

19. Give an account on the kinds of experimental design you have studied
20. Differentiate molar solution from molal solution.

21. Describe pigment diversity in Algae.
22. Give an account of the different types of lichens based on their thallus
23. Describe plectenchyma with the help of diagrams?
24. Explain alternation of generation in homosporous pteridophytes

(4x4 = 16 marks)

Part D (Long answer/ Problem questions)

Answer any two questions (Each question carries 12 marks)

25. Describe the essential steps followed in an experiment to get useful result
26. Explain the differences between the cellular organization of prokaryote from eukaryote
27. Give an account on the different types of thallus organization in Algae
28. With suitable diagrams, explain the different forms of Bacteria and bacterial flagellation

(2x12 = 24 marks)

SEMESTER II

B. SC BOTANY PROGRAMME

SEMESTER II COURSE 02 BOT2GIMPS

GENERAL INFORMATICS AND METHODOLOGIES IN PLANT SCIENCES

(Theory 36 hours, Practical 36 hours) (Theory Credit 2, Practical credit 1)

GENERAL INFORMATICS (Theory 18 hours, Practical 18 hours)

Module 1

Overview of the information technology 3 hours

-Features of the modern personal computers and peripherals.

- Internet as a knowledge repository, e-mail, search engines (Google,), study of educational sites related to life sciences (DNAi, Scitable) , academic search techniques,(Science direct and INFLIBNET)

-Introduction to the use of information technology in teaching and learning

Module 2

Use of computers 15 hours

-DOS – The basic concept of operating systems (Study of commands not required)

-MS-WINDOWS:- logging to windows, organizing files and folders, copying, moving, deleting and saving documents, installing software, installing hardware

-MS-WORD:- word processing using WORD, editing tools (cut , copy, paste,) formatting tools (font, paragraph) use of spell check, inserting tables (draw), inserting graphs and pictures

-MS-EXCEl:- Creating a worksheet, data entry, sorting (ascending and descending), use of statistical tools in EXCEL (SUM, MEAN, MODE, MEDIAN), preparation of graphs (bar diagram, pie chart and line graph)

-MS-POWERPOINT:- Creating a presentation, Inserting tables, charts and pictures into slides, Use of animation tools

PRACTICALS **18 hours**

1. Gather information and pictures on a given topic using the internet. Make a list of the sites visited for the purpose
2. Prepare a project report using MS-WORD based on the information and pictures gathered from the internet.
3. Prepare a worksheet using a set of data collected and find out the SUM, MEAN, MEDIAN and MODE using EXCEL
4. Prepare suitable tables/ charts/graphs based on the data using EXCEL
5. Prepare a powerpoint presentation based on the 1& 2 exercises

METHODOLOGIES OFPLANT SCIENCE (Theory 18 hours, Practical 18 hours)

Module 1

Microtechnique **6 hours**

- Introduction
- Microscopy:- simple, compound, phase contrast, fluorescent, confocal and electron microscopes (working principle and application only)
- Microtome:- rotary, sledge (application only)
- Killing and fixing :- Purpose,

  Agents used:-

  Killing agents – Formalin, Ethyl alcohol

  Fixing agents - Carnoy's fluid, Farmers' fluid, FAA
- Dehydration:- Purpose, Agent used – Ethyl alcohol
- Sectioning:- Hand sections, microtomy
- Staining technique:- Principle of staining

  Stains:- Safranin, Hematoxylin, Acetocarmine

  Vital stains: Purpose , Examples: Neutral red and Evan's blue

  Mordents : Purpose and examples

  Single staining and Double staining

- Mounting and Mounting Media, Purpose of mounting media , Glycerin, DPX, Canada balsam
- Use of permanent whole mounts, permanent sections
- Maceration
- Smear and squash preparation

PRACTICALS **2 hours**

1.Maceration and identification of tracheary elements

Module 2

Biophysics **3 hours**

- Principles and applications of colorimeter, spectrophotometer and centrifuge, Beer-Lambert's Law,
- Separation methods :- chromatography ; thin layer , paper, column (principle and applications only) , electrophoresis ; PAGE, Agarose gel electrophoresis(Principle and applications only)
- pH:- concept of pH, methods to measure pH ; pH paper and pH meter,
- Buffers:- definition, functions of buffers in biological systems, use of buffers in biological research, examples of commonly used buffers

PRACTICALS **6 hours**

1.Preparation of 0.1M sodium phosphate buffer (pH 6 and 7)

2.Measurement of pH using pH meter

3.Paper chromatography of plant pigments (demonstration)

4.Electrophoresis of nucleic acids (demonstration)

5.Column chromatography of plant pigments (demonstration)

6.Determination of the concentration of a given solution of $CuSO_4$ using colorimetry

Module 3

Biostatistics **8 hours**

- Introduction, statistical terms and symbols
- Sample:- concept of sample, sampling methods,
- Collection and representation of data, graphic representation of data(Line graph, bar diagram, Pie diagram & Histogram)
- Measures of central tendency:- mean, mode, median
- Measures of dispersion:- standard deviation, standard error
- Distribution patterns:- normal distribution, binomial distribution
- t-test :- introduction, uses, procedure
- chi-squire test:- introduction, uses, procedure

PRACTICALS **10 hours**

1. Collect numerical data and find out the central tendencies and prepare different types of graph mentioned in the syllabus
2. Familiarize with situations requiring t-test, chi-squire test

Module 4

Research Methodology **1 Hour**

- Need for research
- Types of research
- Scientific literature, Books, Research Journals, Reputed National and International journals in life sciences, Research paper
- INSDOC services
- Laboratory Etiquette
- Laboratory Hygiene

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BOT2GIMPS - GENERAL INFORMATICS AND METHODOLOGIES IN PLANT SCIENCES

(Maximum Marks = 60)

MODULES		HOURS	PART A 1 MARK (8/8)	PART B 2 MARKS(6/10)	PART C 4 MARKS (4/6)	PART D 12 MARKS(2/4)	TOTAL MARKS (60)
General informatics	1	3	1	1	1	1	19
	2	15	2	2	1	1	22
Methodologies in plant sciences	1	6	2	3	1	1	24
	2	3	1	2	1	-	09
	3	3	1	1	1	-	07
	4	1	1	1	1	1	19

B. Sc. BOTANY (C.B.C.S.S.) DEGREE EXAMINATION

SEMESTER II CORE COURSE 02

BOT2GIMPS - GENERAL INFORMATICS AND METHODOLOGIES IN PLANT SCIENCES

Time: Three Hours **Maximum:60 Marks**

Part A (Short Answer Questions)

Answer all questions. Each question carries 1 mark

1. Expand PAGE.
2. Name a clearing agent.
3. Expand LCD.
4. Name a computer peripheral.
5. Give the name of an operating system?
6. Name a vital stain.
7. Which are the measures of central tendency?
8. Expand INSDOC.

(8x1=8marks)

Part B (BriefAnswer Questions)

Answer any six questions. Each question carries 2 marks

9. What is scitable?
10. What is DOS?
11. What is meant by spherical aberration?
12. What is metachromasia?
13. What is the significance of buffers?
14. Explain the principle of electrophoresis.
15. Give the formula of Carnoy's Fluid.
16. Explain the protocol for saving a document.
17. Give an account on creating pie diagram.
18. What is meant by diagnostic research?

(6x2=12 maks)

Part C (Problems/Derivations)

Answer any four questions. Each question carries 4 marks

19. Explain the different types of centrifugation
20. Define killing and fixing. Write notes on the reagents used for killing and fixing
21. Write short note on Microsoft excel.
22. Give an account of editing tools in MS WORD.

23. Describe the procedure and use of Chi-square test.
24. Give an account on Laboratory etiquette and Laboratory hygiene.

(4x4 = 16 marks)

Part D (Long answer/ Problem questions)

Answer any two questions. Each question carries 12 marks

25. Explain the laws of photometry. Give an account on the principle and working of spectrophotometer
26. Give an account of the various input and output devices of a computer system
27. How do you create, edit and design a document?
28. Write an essay on the various steps in the preparation of a research project.

(2x12 = 24 marks)

B. Sc. BOTANY (C.B.C.S.S.) DEGREE EXAMINATION
SEMESTER II

CORE PRACTICAL **COURSES 1 & 2**

BOT2 MPSIWP(P) - METHODOLOGY AND PERSPECTIVES OF SCIENCE AND INTRODUCTION TO THE WORLD OF PLANT DIVERSITY & GENERAL INFORMATICS AND METHODOLOGIES IN PLANT SCIENCES

Time: 3 Hours **Maximum: 40 Marks**

1. By using the ---------- molar stock of $CuSO_4$ prepare 10ml each of dilute solutions of $CuSO_4$ with the following concentrations. **(4)**

   a. ----------
   b. ----------
   c. ----------
   d. ----------

   Calculate the volume of the stock solution to be taken and the volume of water to be added to achieve the required dilutions. Draw a dilution table showing the details.

   - Conduct of the exercise (2)
   - Calculation and dilution table (2)

2. Observe the given plants (a-f) and , **(4)**
   a. assign them to their major groups . Write down the most significant reason for your decision in each case.
   b. select a plant with/which can produce ----------
   - Major group assigned and reason (3)
   - Correctness of the selection (1)

3. Write a critical account on the given interaction **(2)**

4 Examine the compound leaf supplied and measure the lengths of the leaflets. **(5)**
   a. Group them into frequency classes according to their length
   b. Calculate the mean and standard deviation of the data
   c. Prepare a histogram using EXCEL to represent the data. Make a print out and submit
      - Construction of the classes and scoring of frequency (1)
      - Mean (1)
      - Standard deviation (2)
      - Histogram (1)

5 Take a C.S. of the given material, stain with safranin and mount in glycerine **(4)**

6 Determine the concentration of the given solution of $CuSO_4$ using colorimetry. Use the values supplied for the preparation of a standard graph. **(4)**

- Standard graph (2)
- Determination of concentration (2)

7 Determine the pH of the given solution using pH meter **(3)**

- Conduct of the exercise (2)
- pH (1)

8 Illustrated report of the field visit **(3)**

9 Viva –voce (based on practicals and field visit) **(3)**

10 Record **(8)**

Instructions to the examiner

1. The external examiner can decide the stock concentration (in moles) and the concentrations of the four dilute solutions (in moles/millimoles/micromoles) to be prepared.
2. Five fresh or well-preserved plants (including fungi and lichens) belonging to different major groups should be supplied individually to each student or should be kept as a common lot. Select items from the following list

   Algae:-*Spirogyra, Cladophora, Oedogonium. Oscillatoria, Sargassum*

   Fungi:-*Penicillium, Rhizopus, Peziza, Xylaria, Auricularia*, any mushroom

   Lichens:-*Usnea, Graphis, Cladonia, Parmelia*

   Bryophytes:-*Riccia, Porella, Moss, Anthocerose, Cyathodium*

   Pteridophytes:-*Selaginella, Pteris, Adiantum, Lycopodium, Hemionitis, Drynaria, Drymoglossum, Lygodium, Gleichenia, Salvinia, Azolla*

   Gymnosperms:-*Cycas, Pinus, Cupressus, Thuja,(plant part with at least any one type of reproductive structure)*

   *A*ngiosperms:-Any monocot or dicot plant with flowers

3. Root nodule, Lichen, *Azolla- Anabena*, Leaf/stem gall, Parasitic plants, Epiphytic plants
4. Provide one or two compound leaves with minimum 25 leaflets and the centre should provide the required computer hardware and software facilities
5. Any stem or root
6. Values of the standard graph and solution of CuSO4 should be provided
7. pH meter and a solution to check the pH should be provided
8. Each student should submit a neatly typed report of the field visit (certified by the teacher in charge and the head of the department) emphasizing the richness of biodiversity he/she encountered during the visit. The report should be adequately illustrated with photographs taken during the visit. Viva should focus on the biodiversity aspect of the visit. (class record and report of field visit can be submitted in a single book)
9. Viva –voce (based on practicals and field visit)
10. Record

SEMESTER III

B.SC. BOTANY PROGRAMME

SEMESTER III COURSE-3 BOT3MP

MICROBIOLOGY AND PHYCOLOGY

(Theory 54 hours, Practical36hours) (Theory Credit 3, Practical Credit1)

MICROBIOLOGY (Theory: 18 hours; Practical: 12 hours)

Module 1 **1 hour**

Introduction, Scope of Microbiology

Module 2 6 **hours**

- Bacteria - Morphology and classification based on staining, morphology and flagellation
- Fine structure - cell wall - Peptido glycan- cytoplasm - Nucleoid, Flagella
- Reproduction- Binary fission
- Genetic recombination - Conjugation, transformation & transduction
- Archaebacteria, Mycoplasma - general characters

Module 3 6 **hours**

Virus- General composition and properties - Architecture of TMV, HIV and Bacteriophages ,Multiplication and transmission.

Module 4 5 **hours**

Applied Microbiology

1. Role in Nitrogen cycle.
2. Biofertilizers & Bio pesticides.
3. Biogas production.
4. Reconvertion of waste products.
5. Bioremediation.
6. Spoilage and preservation of food.
7. Antibiotics.
8. Production of Vinegar, curd, Yoghurt, single cell protein and Probiotics.
9. Bio reactors.

PRACTICAL 12 **hours**

Students are expected to do the following practical
1. Preparation of bacterial smear.
2. Grams staining.
3. Isolation of microbes from soil (Streaking method).

PHYCOLOGY (Theory: 36 hours ; Practical: 24 hours)

Module 1 **3 hours**

Introduction - General characters of algae. Classification (Fritsch F. E, 1935; 1945.

Module 2 **22 hours**

General characters of the following major groups with special reference to the structure , reproduction and life cycles of the following types.

a. Cyanophyceae: *Nostoc*
b. Chlorophyceae: *Chlamydomonas, Volvox, Spirogyra, Oedogonium, Cladophora, Chara*
c. Xanthophyceae: *Vaucheria*
d. Bacillariophyceae: *Pinnularia*
e. Phaeophyceae : *Sargassum*
f. Rhodophyceae :*Polysiphonia*

Module 3 **9 hours**

Economic importance
a. Algae as pollution indicator and in waste water treatment
b. Commercial products: Agar, Alginates, Carrageenin, Diatomaceous earth
c. Algae in soil fertility, Fertilizer, Nitrogen fixation, minerals, soil algae and symbiosis
d. Sources of food & medicine
e. Diatoms and nanotechnology
f. As a source of Hydrogen as fuel
g. Toxic algae – Algal blooms, red tides & fish poisoning
h. Algae as primary producers – Oxygen liberators
i. Cyanobacteria as a source of restriction endonuclease
j. Role of algae in aquaculture.

Module 4 **2 hours**

Algal culture: scope and methods

PRATICALS **24 hours**

1. Make micro preparation of vegetative and reproductive structures of the types mentioned in the syllabus.
2. Identify the algal specimens up to the generic level by noting their key characters.
3. Make labeled sketches of the specimens observed.

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Blueprint

BOT3MP :MICROBIOLOGY AND PHYCOLOGY(Total marks: 60)

MODULE	NO. OF HOURS	PART A 1 MARKS 8/8	PART B 2 MARKS 6/10	PART C 4 MARKS 4/6	PART D 12 MARKS 2/4	TOTAL MARKS 60
Microbiology						
1	1	1	-	-	-	1
2	6	1	1	1	1	19
3	6	1	1	1		7
4	5	1	2	1	-	9
Phycology						
5	3	0	1	1	-	6
6	22	2	2	1	2	26
7	9	2	2	1	1	24
8	2	0	1	-	-	2

B.SC. BOTANY (C.B.C.S.S.) PROGRAMME
SEMESTER III CORE COURSE-03
BOT3MP - MICROBIOLOGY AND PHYCOLOGY

Time: Three Hours **Maximum: 60 Marks**

Part A

Answer all questions. Each question carries 1 mark

1. What is a holdfast?
2. What is a capsid?
3. Name any two bacteria used in the preservation of food?
4. What are biopesticides?
5. Mention any two functions of heterocysts.
6. What are carpospores?
7. Name two pigments of Xanthophyceae.
8. What are the reserve food materials of Phaeophyceae?

(8 x 1 =8 marks)

Part B

Answer any six questions. Each question carries 2 marks

9. What are archaebacteria?
10. What is a cystocarp?
11. What is the cell wall composition of Cyanophyceae?
12. What are mycoplasma?
13. Mention any two characteristic features of Bacillariophyceae.
14. What are red tides?
15. What is a coenocytes?
16. What is the source of carrageenin?
17. Name any two DNA viruses?
18. What is Gram's staining?

(6 x 2 =12 marks)

Part C

Answer any four questions. Each question carries 4 marks

19. Enlist any four advanced characters of Rhodophyceae
20. Differentiate between transformation and transduction.
21. Explain the life cycle of *Volvox*.
22. Write a short note on HIV.
23. Explain Binary fission in bacteria.
24. Classify bacteria based on the distribution of flagella

(4 x 4 =16)

Part D

Answer any two questions. Each question carries 12 marks

25. Explain the life cycle of *Polysiphonia* with suitable diagrams.
26. Identify the microbes and describe the processes involved in the production of antibiotics, SCPs and vinegar
27. Write an essay on the thallus organization in Chlorophyceae.
28. What are bacteriophages? With the help of suitable diagrams explain the ultrastructure of a bacteriophage

(2 x 12 =24)

SEMESTER IV

B.SC. BOTANY PROGRAMME

SEMESTER IV COURSE-4 BOT4ARB

ANATOMY AND REPRODUCTIVE BOTANY OF ANGIOSPERMS

(Theory 54 hours, Practical 36 hours) (Theory Credit 3, Practical Credit1)

ANATOMY (Theory: 36 hours. Practical: 27 hours,)

Module-1 2 hours

Scope and importance of Plant Anatomy

Interdisciplinary applications: - Histotaxonomy, Histochemistry, Pharmacognosy, Physiological Anatomy, Ecological Anatomy, Evolutionary trends in plant anatomy

Module -2 6 hours

Study of Cell wall: Gross structure of primary and secondary cell walls, simple and bordered pits. Structure and function of plasmodesmata.

Submicroscopic structure of cell wall- Cellulose, micelle, micro fibril and macro fibril. Different types of Cell wall thickening in tracheary elements

Extra cell wall thickening materials: - Lignin, cutin, suberin and callose.

Origin of cell wall; Growth of Cell wall- Apposition and intussusceptions – cavities & ducts, schizogenous & lysigenous developments

Non living inclusions in plant cell: - Reserve food materials -carbohydrate (starch), protein (Aleurone grain) and lipids (fats and oil);

Secretory products- pigments, enzymes and nectar.

Metabolic byproducts: - tannin, gums, resins, essential oils, mucilage, latex, mineral crystals and alkaloids

Module-3 7 hours

Tissues

Meristematic tissue- definition, structure, function and classification

Apical organization and theories; Shoot apex- Apical cell theory, Histogen theory

and Tunica-Corpus theory.

Root apex - Histogen theory and Korper- Kappe theory.

Permanent Tissue: - Structure and function of simple and complex tissues.

Distribution and function of mechanical tissues in plants.

Plant fibres-economic importance.

Secretory tissues: - a). External secretory tissue- glands and nectaries, b). Internal secretory tissues- laticifers.

Module-4 7hours

Tissue System- Structure and Function in root, stem and leaves.

a) Epidermal Tissue System- Epidermis, Cuticle, Trichome, Stomata, Bulliform cells, Cork and Silica cells.

b) Ground Tissue System- Cortex, Endodermis, Pericycle, Pith and Pith rays.

c) Vascular Tissue System- Different types of vascular bundles and their arrangement in root and stem

Module-5. 3 hours

Vascular cambium: - Development, structure and function, Activity of cambium,

role of cambium in budding, grafting and wound healing.

Module-6. 8 hours

Normal secondary growth in dicot stem and root.

Wood anatomy- basic structure, heart wood, sap wood, hard wood, soft wood, growth rings and dendrochronology, porous and non porous wood, ring porous and diffuse porous wood, tyloses, knots.

Wood rays: Structure and cell types, uniseriate and multiseriate rays; heterocellular and homocellular rays.

Reaction wood- Tension wood and compression wood.

Properties, defects and seasoning of wood.

Stem thickening in monocots.

Periderm: Structure and development- phellum, phellogen, phelloderm, bark, polyderm, rhytidome and lenticel.

Module-7. 3 hours.

Anomalous secondary structure: *Bougainvillea* stem, *Bignonia* stem and *Dracaena* stem.

PRACTICALS 27 hours

1. Cell types and tissues.

2. Non living inclusions – starch grains, cystolith, raphides, aleurone grains.

3. Primary structure of stem root and leaf-Dicots and Monocots.

4. Stomatal types: - anomocytic, anisocytic, paracytic, diacytic and grass type.

5. Secondary structure of dicot stem and root.

6. Anomalous secondary structure of *Bougainvillea* stem, *Bignonia* stem and *Dracaena* stem.

Reproductive Botany (Theory-18 hrs. Practical -9 hrs,)

Module-1 2 hours

Introduction: - General account and interdisciplinary relevance of embryology, embryology in relation to taxonomy; experimental embryology.

Module-2 2 hours

Life cycle of Angiosperms.

Floral morphology- parts of flower; androecium-morphology and types of anthers; gynoecium-morphology and types of carpel and types of placentation.

Module-3 4 hours

Structure and development of anther, microsporogenesis, development of male gametophyte, dehiscence of anther, structure of pollen, pollen germination, pollen tube growth and pollen viability.

Module-4 3 hours

Structure and development of ovule, megasporogenesis, embryosacs-monosporic (polygonum type), bisporic (Allium type) and tetrasporic (Peperomia type). Structure of mature embryo sac.

Module-5 3 hours

Pollination mechanisms and agencies of pollination; pollen stigma interaction; compatibility and incompatibility; syngamy and fusion; apomixis.

Module-6 4 hours

Development of endosperm and embryo in Dicots and Monocots;

Polyembryony; Development and general structure of fruits(dry and fleshy) and seed.

PRACTICALS 9 hours

1. Identification of C.S. of anther, embryo sac and embryo.
2. Identification of various anther types-monothecous, dithecous
3. Identification of placentation types.
4. Observation of pollen and locating pollen pore
5. Pollen germination study

Suggested Additional Topics

Applied Anatomy: Wood anatomy and identification of wood;

Wood fibres and Economic uses, Food fibers

Internal Structure of fruits, seeds and vegetables.

Cellulose fibre source and use in paper industry- Pulp and paper manufacture.

Fruit and leaf abscission

Electron microscopic structure of plant parts and their application in different branches of plant science

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BOT4ARB– ANATOMY AND REPRODUCTIVE BOTANY OF ANGIOSPERMS
(Total Marks =

MODULES	NO. OF HOURS	PART A 1 MARK (8/8)	PART B 2 MARKS (6/10)	PART C 4 MARKS (4/6)	PART D 12 MARKS (2/4)	TOTAL MARKS
ANATOMY						
1	2	1	-	-	-	1
2	6	1	1	1	1	22
3	7	1	1			
4	7	1	1	1	2	38
5	3		1			
6	8	1		1		
7	3			1		
REPRODUCTIVE BOTANY						
1	2	1	1			3
2	2					
3	4	1	1		1	26
4	3	1	1	1		
5	3			1		
6	4		1			2

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION

SEMESTER IV **CORE COURSE 04**

BOT4ARB – ANATOMY AND REPRODUCTIVE BOTANY OF ANGIOSPERMS

Time: Three Hours **Maximum: 60 Marks**

PART A

Answer all questions. Each question carries1 mark)

1. What is histochemistry?
2. What are plasmodesmata?
3. Define calyptrogen.
4. Explain polyembryony.
5. What are bulliform cells?
6. Define dendrochronology.
7. What is phellogen?
8. Name the reproductive parts of a flower.

(8 x 1 = 8)

PART B

Answer any six questions. Each question carries2 marks

9. What is Korper-Kappe theory?
10. Explain the role of cambium in budding.
11. Distinguish between schizogenous and lysigenous ducts.
12. What is the interdisciplinary relevance of embryology?
13. Differentiate between amphivasal and amphicribal vascular bundles.
14. What is a campylotropous ovule?
15. What are the functions of the tapetum?
16. What is triple fusion?
17. What are antipodals? What is its function?
18. Describe the functions of lenticels.

(6 x 2 = 12)

PART C

Answer any four questions. Each question carries4 marks

19. Write a note on mineral crystals in plants.
20. Give a short account on the epidermal system of plants.
21. Explain the internal structure of a mature anther.
22. Write notes on the structure and functions of sclerenchyma.
23. Differentiate between the anatomy of a monocot and dicot stem.
24. What are the characteristic features of wind-pollinated flowers?

(4 x 4 = 16)

PART D

Answer any two questions. Each question carries12 marks

25. Explain with illustrations, the anomalous secondary growth in *Bignonia* stem.
26. Describe in detail the various theories explaining the stem apex in plants.
27. What are complex tissues? With diagrams, explain the different types of complex tissues in plants.
28. Describe the various types of embryo sac development in plants.

(2 x 12 = 24)

B.Sc. DEGREE (CBCSS) BOTANY PROGRAMME
SEMESTER III & IV – PRACTICAL
BOT4MPARA(P): MICROBIOLOGY &PHYCOLOGY, ANATOMY& REPRODUCTIVE BOTANY OF ANGIOSPERMS

Time 3 hours Maximum marks 40

1. Grams stain the bacterial culture **A1**. Write down the procedure/ flow chart. Identify and leave the preparation for valuation. **4**
   Preparation 2 Procedure / flow chart 1
   Identification 1

   OR

   Isolate the soil microbe from the sample A2 by dilution plate method **4**
   Working 2
   Procedure / flow chart 2

2. Make suitable micro preparation of **B**. Identify giving key characters. Submit the Preparation for valuation. **5**
   Preparation 1
   Identification with class / sub division 2
   Key characters 2
3. Take a T.S of the given material **C** stain and mount in glycerine, identify giving reasons (primary) **5**
   Preparation 2 Diagram 1
   Identification with reason 2
4. Take a T.S of the given material **D** , stain and mount in glycerine, Identify giving reasons (secondary/anomaly) **7**
   Preparation 2 Diagram 2
   Identification with reason 3

5. Name the living organisms and type of fermentation in material **E**. **1**
6. Spot at sight **F** and **G** **2**
   Generic name 1 Part displayed 1
7. Identify the cell inclusion of **H** **1**
8. Identify the anther type/embryo type /ovule of **I** **1**
9. Describe the Placentation type of the given material **J** **1**
10. Identify the stomata type of the material **K 1** with the help of suitable preparation **3**
    Preparation 1 Identification 1
    Diagram 1

OR

Find out the pollen viability of **K 2** by germination or Staining method		**3**
Preparation	1.5	
Calculation and result	1.5	

11. Viva-voce (Based on the Practicals).	**2**
12. Record	**8**

Instructions

A1.Bacterial Culture

A2.Soil sample

B. (Draw lots for the 2 experiments)
C. Vegetative thallus of alga
Nostoc, Volvox, Oedogonium, Cladophora, Spirogyra, Chara, Vaucheria, Sargassum, Polysiphonia
D. Primary structure only
Dicot Stem- *Centella, Eupatorium/ Vernonia* young stem, Grass stem, *Colocasia* root)
E. Anomaly /secondary structure only.
Dicot stem- *Eupatorium*/ *Vernonia*, Papaya Root, *Tinospora* Root, *Bignonia* stem, *Dracaena* stem, *Bougainvillea* stem)
F. Wine, Vinegar, Bread, Appam, Curd etc
G. Thallus with reproductive structure
Nostoc with heterocyst, *Oedogonium* with Oogonium, *Spirogyra* conjugation, *Chara* with nucule/ globule, *Sargassum* with receptacles, *Polysiphonia* with cystocarp/ tetraspores
H. Vegetative thallus
Nostoc, Volvox, Oedogonium, Cladophora, Spirogyra, Chara, Vaucheria, Sargassum, Polysiphonia
I. Raphides (*Colocasia* petiole), cystoliths (*Ficus* leaf), starch grains (Potato)
J. Photograph/diagram/section
(Dithecous anther section, monocot embryo, dicot embryo, orthotropous ovule, anatropous ovule) – will be provided from centre
K. Mounded specimen
Axile placentation- Hibiscus, Lady's finger; Marginal Pea, Beans; Parietal- Cucurbit (Kovakka)

K 1.Any dicot stomata

Ixora leaf, *Hamelia* leaf- Paracytic stomata; *Dianthes* – Diacytic; *Clematis*- Anisocytic

K2.Suitable flower

Vinca flower, Balsam flower- may be provided from the centre

(Draw lots for the 2 experiments)

SEMESTER V

B.Sc. BOTANY PROGRAMME

SEMESTER V COURSE-5 BOT5MLP

MYCOLOGY, LICHENOLOGY AND PLANT PATHOLOGY

(Theory: 36 hours; Practical: 45 hours) (Theory Credit 2, Practical Credit 2)

MYCOLOGY (Theory 24 hours; Practical : 36 hours)

Module 1 15 **hours**

1. Introduction , structure, reproduction, life cycle, evolutionary trends. Classification based on Ainsworth (1973)
2. Distinguishing characters of different classes of fungi with special reference to reproductive structures and life history of the genera mentioned in each group

a) Myxomycotina – General Characters

b) Mastigomycotina – *Albugo*

c) Zygomycotina - *Rhizopus*

d) Ascomycotina

* Hemiascomycetes -- *Saccharomyces*

*Plectomycetes --*Pencillium*

* Pyrenomycetes – *Xylaria*

* Discomycetes --*Peziza*

e) Basidiomycotina

* Teliomycetes ---*Puccinia*

* Hymenomycetes—*Agaricus*

f) Deuteromycotina – *Fusarium*

Module 2 **7 hours**

1. Economic importance of Fungi –useful and harmful aspects.

2.Fungi of Agricultural importance –mycoherbicides, myconematicides , mycoparasites , Mycorrhiza –diversity , function and significance.

3. Fungal biotechnology- Fundamental principles.

Mushrooms- edible and poisonous types.

cultivation technique-Spawn production .

Cultivation of Oyster mushroom.

LICHENOLOGY **2 hours**

Module 1

General account , economic and ecological importance of lichen

Structure, reproduction and life cycle of *Parmelia.*

PRACTICALS 36 **hours**

1. Students are expected to identify the following types by making suitable microprepartions and make labeled sketches *Rhizopus , Albugo , Saccharomyces,Pencillium , Xylaria, Peziza, Puccinia, Fusarium and Parmelia.*
2. Isolation and culture of Oyster mushroom mycelium.
3 Preparation of bed for mushroom cultivation.
4. Staining of endomycorrhiza / fungus.
5. Isolation of fungus from dung, air ,fruits ,vegetables.
6. Slide culture technique of fungus.

PLANT PATHOLOGY **(Theory 12 hours; Practical : 9 hours)**

Module 1 4 hours

History of plant pathology, Classification of plant diseases on the basis of causative organism and symptoms , Host parasite interaction , Defense mechanism in host ,Mechanism of infection, transmission and dissemination of diseases.

Module 2 2 hours

Control of plant diseases –

Prophylaxis-quarantine measures, seed certification

Therapeutic – physical therapy , chemotherapy.

Biological control.

Module 3 5 hours

Study of following diseases with emphasis on symptoms, disease cycle and control

Bunchy top of Banana.

Bacterial blight of Paddy.

Root wilt of Coconut.

Abnormal leaf fall of Rubber .

Fungicides - Bordeaux mixture, Tobacco Neem decotion, preparation. (Brief account only)

Module 4 1 hours

Medical mycology- Mention about fungal infections of man – Fungal allergens Athelet's foot, aspergillosis, candidiosis, aflatoxin

PRACTICALS 9 hours

Students are expected to :

1.Identify the diseases mentioned in the syllabus with respect to causal organisms and symptoms

2. Submit herbarium preparations of various stages (3stages) of any one of the diseases mentioned.

3. Students should be trained to prepare the fungicide – Bordeaux mixture, Tobacco decotion .

Suggested Additional Topics

Fungal ecology- details of fungal decomposition of organic matter , coprophilous fungi, cellulolytic fungi, lignin degrading fungi ,details of wood decay. soil fungi

Plant diseases, Role of enzymes in pathogenesis.

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BOT5MLP: MYCOLOGY LICHENOLOGY AND PLANT PATHOLOGY

(Maximum Marks =60)

MODULES	**HOURS**	**PART A** **1 Marks** **8/8**	**PART B** **2 Marks** **6/10**	**PART C** **4 Marks** **4/6**	**PART D** **12 Marks** **2/4**	**TOTAL NO. OF QUESTIONS** **60 Marks**
1	22hrs	4	4	4	3	64
2	2hrs	2	3	1	0	12
3	12hrs	2	3	1	1	24

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION

SEMESTER V CORE COURSE 05

BOT5MLP: MYCOLOGY LICHENOLOGY AND PLANT PATHOLOGY

Time: Three Hours **Maximum: 60 Marks**

PART A

Answer all questions. Each question carries one mark.

1. What is mycology?
2. What are coprophilous fungi?
3. Write a note on the vegetative method of reproduction in yeast
4. Name the source of Penicillin?
5. What are aflatoxins?
6. Explain symbiosis with an example.
7. What is the causative organism of Bacterial blight of Paddy
8. Name the pathogen that causes Athlete's foot.

(8 x 1 = 8)

PART B

Answer any six questions.Each question carries two marks.

9. Draw the L.S. of Peziza apothecium
10. Distinguish between conidia and oidia
11. Write notes on Ericaceous mycorrhizae
12. Write note on pencillium
13. Explain the importance of plant quarantine measures
14. Give an account on the salient features of myxomycota
15. Discuss the role of lichen in cosmetics and perfumes
16. Distinguish between Crustose lichen and foliose lichen
17. Give an account on the vegetative structure of Xylaria
18. What is quarantine measures

(6 x 2 = 12)

PART C

Answer any fourquestions. Each question carries four marks.

19. With the help of neat diagram explain ascus formation in ascomycetes.
20. Explain the role of fungi in agriculture.
21. Explain the economic importance of lichen.
22. Explain clamp connection with the help of a neat labeled diagram.
23. Give an account on symptoms of fungal diseases.
24. Explain the structure of the fruiting bodies of *Agaricus.*

(4 x 4 = 16)

PART D

Answer anytwo questions.Each question carries twelve marks

25. Explain the sexual reproduction of Rhizopus with the help of a diagram.
26. Give an account on harmful and beneficial aspects of fungus.
27. Discuss about fungal biotechnology.
28. Explain the importance of biological control of plant disease.

(2 x 12 = 24)

B.Sc. BOTANY PROGRAMME

SEMESTER V COURSE 06 BOT5ESE

ENVIRONMENTAL SCIENCE AND ECOTOURISM

(Theory 54 hours, Practical 45hours) (Theory Credit 3, Practical Credit1)

ENVIRONMENTAL SCIENCE 48 hours

Module 1 1 hour

Environmental science and its multidisciplinary nature

Introduction, relevance and scope, public awareness

Module 2 6 hours

Natural Resources

- Types of resources-renewable and non renewable
- Forest resources: Timber extraction, mining, dams, over exploitation, deforestation, MFP (minor Forest products) , Joint Forest Management (JFM)
- Water resources: surface and ground water, drinking water, dams-benefits and problems, conflict over water, Rain water harvesting, Water shed conversation
- Food resources: major food crops in India. Causes of food shortage. Food security, world food problems.
- Energy resources: Energy plantation, - *Jatropha*
- Land resources: Land use, land degradation, desertification, EFL(Ecologically Fragile Land)
- Conservation of natural resources, ecological footprints

Module 3 10 hours

Ecosystems:

- Structure and function of ecosystem: Ecosystem components- abiotic and biotic, Productivity – primary and secondary-gross and net productivity. Decomposition in nature, homeostasis in ecosystem
- Ecological energetics: energy flow, trophic levels, food chain and food web, ecological pyramids
- Nutrient cycles: Biogeochemical cycles of C, N and S.

Module 4 **4 hours**

Community ecology

- Population: size, density, natality, mortality.
- Community characteristics: Species diversity and species richness, dominance, growth forms and structure, trophic structure.
- Association of communities: plant association, ecotypes, ecotone, edge effect, ecological indicators.
- Ecological succession: types of succession, process – migration, ecesis, colonization, stabilization and climax community; hydrosere, xerosere, lithosere.

Module 5 **4 hours**

Plants and environment

Ecological complexes and factors affecting plants growth and response:

Climatic factors: temperature and pressure; water - precipitation, humidity, soil water holding capacity; light - global radiation.

Topographic factors: altitude and aspects

Edaphic factors - profile and physical and chemical properties of soil

Biotic factors: interactions – positive and negative.

Species – ecosystem interaction: Habitat, ecological niche, microclimate

Adaptation of plants to environment: To Water- Xerophytes, Hydrophytes; Temperature – thermo periodicity, vernalization; light – photoperiodism, heliophytes, sciophytes; salinity – halophytes, mangroves.

Module 6

Environmental pollution and Management **12 hours**

- Definition and general introduction
- Air pollution: Causes and sources, types of pollutants-particulates-aerosol, mist, dust, smoke, fume, plume, fog, smog. Effect of air pollution on plants and animals, Bhopal Gas Tragedy.

- Water pollution: Sources and types of pollutants. Water quality standards, water quality assessment. Ground water pollution-blue baby syndrome. Cycling of heavy metals, hydrocarbons. Eutrophication, BOD, Minamata disease.
- Soil pollution: Causes and sources-waste dumps, municipal wastes, agrochemicals, mining, solid waste management-vermi composting.
- Noise pollution: Sources, standards and measurements, effect on health, control techniques.
- Thermal pollution: Sources and effects
- Nuclear hazards: Sources and impacts.
- EIA: Environmental Impact Assessment in polluted areas

Module 7

Social issues and the environment: **2 hours**

Climate change, global warming and green house gases, IPCC, Acid rain, Ozone layer depletion, nuclear accidents and nuclear holocaust.

Module 8

Environmental legislation and laws: **1 hour**

(1) Environment (protection) Act, 1986, (2) Air (Prevention and control of pollution) Act, 1981, (3) Water (Prevention and control of pollution) Act, 1974, (4) Wildlife (protection) Act, 1972, (5) Forest (Conservation) Act, 1980 (briefly)**.**

Module 9 **6 hours**

Biodiversity and Conservation biology:

- Endemism: Definition-types-factors. Hotspot of endemism-hotspots in India. IUCN-threat categories. Red data book., Western Ghats as the hottest spot and its conservations.
- Biodiversity loss: Causes and rate of biodiversity loss, extinction-causes. Alien species, negative and positive impacts
- Conservation efforts: Rio Earth Summit, Agenda 21, Kyoto protocol, COP 15(15th Conference of the Parties under the U N Framework Convention on Climate Change), IPCC (Inter Governmental Panel for Climate Change) and its contribution. Conservation strategies and efforts in India and Kerala, In situ and ex situ conservation methods. Role of NGOs in biological conservation

Module 10 **2 hours**

Organizations, movements and contributors of Ecological studies

· *Organizations*: BNHS, WWF, CSE, NEERI, , MoEF, Green Peace, Chipko

- *Famous contributors of Ecology in India:* Salim Ali, M.S. Swaminathan, Madhav Gadgil, M.C. Mehta, Anil Agarwal, Medha patkar, John C. Jacob, Sunderlal Bahuguna

ECOTOURISM: **6 hours**

Definition, concept, introduction, history, relevance and scope. Components of ecotourism: Forms and types of ecotourism in India and Kerala, ecotourism resources- biological, historical, cultural, and geographical. Ecotourism centers in Kerala. Positive and negative impacts of ecotourism.

PRACTICALS – **45 hours**

1. Estimation of CO_2, Cl, and salinity of water samples (Titremetry)
2. Determination of pH of soil and water
3. Assessment of diversity, abundance, and frequency of plant species by quadrate method (Grasslands, forests)
4. Study of the most probable number (MPN) of coliform bacteria in water samples
5. EIA studies in degraded areas (Sampling – line transect, Quadrate)
6. Visit to any forests types including grasslands and preparation of the list of Rare and threatened (R&T) plants (no collection of specimens)
7. Collection, identification and preparation of the list of exotic species in the locality.
8. Identification of pollutant to respective pollution types.
9. Study of anatomical, morphological, physiological adaptation of plants to the environment (Xerophytic, Hydrophytic, Epiphytic, Halophytic).
10. Collection and recording of rain data by using simple rain gauge.

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BOT5ESE – ENVIRONMENTAL STUDIES AND ECOTOURISM

(Maximum Marks:60)

Module	**Hours**	**Part A** **(1 Mark)** **(8/8)**	**Part B** **(2 Marks)** **(6/10)**	**Part C** **(4 Marks)** **(4/6)**	**Part D** **(12 Marks)** **(2/4)**	**Total marks**
1.	1	1				1
2.	6	1		2	1	21
3.	10	2	1		1	16
4.	4	1	2		1	17
5.	4	1	1	1		7
6.	12	1	2		1	17
7.	2			1		4
8.	1		1			2
9.	6		2	1		8
10.	2	1	1	1		7

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION

SEMESTER V **CORE COURSE 06**

BOT5ESE: ENVIRONMENTAL STUDIES AND ECOTOURISM

Time: Three hours **Maximum Marks: 60**

PART A

Answer all questions. Each question carries 1 mark

1. Expand MoEF.
2. What is meant by mortality?
3. Differentiate between habit and habitat
4. What are heliophytes?
5. Define environment.
6. What is ecological foot print?
7. Define food chain.
8. What is eutrophication? (8x1= 8)

PART B

Answer any six questions. Each question carries 2 marks.

9. Give an account of vernalization.
10. Differentiate between allogenic and autogenic succession.
11. What are the impacts of alien species on biodiversity?
12. Write short note on the contributions of Sri.Salim ali.
13. Give an account on EIA.
14. Give an account of the Environment (protection) Act, 1986 of India.
15. What is meant by trophic levels?
16. Give an account on Minamata Disaster.
17. Differentiate between in situ and ex situ conservation practices using examples.
18. What are ecotypes? Give an example. (6x2=12)

PART C

Answer any four questions. Each question carries 4 marks.

19. Describe the IUCN threat categories.
20. Give an account of energy plantations.
21. Explain the causes of food shortage and world food problems.
22. Explain the anatomical adaptive features of xerophytes.
23. What is meant by ozone depletion? What are its causes and effects?
24. Write note on the forms and types of Ecotourism.(4x4= 16)

PART D

Answer any two questions. Each question carries 12 marks.

25. Explain the major nutrient cycles existing in nature.
26. Give an account of the types, causes and effects of soil pollution.
27. Write an essay on forest resources.
28. Write an account on the characteristics of community. (2x12= 24)

B.Sc. BOTANY PROGRAMME

SEMESTER V COURSE 7 BOT5GPH

GENETICS, PLANT BREEDING AND HORTICULTURE

(Theory 54 hours ; Practical 45 hours) (Theory Credit 3, Practical Credit1)

GENETICS (Theory 25 hrs)

Module 1. 2 hours

Origin of a new branch of Biology- Genetics- Mendelian era; basic laws of inheritance, Mendelian ratios

Module2. 8 hours

Growth of Genetics- post Mendelian period- modified Mendelian ratios; incomplete dominance- flower color in *Mirabilis*: Interaction of genes- comb pattern in poultry (9:3:3:1): Epistasis- recessive- coat color in mice (9:3:4); dominant epistasis- fruit color in summer squash (12:3:1): complementary genes- flower color in *Lathyrus* (9:7).

Module3. 2 hours

Multiple alleles- general account: ABO blood group in man; co dominance; self sterility in *Nicotiana*.

Module4 2 hours

Quantitative characters- polygenic inheritance, continuous variation- kernel color in wheat; ear size in maize.

Module 5 4 hours

Linkage and crossing over- importance of linkage, linkage and independent assortment. Complete and incomplete linkage. Crossing over- general account, cytological basis of crossing over- two point test cross; determination of gene sequences; interference and coincidence; mapping of chromosomes.

Module 6 4 hours

Sex determination- sex chromosomes and autosomes- chromosomal basis of sex determination; XX-XY, XX-XO mechanism; sex determination in higher plants (*Melandrium album*); genic balance theory of sex determination in *Drosophila*; sex chromosomal abnormalities in man-

Down's syndrome, Klinefelter's syndrome, Turner's syndrome- Sex linked inheritance- eye color in Drosophila, Haemophilia in man; Y-linked inheritance.

Module7 2 hours

Extra nuclear inheritance- general account- maternal influence- plastid inheritance in *Mirabilis*, cytoplasmic male sterility in plants, kappa particle in *Paramecium*.

Module8 1 hour

Population genetics-Hardy Weinberg law

PLANT BREEDING **(Theory: 15hours)**

Module 1 2hours

Introduction and objectives of plant breeding; methods of plant breeding

Module 2 3 hours

Plant introduction- procedure of plant introduction, quarantine regulations, acclimatization- agencies of plant introduction in India, major achievements..

Module3 2 hour

Selection- mass, pureline, clonal- genetic basis of selection-achievements.

Module 4 6 hours

Hybridization- procedure- intergeneric, interspecific and intervarietal hybridization.with examples- composite and synthetic varieties- heterosis in plant breeding, inbreeding depression; genetics of heterosis and inbreeding depression; single cross, pedigree method, bulk population method, multiple cross, back cross, polyploidy breeding, male sterility in plant breeding. Use of apomixis in plant breeding.

Module 5 2 hours

Mutation breeding- methods- achievements in India; breeding for pest, disease and stress resistance

HORTICULTURE **(Theory: 14 hours)**

Module 1 2 hours

Introduction to horticulture- definition, history, classification of horticultural plants, disciplines of horticulture; Garden tools and implements. Irrigation methods- surface, sub, drip and spray irrigations, mist chambers- advantages and disadvantages

Module 2 6 hours

Propagation of horticultural plants- by seeds- Seed viability, seed dormancy, seed testing and certification, seed bed preparation, seedling transplanting, hardening of seedling; advantages and disadvantages of seed propagation. Vegetative propagation- organs used in propagation- natural and artificial vegetative propagation; methods- cutting, layering, grafting and budding; advantages and disadvantages of vegetative propagation.

Module 3 6 hours

Gardening- ornamental gardens, indoor gardens, kitchen gardens- terrestrial and aquatic gardens- garden adornments; garden designing- garden components- lawns, shrubs and trees, borders, hedges, edges, walks, drives- famous gardens of India; Landscape architecture- home landscape design, parks. Physical control of plant growth- training and pruning; selection of plantfor bonsai, bonsai containers and method of bonsai formation

PRACTICAL **45 hours**

A. Genetics 27 hours

a. Students are expected to work out the problems in:

1. Monohybrid , dihybrid cross and back crosses.
2. All types of modified Mendelian ratios mentioned in the syllabus.

b. Study of human karyotype and study of characteristic karyotypes and symptoms of the syndromes mentioned in the syllabus

B. Plant breeding 9 hours

1. Emasculation and bagging
2. Comparison of percentage of seed germination and the effect of any one chemical on the rate of elongation of radicle in any three crop seeds

C. Horticulture 18 hours

1. Tongue grafting, budding ('T' and patch), air layering
2. Identification of different garden tools and their uses
3. List out the garden components in the photograph of the garden given

4. Preparation of potting mixture in the given proportion

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BOT5GPH: GENETICS, PLANT BREEDING AND HORTICULTURE

Maximum Marks = 60

Subject	Modules	Hours	Part A 1 mark (8/8)	Part B 2 marks (6/10)	Part C 4 marks (4/6)	Part C 12 marks (2/4)	Total Marks
GENETICS	1	2	1	-	1	-	5
	2	8	-	1	-	1	14
	3	2	1	1	-	-	3
	4	2	-	1	-	-	2
	5	4		1	-		2
	6	4	1		1	1	17
	7	2	-		1		4
	8	1	1				1
PLANT BREEDING	1	2		1			2
	2	3	1		1		5
	3	2		1		1	14
	4	6	1		1		5
	5	2		1			2
HORTICULTURE	1	2		1			2
	2	6	1	1	1	1	19
	3	6	1	1			3

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION,

SEMESTER V CORE COURSE 07

BOT5GPH: GENETICS, PLANT BREEDING AND HORTICULTURE

Time: Three Hours **Maximum: 60 Marks**

PART A

Answer all questions. Each question carries one mark.

1. Give the binomial of the experimental plant used by Mendel for genetical studies.
2. What is co-dominance?
3. State Hardy- Weinberg law.
4. Give an example for sex-linked inheritance.
5. What is cytoplasmic inheritance?
6. Define acclimatization.
7. What is heterosis?
8. Describe seed certification.

(8 x 1 = 8)

PART B

Answer any six questions. Each question carries two marks.

9. Define epistasis. Give an example.
10. Describe multiple allelism with an example.
11. What is polygenic inheritance?
12. What is linkage? What is its significance?
13. Enumerate the objectives of plant breeding.
14. Describe clonal selection.
15. Describe drip irrigation.
16. What are the precautions to be taken during transplantation?
17. Distinguish between hedges and edges.
18. Why are plants pruned?

(6 x 2 = 12)

PART C

Answer any four questions. Each question carries four marks.

19. Differentiate between a back cross and a test cross with an example.
20. Describe the genetic basis of haemophilia in man.
21. Write briefly on plastid inheritance in Mirabilis.
22. Describe the procedures followed in plant introduction.
23. What is polyploidy breeding? What is its significance?
24. Enumerate the advantages and disadvantages of vegetative propagation.

(4 x 4 = 16)

PART D

Answer any two questions. Each question carries12 marks.

25. What is interaction of genes? Substantiate your answer with an example giving the modified ratio.
26. Differentiate between autosomes and sex chromosomes. Explain the chromosomal basis of sex determination with examples.
27. Describe mutation breeding in detail citing major achievements in India.
28. Describe the method of bonsai formation.

(2 x 12 = 24)

B.Sc. BOTANY PROGRAMME

SEMESTER V COURSE 8 BOT5CME

CELL MOLECULAR BIOLOGY AND EVOLUTION

(Theory: 54 hours; Practical : 45 hours) (Theory Credit 3, Practical Credit1)

CELL BIOLOGY 28 hours

Module – I

Historical account of cell Biology 1 hours

Cell theory

Protoplasm theory

Cell 8 hours

The physio-chemical nature of plasma membrane and cytoplasm Eukaryotic, Prokaryotic cell.

The ultra structure of plant cell with brief description and function of the following organelles- Endoplasmic reticulum, Plastids, Mitochondria, Ribosomes, Dictyosome, Microbodies, lysosomes. Vacuole and cell sap, Nucleus - ultra structure, nucleolus structure and function.

Chromosomes 15 hours

Morphology - fine structure Dupraw model - Nucleosome model – chemical organization of nucleosome – nucleoproteins, karyotype and idiogram; Special type of chromosomes - salivary gland ,Lampbrush and B chromosome.Cell cycle, mitosis, meiosis: significanceof mitosis and meiosis.Change in number of chromosomes -Aneuploidy and Euploidy

Change in the structure of chromosomes - Chromosomal abberations deletion, duplication, inversions and translocations. Meiotic Behaviour of chromosomes.

Mutations 2 hours

Spontaneous and induced. Mutagens- Physical and Chemical mutagens.
Chromosomal and point mutations. Molecular mechanism of mutation - Transition, Transvesion and Substitution.

Stem cells; definition, sources and applications. 2 hours

Module – II **17 hours**

MOLECULAR BIOLOGY

Nucleic acids - structure of DNA and RNA - basic features, alternate forms of DNA - types and structure of RNA 3hrs.

Replication of DNA - Meselson-Stahl experiment - details of semiconservative replication of DNA 3 hrs.

Gene expression - concept of gene, definitions - the central dogma - details of transcription in procaryotes and eucaryotes - RNA prosessing, details of translation - genetic code features 6hrs

Control of gene expression - positive and negative control - operon model - lac operon, trp operon -attenuation 3hrs

Genetic basis of cancer - oncogenes - tumor suppressor genes - metastasis - 2hrs

Module – III

Evolution **9 hours**

Introduction, Progressive, Retrogressive, Parallel and Convergent evolution. Theories of evolution - Lamark's, Darwin's, Weisman's and De Vries 4 hours

Neo Darwinism 5 hours

Reproductive isolation, Mutation, Genetic drift, Speciation. Variation and evolution, hybridization and evolution, Polyploidy and evolution. Mutation and evolution.

PRACTICALS **45 hours**

1. Make acetocarmine squash preparation of onion root tip to identify mitotic stages.
2. Study the Mitotic Index of onion root tip cells
3. Study of meioses in any flower bud by smear preparation of PMC's
4. Identification of Barr body
5. PTC Testing

6. Identification of salivary gland chromosome.

7. Identify and study photographs and diagrams of cell division anomalies like lagging chromosomes, chr. bridge, aneuploidy, polyploidy. study the chromosomal patterns/ Karyotype in auto-, allo-, and aneuploids

8.Work out elementary problems based on DNA structure and replication

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BOT5CME: CELL MOLECULAR BIOLOGY & EVOLUTION

(Maximum Marks = 60)

MODULES	**HOURS**	**PART A** **1 Mark** **8/8**	**PART B** **2 Marks** **6/10**	**PART C** **4 Marks** **4/6**	**PART D** **12 Marks** **2/4**	**TOTAL MARKS**
1	28	5	5	3	2	51
2	17	1	3	1	1	23
3	9	2	2	2	1	26

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION

SEMESTER V CORE COURSE 08

BOT5CME – CELLMOLECULAR BIOLOGY AND EVOLUTION

Time: Three Hours **Maximum: 60 Marks**

PART A

Answer all questions. Each question carries one mark.

1. What is transcription?
2. Distinguish between DNA and RNA.
3. Define transverion.
4. Write any two examples for chemical mutagens?
5. Define euploidy.
6. What is the role of nucleolus?
7. Who is the father of Evolution?
8. What is speciation?

(8 x 1 = 8)

PART B

Answer any six questions. Each question carries two marks.

9. What is progressive evolution?
10. What is unit membrane?
11. Give an account on tumor suppressor genes.
12. What is chromosomal mutation?
13. Give an account on Genetic drift.
14. What the functions of endopladsmic recticulum?
15. Define plastids.
16. Draw a neat labeled diagram of chloroplast.
17. Distinguish between DNA and RNA?
18. What is an ideogram?

(6 x 2 = 12)

PART C

Answer any four questions. Each question carries four marks.

19. Give an account on ribosomes.
20. Explain variation and evolution.
21. What are the different forms of DNA?
22. Give an account on mutagens.
23. Write notes on central dogma.
24. Give an account on Lamark's theory of evolution.

(4 x 4 = 16)

PART D

Answer any two question. Each question carries 12 marks.

25. Give a detailed account on Darwin's theory of evolution. What are the criticisms against this theory?
26. Explain structural chromosomal aberrations.
27. Give an account on DNA double helix.
28. Explain mitosis.

(2 x 12 = 24)

OPEN COURSE

(OFFERED FOR OTHER BACHELOR PROGRAMMES)

B.Sc. BOTANY PROGRAMME
SEMESTER V OPEN COURSE BOT5HNM(O)
HORTICULTURE AND NURSERY MANAGEMENT
(72 Hours,Theory Credit 3)

HORTICULTURE 48 hours

Module 1 10 hours

1. Introduction to horticulture- definition, history, classification of horticultural plants, disciplines of horticulture.
2. Soil- formation, composition, types, texture, pH and conductivity.
3. Garden tools and implements.
4. Preparation of nursery bed; manures and fertilizers- farm yard manure, compost, vermicompost, biofertilizers;-chemical fertilizers NPK; time and application of manures and fertilizers, foliar spray.
5. Irrigation methods- surface, sub, drip and spray irrigations- advantages and disadvantages-periodicity of irrigation.

Module 2 10 hours

Propagation of horticultural plants- by seeds- Seed development and viability, seed dormancy, seed health, seed testing and certification, growing seedlings in indoor containers and field nurseries, seed bed preparation, seedling transplanting; advantages and disadvantages of seed propagation.

Vegetative propagation- organs used in propagation- natural and artificial vegetative propagation; methods- cutting, layering, grafting and budding; advantages and disadvantages of vegetative propagation; micropropagation.

Module 3 10hours

Gardening- ornamental gardens, indoor gardens, kitchen gardens- terrestrial and aquatic gardens- garden adornments; garden designing- garden components- lawns, shrubs and trees, borders, hedges, edges, drives, walks, topiary, trophy, rockery- famous gardens of India. Landscape architecture- home landscape design, urban planning, parks, landscaping and public buildings, industrial and highway landscaping.

Physical control of plant growth- training and pruning- selection of plant, bonsai containers and method of bonsai formation.

Module 4 6 hours

Commercial floriculture- jasmine, orchid, anthurium, rose, gladiolus; production of cut flowers, quality maintenance, packing, marketing. Flower arrangements-basic styles-upright and slanting-japanese ikebana, dry flower arrangement.

Module 5 4 hours

Olericulture- Types of vegetable growing-home gardens and market gardens; cultivation practices of leafy vegetable (Amarathus), tuber (Potato), fruit (Tomato), flower (Cauliflower).

Module 6 4 hours

Pomology- Cultivation of fruit crops-mango, banana and pine apple- preparation of land, spacing, planting, irrigation, hormones, harvest and storage. Factors affecting duration of storage. Principles of preservation-temporary and permanent- agents for fruit preservation. Preparation of pickles, jams, jellies and squashes using locally available fruits.

Module 7 4 hours

Garden friends -honey bees, ladybirds, frogs, spiders, earthworms, centipedes and millipedes. Garden foes- pests, pathogenic fungi, bacteria, virus. Control measures-pesticides and fungicides; neem tobacco decoction. Hazards of chemical pesticides; equipments used in controlling horticultural pests-sprayers, dusting equipments-sterilization, fumigation.

Weeds- annual, perennial; weed control-prevention, eradication - hand weeding, tillage, burning, mowing, biological control, use of herbicides- selective and non selective- mechanisms involved in herbicidal actions.

Nursery management 6 hours

Module 1

Nursery-definition, types; management strategies- planning, layout, budgeting-production unit, sales unit.

Plant growing structures- green houses, fernery, orchidarium, arbetorium.

On hand training **18 Hours**

1. Preparation of potting mixture of known combination and potting in earthern pots / poly bags.
2. Preparation of nursery beds.
3. Preparation of compost / vermicompost using different substrates.
4. Working knowledge and identification of garden tools and implements.
5. Practical knowledge in different plant propagation techniques listed in syllabus.
6. Cultivation of a vegetable / ornamental plant / fruit crop listed in the syllabus.
7. Practice of different pruning operations (top dressing , shaping and topiary) in the following plants (1) Bougainvillea (2) Phyllanthus .
8. Visit a well established nursery and submit report.

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BLUE PRINT

BOT5HNM(O): HORTICULTURE AND NURSERY MANAGEMENT

MAXIMUM MARKS: 80

MODULES	**PART A** **6/6** **1 mark**	**PART B** **7/10** **2 marks**	**PART C** **5/8** **6 marks**	**PART D** **2/4** **15 marks**	**Total Marks**
Horticulture **1**	1	2	1	-	11
2	1	2	2	1	32
3	1	2	-	1	20
4	-	-	1	-	6
5	-	-	1	-	6
6	1	1	-	-	3
7	1	2	2	1	32
Nursery Management **1**	1	1	1	1	24

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION

SEMESTER V - OPEN COURSE (BOTANY)

BOT5HNM(O): HORTICULTURE AND NURSERY MANAGEMENT

Time: Three Hours **Maximum: 80 Marks**

PART A

Answer all questions. Each question carries one mark.

1. Distinguish between weeding and pruning.
2. What is a trophy? What is its importance?
3. Explain soil fertility.
4. Describe the role of trees in garden. Give an example.
5. Briefly describe fumigation.
6. Explain olericulture.
7. What is pomology?
8. Define soil texture.
9. Define garden adornment.
10. List two plants that can be used as hedges.

(10 x 1 = 10)

PART B

Answer any eight questions. Each question carries 2 marks.

11. Distinguish between budding and grafting.
12. With examples write notes on hedges and edges.
13. What is mulching? What is its significance?
14. Give an account on water garden?
15. What are biofertilizers?
16. Write note on common plant diseases.
17. What is cutting? What are the different types?
18. Write a short note on the importance of trees in garden.
19. Write an account on dry flower arrangement.

20. What are phytohormones?
21. What are the methods of indoor gardening?
22. What is a fernery?

(8 x 2 = 16)

PART C

Answer any sixquestions. Each question carries four marks.

23. Explain chemical fertilizers with examples.
24. Describe the art of topiary. What is its significance?
25. Explain the steps involved in maintenance of bonsai.
26. Write an account on seed testing and seed certification.
27. Give an account on micropropagation.
28. Differentiate compost propagation and vermicompost.
29. Explain the importance of landscape gardening.
30. With diagrams explain layering.

(6 x 4 = 24)

PART D

Answer any two questions. Each question carries fifteen marks.

31. What is irrigation? Describe the various methods of irrigation.
32. Explain the various biological methods to control plant diseases in home gardens.
33. Give an account on the famous gardens of India.
34. Explain plant propagating structures with suitable examples.

(2 x 15 = 30)

B.Sc. BOTANY PROGRAMME

SEMESTER V - OPEN COURSE (BOTANY)

AGRIBASED MICROENTERPRISES

72 HoursTheory credit 3

AGRIBASED MICROENTERPRISES **72 hours**

Module 1. 9 hours

Organic farming and composting techniques

Organic manures and fertilizers. Composition of fertilizers – NPK content of various fertilizers. Common organic manures – bone meal, cow dung, poultry waste, oil cakes, organic mixtures and compost. Preparation of compost –aerobic and anaerobic- advantages of both; vermicompost – preparation, wormiwash. Biofertilizers – definition, types – *Trichoderma, Rhizobium,* PGPR. Biopesticides – Tobacco and Neem decoction. Biological control. Sustainable agriculture.

Module 2. 18 hours

Horticulture and Nursery management.

Soil components. Preparation of potting mixture. Common Garden tools and implements. Methods of plant propagation – by seeds – advantages and disadvantages. Vegetative propagation – advantages and disadvantages. Natural methods of vegetative propagation. Artificial methods – cutting, grafting, budding and layering. Use of growth regulators for rooting. Micropropagation by tissue culture. Gardening – Types of garden – ornamental, indoor garden, kitchen garden, vegetable garden for marketing. Rockery and artificial ponds. Ornamental garden designing – garden components – flower beds, borders, hedges, edges, drives and paths, garden adornments. Lawn - preparation by seeds, by transplanting seedling and by turfing. Annuals, Biennials, Shrubs, Trees, Cycads and Palms. Bonsai preparation. Pruning of plants. Types of Nurseries – Management aspects and Maintenance. Plant growth structures – advantages of green house, polyshed, fernery and orchidarium. Packaging of fruits, vegetables, nursery products and flowers.

Module 3. 9 hours

Food spoilage and preservation techniques.

Causes of spoilage. Preservation techniques – asepsis, removal of microorganisms, anaerobic conditions and special methods – by drying, by heat treatment, by low temperature storage and by chemicals (Food Additives). Preparation of wine, vinegar and dairy products(Milk peda, Khoa, Ice cream and Paneer)

Module 4. 9 hours

Mushroom cultivation and Spawn production.

Significance of Mushrooms, General outline of life cycle. Types of mushrooms - button mushroom, oyster mushroom and milky mushroom, poisonous mushroom – methods of identification. Spawn – isolation and preparation. Cultivation of oyster and milky mushrooms – using paddy straw and saw dust by polybag. Farm design and control of pests and diseases. Value added products from mushroom – pickles, candies, dried mushrooms.

Module.5. 9 hours

Plant tissue culture and micropropagation

Protoplasm- basic structure and function of plant cellconcept of totipotency- differentiation and dedifferentiation. Infra structure of a tissue culture laboratory .Solid and liquid media- composition and preparation. Sterilization- dry, wet and filter sterilization. Explant- inoculation and incubation techniques. Callus induction- organogenesis and embryogenesis. Transplanting, hardening, package and transportation of tissue cultured plantlets.

On Hand Training 18 hours

1. Prepare a chart showing the NPK composition of minimum 6 manures and fertilizers.
2. Identification and familiarization of the following organic manures- cow dung (Dry), Coconut cake, Vermicompost, neem cake, Organic mixture, Bone meal.

3. Preparation of potting mixture.
4. Make a Vermicompost pit /pot in the campus/ house of the student.
5. Familiarization of common garden tools and implements.
6. Estimation of germination percentage of seeds
7. Demonstrate the effect of a rooting hormone on stem cutting.
8. Demonstration of T budding, epicotyle grafting and air layering on live plants
9. Familiarization of garden components from photographs
10. Preparation of vinegar / dairy product (Any two) in class or home

11. Familiarization of different mushrooms and preparation of a polybag of *Pleurotus* using straw/sawdust

12. Visit to a well established tissue culture lab, nursery and mushroom cultivation unit.

References.

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B.Sc. BOTANY PROGRAMME

SEMESTER V - OPEN COURSE (BOTANY)

ECOTOURISM

72 Hours Theory credit 3

ECOTOURISM **72 hours**

Module 1 **4 hours**

Eco-tourism

Definition, concept, introduction, history, relevance and scope

Module 2 **4 hours**

Key Principles and Characteristics of Ecotourism:

Nature area focus, interpretation, environmental sustainability practice, contribution to conservation, benefiting local communities, cultural respect, customer satisfaction, responsible marketing

Module 3 **12 hours**

Components of Ecotourism:

Travel, tourism industry, biodiversity, local people, cultural diversity, resources, environmental awareness, interpretation, stake holders, capacity building in ecotourism.

Module 4: **10 hours**

Eco Tourism Terms:

Adventure tourism, certification, commercialization chain, cultural tourism, canopy walkway, conservation enterprises, ecosystem, ecotourism activities, ecotourism product, ecotourism resources, ecotourism services, endemism, ecolabelling, ecotourism "lite", geotourism, greenwashing, stakeholders, sustainable development, sustainable tourism, leakages

Module 5: **14 hours**

Ecotourism resources in India and Kerala:

Major ecosystems vegetation types and tourism areas in Kerala. Festivals and events, entertainment, overview, culture, famous destinations, sightseeing, historical monuments, museums, temples, national parks & wildlife sanctuaries, hill stations, water falls, rivers, reaches, wildlife watching and bird watching sites, agricultural sites, tribal areas, tribal museums, tribal arts, rural handicrafts, tribal medicines, archeological sites, adventure sports, sacred groves, mountains, etc.

Module 6: **8 hours**

Forms of Ecotourism in India and Kerala:

Eco regions, eco places, waterfalls in Kerala and India, eco travel, dos and don't on eco travel, eco trips. Potentials of ecotourism in Kerala. Community based ecotourism, ecotourism and NGOs

Module 7 **16 hours**

Ecotourism Planning:

Background, objectives, strategy, design of activities, target groups, opportunities, capacity building, threats, expectations positive and negative impacts, strength and weakness, benefits and beneficiaries, stakeholders, linkages, economics, ecotourism auditing. Problems with ecotourism. Carrying capacity of ecotourism. ecotourism facilities – Green report card. Ecotourism management – issues

Module 8 **4 hours**

Ecotourism and livelihood security:

Community, biodiversity conservation and development – Eco-development committees

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1. A K Bhattacharya, 2005. *Ecotourism and Livelihoods*. Concept Publ. company, New Delhi.
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B.Sc. BOTANY PROGRAMME

SEMESTER V - OPEN COURSE (BOTANY)

BIOTECHNOLOGY

72 hours Theory credit 3

BIOTECHNOLOGY **72 hours**

Module – I(10 hours)

General structure of eukaryotic and prokaryotic cells. Structure and functions of major organelles – nucleus, chloroplast, mitochondria, ribosomes, endoplasmic reticulum, golgi apparatus. Biomolecules – DNA, Protein and lipids, carbohydrates. Role of biomolecules in a cell.

Module – II **(5 hours)**

History of Biotechnology . Old Vs new biotechnology. General concept of Biotechnology

Module – IIII-Plant tissue culture **(10 hours)**

Plant tissue culture – concept of totipotency, organogenesis and embryogenesis. General facilities of tissue culture; constituents and role of different components in tissue culture medium. Steps involved in micro propagation – media preparation sterilization, inoculation of explants and incubation, rooting, hardening and field transfer. Role of different hormones. Applications of plant tissue culture

Module –IV Recombinant DNA Technology(10 hours)

Recombinant DNA technology – General outline. Role or vectors, restriction enzymes, ligases & DNA polymerases in recombinant DNA technology. Applications of rDNA technology-production of hormones, vaccines, antibodies etc. DNA fingerprinting. PCR and their applications. Gene library. Human Genome project (HGP)

Module –V Microbial Biotechnology (15 hours)

History of Microbiology – contributions by famous scientists - Edward Jenner, Louis Pasteur, Robert Koch, Joseph Lister & Alexander Fleming. Group of Microorganisms-Bacteria, fungi, virus & protozoa (No detail study intended). Fermentation ,use of Microorganisms. Production of wine, beer, cheese, paneer Microbes causing common diseases – Typhoid, TB, AIDS, Leptospirosis, viral fever, meningitis, Tuberculosis, leprosy. Water quality analysis

Module –VI Environment Biotechnology

Pollution- Different types. Global warming and ozone depletion- causes and implications. Role of Biotechnology in solving environmental problems- biodegradation, bioleaching, biopesticides, bioremediation. Role of microorganisms in waste management- solid and liquid waste management. **(10 hours)**

On Hand training (12 Hours)

1. General Laboratory set up for plant tissue culture.
2. Use of equipments and Glassewares- petridishes, pipettes, autoclave, pH meter and Laminar air flow
3. Preparation of MS media and inoculation of explants
4. Microscopic observation of microorganisms

Suggested additional topics (not for exams)

Genetic transformation and transgenics, molecular markers-molecular biology tools in plant breeding, Gene and genome library, Terminator technology, Advances in microbial biotechnology, Enzyme technology, Advances in animal biotechnology-stem cell research,Bioinformatics ,Micro array, Biosensors.

References

1. Attwood TK & Parry-Smith DJ. 2003. Introduction to Bioinformatics. Pearson Education.
2. Balasubramanian, D. – Bryce CFA , Dharmalingam K. Green J, Kunthala Jayaraman, 2007. Concepts in Biotechnology – University Press India Pvt. Ltd.
3. Becker JM, Coldwell GA and Zachgo EA 2007. Biotechnology – A Laboratory Course Academic Press.
4. Colin Ratledge and Bjorn Krishansen, 2008. Basic Biotechnology, Cambridge University Press.
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B.Sc. BOTANY PROGRAMME

SEMESTER V - OPEN COURSE (BOTANY)

BIOINFORMATICS

(72 Hours) Theory credit 3

Module 1 **2 hours**

Defining bioinformatics, Scope and relevance of bioinformatics

Module 2 **6 hours**

Characteristics of living organisms, Overview of biological classification and nomenclature, Cell as the basic unit of life : Prokaryotic and eukaryotic cells, examples; Basic structure of prokaryotic and eukaryotic cells; Chemical composition and structure of biomolecules – Carbohydrates, Nucleic acids, Proteins

Module 3 **6 hours**

Biological information; DNA as the store house of genetic information ; Concept of gene, split genes ; Mechanism of DNA replication- the centraldogma, transcription, translation

Module 4 **4 hours**

DNA sequencing**: Sanger's** method; Protein sequencing**:** Edman degradation method

Module 5 **6 hours**

Introduction to genetic engineering - Gene cloning: Cloning vectors, restriction endonucleases, ligases . Techniques to transfer the recombinant DNA into cells: Transformation, transduction, electroporation, microinjection, DNA gun.DNA libraries: Genomic DNA library, cDNA library

Module 6 **4 hours**

Genomics: Definition; Sequencing genes to sequencing genomes, Sequence assembly;

Major findings of the following genome projects- Human, *Arabidopsis thaliana, Drosophila melanogaster, Caenorhabditis elegans*

Module 7 **8 hours**

Biological Data bases: Bibliographic databases - Finding Scientific Articles, PubMed:

Genome sequence databases-Entrez Genome, TIGR database; Nucleic acid sequence databases; GenBank; Protein sequence databases – GenBank, SWISS-PROT; Protein structure database- Protein Data Bank; Searching Biological databases- Saving search results, FAST format, ASN.1 format, Batch Entrez, PDB flat file format, mmCIF format

Module 8 **10 hours**

Sequence comparison- Pair wise sequence alignment- Global alignment: Use of ALIGN; Local alignment: Use of BLAST, FASTA; Multiple sequence alignment: Use of ClustalW; Phylogenetic analysis – Use of PHYLIP; Data mining- Use of PERL in bioinformatics

Module 9 **6 hours**

Structure visualization- Molecular structure viewers, RasMol, SWISS-PDBViewer;

Predicting protein structure and function from sequence ; Protein modeling, docking and drug discovery

On Hand Training **18 hours**

Familiarize with the various databases given in the syllabus

Practice retrieving data from the various databases

Learn how to store the retrieved data

Practice the use of BLAST

Familiarize with the use of RasMol

References

1. Bioinformatics: *A Machine Learning Approach*. P Baldi and S Brunak. MIT Press, 2000
2. Bioinformatics : *A Practical Guide to the Analysis of Genes and Proteins*, 2001
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7. *Genomic Pearl*, Rex A Dwyer, Cambridge, 2005
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9. Jin XIong, 2009 *Essential Bioinformatics*, Cambridge.

SEMESTER VI

B.Sc. BOTANY PROGRAMME

SEMESTER VI COURSE 9 BOT6PPB

PLANT PHYSIOLOGY AND BIOCHEMISTRY

(Theory 54: hours; Practical : 45 hours) (Theory Credit 2, Practical Credit 2)

PLANT PHYSIOLOGY (Theory 36: hours; Practical : 33 hours)

Module 1 6 Hours

Water relations

A. Physical aspects of absorption-Diffusion, imbibition, osmosis, OP, DPD, TP, WP, Concept of Water potential, matrix potential, pressure potential.

B. Absorption of water-active & passive, Ascent of sap-cohesion adhesion theory, Transpiration-types-mechanism-theories-(starch-sugar, proton-K+ion exchange)-significance – antitranspirants, Guttation.

Module 2 3hours

Mineral Nutrition and mechanism of absorbtion.

Essential and non essential elements- macro& micro- role- deficiency symptoms.

Absorption of minerals– active & passive-ion exchange, carrier concept.

Module 3 10 hours

Photosynthesis

History - Photosynthetic pigments, photo exitation- Fluorescence, Phosphorescence - Absorbtion and action spectra, Red drop and Emerson enhancement effect, Concept of photo systems, Cyclic & Non Cyclic photophosphorylation, Carbon assimilation pathways-C_3, C4, CAM-Photorespiration –factors affecting photosynthesis.

Module 4 2 hours

Translocation of solutes

Pathway-phloem transport-mechanism-pressure flow-phloem loading and unloading.

Module 5 8 hours

Respiration

Aerobic and Anaerobic, Glycolysis, Krebs cycle, Electron transport system & Oxidative phosphorylations, ATPases - chemi osmotic hypothesis-RQ –significance-factors affecting respiration.

Module 6 1hour

Plant responses to environment

Allelochemicals- herbivory

Module 7 4hours

Physiology of growth and development

A. Physiological effects and practical application of hormones-Auxins, Giberillins, Cytokinins, ABA, ethylene.

B. Physiology of flowering–phytochrome-photoperiodism-vernalisation

Module 9 2 hours

Stress physiology

Abiotic-concept of plant responses to water, salt and temperature stresses-Biotic- pathogens

BIO-CHEMISTRY **(Theory 18: hours; Practical : 12 hours)**

Module1 2 hours

Water, Solutions & pH

Physical and chemical properties of water, Acid and bases, pH definition, significance, measurement, pH indicators, buffer action, pH and lif .

Module2 10 hours

Chemistry of biological molecules

Carbohydrates- structure and role of mono-di & poly-saccharides-common sugars seen in plants

Proteins-peptide bond-essential and non essential amino acids-primary structure-physiologically important proteins.

lipids - general features and their roles - fatty acid types and structure - fatty acid derivatives-fats and oils, structure and functions - compound lipids

Module3

Enzymes 6 hours

Nomenclature, characteristics mechanism and regulation of enzyme action, enzyme kinetics, factors affecting enzyme action.

PLANT PHYSIOLOGY PRACTICAL **(33 hours)**

Core Experiments

1. Determination of osmotic pressure of plant cell sap by plasmolytic method.
2. Compare the stomatal indices of hydrophytes, xerophytes and mesophytes.
3. Separation of plant pigments by thin layer chromatography (TLC) and paper chromatography.
4. Measurement of photosynthesis by Willmott's bubbler/any suitable method.
5. Estimation of plant pigments by colorimeter.

Demonstration only- experiments.

1. Papaya petiole osmoscope.
2. Demonstration of tissue tension.
3. Relation between transpiration and absorption.
4. Necessity of chlorophyll, light and CO_2 in phytosynthesis.

5. Simple respiroscope

6. Respirometer and measurement of R.Q.

7. Fermentation.

8. Measurement of transpiration rate using Ganong's photometer/ Farmer's Potometer.

BIOCHEMISTRY – PRACTICAL 12 hours

1. General test for carbohydrates- Molischs test, Benedicts's tests, Fehling's test.

2. Colour test for starch – lodine test.

3. Colour tests for proteins in solution. Biuret test, Million's test, Ninhydrin test.

4. Detect the presence of any three major organic compounds in the given food stuff/material viz. reducing /non-reducing sugar/fat proteins/starch.sucrose.

5. Action of various enzymes in plant tissues: peroxides, dehydrogenase.

6. Estimation of protein using colorimeter.

Suggested additional topics

1. Mycorrihzae

2. Chelating agents

3. Photosynthetic rates, efficiencies and crop production.

4. Pentose phosphate pathway.

5. Nitrogen fixation.

6. Plant protective coats –cutins ,waxes and suberin.

7. Senescence and abscission.

8. Circadian rhythms.

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BOT6PPB: PLANT PHYSIOLOGY AND BIOCHEMISTRY

Subject	**Modules**	**Hours**	**Part A 1 mark (8/8)**	**Part B 2 marks (6/10)**	**Part C 4 marks (4/6)**	**Part C 12 marks (2/4)**	**Total No. of Questions**
PLANT PHYSIOLOGY	I	6	1	1	-	2	46
	II	3	1	1			
	III	10	1	1	1		
	IV	2	-	1	-		
	V	8	1	1	1		
	VI	1	1	1	-		3
	VII	4	1	1	1		7
	VIII	2	1	1			3
BIOCHEMISTRY	I	2	1	1	1	1	25
	II	10	-	1	1		
	III	6	1	-	-	1	13

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION

SEMESTER VI CORE COURSE 09

BOT6PPB: PLANT PHYSIOLOGY AND BIOCHEMISTRY

Time: Three Hours **Maximum: 60 Marks**

PART A

Answer all questions. Each question carries one mark.

1. Define water potential.
2. What is chlorosis?
3. What is fluorescence?
4. Define respiratory quotient.
5. What is allelopathy?
6. Expand ABA.
7. What are cryoproteins?
8. Give an example for a compound lipid.

(8 x 1 = 8)

PART B

Answer any six questions. Each question carries two marks.

9. Explain ascent of sap.
10. Differentiate between trace elements and tracer elements.
11. Explain Emerson Enhancement effect.
12. What is phloem loading and unloading?
13. What are the products of anaerobic respiration?
14. Give the significance of phytochemicals in herbivory.
15. Explain vernalization.
16. Distinguish between halophytes and glycophytes.
17. Explain the importance of peptide bond formation.
18. What is the difference between fats and oils.

(6 x 2 = 12)

P.T.O.

PART C

Answer any fourquestions. Each question carries four marks.

19. Describe active transport of minerals.
20. Write a note on photorespiration.
21. Explain chemi-osmotic hypothesis.
22. What are the practical applications of auxins?
23. Write a note on essential and non-essential amino acids.
24. Write a note on the types and role of common sugars in plants.

(4 x 4 = 16)

PART D

Answer any twoquestions. Each question carries twelve marks.

25. Explain in detail the carbondioxide fixation in C3 and C4 plants. Add a note on their structural differences.
26. Write an essay on aerobic respiration and the energy output in the process.
27. Give an account on pH, its buffering action and its significance in life process.
28. Explain the mechanism and regulation of enzyme action.

(2 x 12 = 24)

B.Sc. BOTANY PROGRAMME

SEMESTER VI COURSE 10 BOT6BPGP

BRYOLOGY, PTERIDOLOGY, GYMNOSPERMS & PALEOBOTANY

(Theory: 54 hours ;Practical :45 hours) (Theory Credit 3, Practical Credit1)

BRYOLOGY (Theory: 16 hours ;Practical :15 hours)

Module 1 2 hours

Introduction, general characters, classification, Evolution of Bryophytes.

Module 2 12 hours

Morphology, anatomy and reproduction in *Riccia*, *Lunularia*,*Anthoceros*and *Funaria.*Evolution of sporophyte and gametophyte (Development of sex organs not necessary).

Module 3 2 hours

Importance of Bryophytes, Prevention of soil erosion, pollution monitoring and control, Antibiotics, Horticultural importance.

PRACTICAL 15 hours

Make micro preparations of the types mentioned. Study vegetative and reproductive structures.

PTERIDOLOGY (Theory:16 hours ; Practical :18 hours)

Module 1 2 hours

Introduction, general characters, classification, evolution of Pteridophytes.

Module 2 14 hours

Structural organization of sporophyte and gametophyte (development. of sex organs not necessary) of the following types with special reference to stelar structure, heterospory and seed habit.

1. *Psilotum*
2. *Lycopodium*
3. *Selaginella*
4. *Equisetum*
5. *Pteris*
6. *Marsilea*

PRACTICALS 18 hours

Make micropreparations to study stelar structure and sporangia of the mentioned types.Identify at sight, noting the morphology.

GYMNOSPERMS (Theory: 14 hours ; Practical :12 hours)

Module 1 2 hours

Introduction, general characters, classification, origin and evolutionary significance

Module 2 12 hours

Study of morphology, anatomy and reproductive features of *Cycas*, *Pinus* and *Gnetum.*

PRACTICAL 12 hours

Study of the morphology, anatomy and reproductive structures of the types mentioned.

PALAEOBOTANY (Theory: 8 hours)

Module 1 3 hours

Introduction, Study of geological time scale, formation of fossil, fossil types & technique of study, fossil as a fuel.

Module 2 4 hours

Detailed study of

Fossil Pteridophyte :*Rhynia*

Fossil Gymnosperm: *Williamsonia*

Fossil Angiosperm :*Palmoxylon*

Indian contribution to Palaeobotany 1 hour

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BOT6BPGP: BRYOLOGY, PTERIDOLOGY, GYMNOSPERMS AND PALEOBOTANY

(Maximum Marks- 60)

MODULE		HOURS	Part A 1 Mark 8/8	Part B 2 Marks 6/10	Part C 4 Marks 4/6	Part D 12 Marks 2/4	Total Marks.
BRYOLOGY	1	2	1				1
	2	12	1	2		1	17
	3	2	1	1	1		7
PTERIDOLOGY	1	2	1				1
	2	14		3	2	2	38
GYMNOSPERMS	1	2	1				1
	2	12	1	2	2	1	25
PALEOBOTANY	1	3		1	1		6
	2	5	2	1			4

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION

SIXTH SEMESTER- CORE COURSE (BOTANY)

BOT6BPGP: BRYOLOGY, PTERIDOLOGY, GYMNOSPERMS AND PALEOBOTANY

Time: Three Hours **Maximum: 60 Marks**

PART A

Answer all questions. Each question carries one mark

1. What is an actinostele.
2. Living fossil?
3. Aquatic species of Ricca?
4. Name any one fossil gymnosperms.
5. What is gemmae?
6. Name any one of the bryophyte which is used for horticulture..
7. What is pycnoxylic wood
8. What is ligule.

(8 x 1 = 8)

PART B

Answer any six questions. Each question carries two marks.

9. Explain the structure of Riccia thallus with the help of a diagram.
10. Distinguish between rhizoids and scales.
11. What is heterospory.
12. What is the morphology of rhizophore in Selaginella?
13. Explain the synangium of Psilotum?
14. Explain the characters of coralloid roots.
15. Explain the structure of Gnetum.
16. Explain the medicinal uses of bryophytes.
17. Give an account on fossil as a fuel.
18. Give an account on Rhynia.

(6 x 2 = 12)

PART C

Answer any four questions. Each question carries four marks.

19. Explain the economic importance of bryophytes
20. Explain the stelar types in pteridophytes
21. Give an account on hydrophytic adaptations of equisetum
22. Give an account on Geological time scale
23. Describe the primary structure and mode of secondary growth in stem of pinus.
24. Describe the development microsporangium and male gametophyte

(4 x 4 = 16)

PART D

Answer any two questions. Each question carries twelve marks.

25. Evolution of sporophyte in bryophytes.
26. Describe the structure and development of male gametophyte of *Cycas*.
27. Explain the life cycle of Marsilea
28. Explain the heterospory and seed germination in Selaginella

(2 x 12 = 24)

B.Sc. BOTANY PROGRAMME

SEMESTER VI **COURSE 11** **BOT6AMSE**

ANGIOSPERM MORPHOLOGY,SYSTEMATIC BOTANY AND ECONOMIC BOTANY

(Theory 54 hours; Practical : 45 hours) **(Theory Credit 3, Practical Credit1)**

Module-1. **(Theory 6 hours; Practical : 6 hours)**

Floral morphology .

Unit 1

Morphology of flower

1. Parts of a flower- description of flower and it's parts in technical terms.
2. Flower as modified shoot.
3. Types of flower – Hypogyny, Perigyny and Epigyny, Symmetry of flowers.
4. Aestivation types.
5. Placentation types.
6. Floral Diagram and Floral Formula.

Unit 2

1. Inflorescence:-

(a) Racemose types-Simple Raceme, Corymb, Umbel, Spike, Spadix and Head.
(b) Cymose types-Simple Cyme, Monochasial- Scorpoid and Helicoid, Dichasial
(c) Special type- Cyathium, Hypanthodium

2. Fruits: – Simple-Fleshy, Dry- dehiscent, indehiscent, Aggregate, Multiple(Sorosis and Syconus)

Module- 2. (**Theory 40 hours)**

Systematic Botany

Unit 1 Aim, Scope and Significance 1 **hour**

Unit 2. Types of Classification- Artificial (Brief account), Natural – Bentham andHooker(Detailed account) and Phylogenetic (Brief account) **3 hours**

Unit 3. Binomial Nomenclature, ICBN- Brief account 1 **hour**

Unit4.Interdiciplinary approach in Taxonomy- Cytotaxonomy and Chemotaxonomy 1**hour**

Unit 5 Herbarium technique- Preparation of herbarium, their preservation. Important herbaria, Botanical Gardens and BSI.

2 **hours**

Unit 6. Family studies: - 32 **hours**

Study the following families of Bentham and Hooker's System with special reference to their morphological and floral characters. Special attention should be given to common and economically important plants within the families

Annonaceae, Nymphaeaceae,Malvaceae, Sterculiaceae, Rutaceae, Meliaceae, Anacardiaceae, Leguminosae (Mimosaceae, Caesalpiniaceae and Fabaceae), Combretaceae, Myrtaceae, Cucurbitaceae, Apiaceae, Rubiaceae, Compositae (Asteraceae), Sapotaceae,Apocynaceae, Asclepiadaceae, Solanaceae, Convolvulaceae, Scrophulariaceae, Acanthaceae, Verbenaceae, Lamiaceae (Labiatae), Amaranthaceae, Euphorbiaceae, Orchidaceae, Liliaceae, Arecaceae, Graminae (Poaceae)

Module- 3 **(Theory 8 hours)**

Economic botany **6** hours

Unit 1. Study of the following groups of plants based on their uses with special reference to the botanical name, family and morphology of the useful part

Cereals- Rice, Wheat
Millets- Ragi
Pulses- Green gram, Bengal gram, Black gram
Sugar yielding plants – Sugarcane
Fruits:- Apple, Pineapple, Orange, Mango and Banana
Vegetables:- Bittergourd, Ladies finger, Carrot and Cabbage.
Timber yielding plants:- Teak wood and Jack wood
Beverages- Tea, Coffee
Fibre yielding plants- Coir, Jute, Cotton
Oil yielding plants- Ground nut, Gingelly
Rubber yielding plants- Para rubber
Gums and Resins- White damer, Gum Arabic, Asafoetida
Spices – Cardamom, Pepper, Cloves , Ginger
Insecticide yielding Plants- Tobacco and Neem

Unit 2. Ethnobotany and it's significance. 2 hours.

Study of the following plants used in daily life by tribals and village folks for Food, Shelter and Medicine

Food :-*Artocarpus, Corypha, Phoenix*

Shelter - *Bamboosa, Ochlandra and Calamus*
Medicine - *Curcuma, Trichopus zeylanicus and Alpinia galangal*

PRACTICALS 45 hours.

1. Identify the following inflorescence and fruits:-

(a) Inflorescence - Simple raceme, Spike, Corymb, Head, Dichasial cyme and Cyathium.

(b) Fruits - Simple: - Nut, Legume, Berry and Drupe Multiple and Aggregate

2. Preparation of floral formula from floral description.
3. Identify the families mentioned in the syllabus by noting their key, vegetative and floral characters.
4. Students must describe the floral parts, draw the L.S., floral diagram and write the floral formula of at least one flower from each family.
5. Study the finished products of plants mentioned in the syllabus of economic botany with special reference to the morphology, botanical name and family.
6. Prepare herbarium of 25 plants with field notes.
7. Conduct field work for a minimum of 5 days under the guidance of a teacher
8. Identify and describe the ethnobotanical uses of the items mentioned in the syllabus.

Suggested additional topics

1. Interdisciplinary approach in Taxonomy, Molecular taxonomy, Numerical taxonomy, Barcoding for species identification and Taxonomy for biodiversity characterization.
2. Binomial nomenclature- Historical account, ICBN, Principles and major rules in – Type concept, priority, valid publication, author citation.

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BOT6AMSE: ANGIOSPERM MORPHOLOGY, SYSTEMATIC BOTANY AND ECONOMIC BOTANY

(Maximum Marks- 60)

Module	**Hours**	**Part A (1 Mark) (8/8)**	**Part B (2 Marks) (6/10)**	**Part C (4 Marks) (4/6)**	**Part D (12 Marks) (2/4)**	**Total Marks**
1	6	3	4	3	-	23
2	40	3	5	3	3	61
3	8	2	1	2	1	24

B.Sc. BOTANY PROGRAMME

SEMESTER VI COURSE 11 BOT6AMSE

ANGIOSPERM MORPHOLOGY,

SYSTEMATIC BOTANY AND ECONOMIC BOTANY

Time: Three Hours **Maximum: 60 Marks**

Part A

Answer all questions. Each question carries one mark.

1. What is the binomial of jack fruit?
2. Name one major Herbaria.
3. Give the binomial of two pulses.
4. What is the use of Vasculum?
5. Define Hypogyny.
6. What is synandrous stamen?
7. Describe stylopodium.
8. What is a schizocarpic fruit? (8x1 = 8 marks)

Part B

Answer any six questions. Each question carries two marks.

9. Describe the ethno botanical importance of *Bamboosa arundinacea*?
10. What is placentation? Name different types of placentations.
11. Explain the difference between scorpioid and helicoid cyme.
12. What is an aggregate fruit? Give an example.
13. What is chemotaxonomy?
14. Explain spiro cyclic flower with an example.
15. Explain Cyathium inflorescence with a diagram.
16. What is binomial nomenclature? Who proposed it?
17. Describe spikelet inflorescence.
18. Differentiate Umbel and Corymb inflorescence.

(6x 2=10 marks)

Part C

Answer any four questions. Each question carries four marks.

19. Explain papilionaceous corolla with diagram.
20. Compare and contrast androecium in Malvaceae and Sterculiaceae.

21. What is the morphology of jute?
22. What are the different types of aestivations?
23. Give the binomial, family and morphology of useful parts of two beverages you have to study.
24. Briefly describe multiple fruits. (4x4= 16 marks)

Part D

Answer any two questions. Each question carries twelve marks

25. Write an essay on Herbarium preparation.
26. Write the botanical name, family and morphology of useful part of any five spices that you have to study.
27. Explain Bentham and Hooker's classification. Write about its merits and demerits.
28. Compare the vegetative and floral characters of the three subfamilies of Leguminosae.

(12x 2 = 24 marks)

B.Sc. BOTANY PROGRAMME

SEMESTER VI COURSE 12 BOT6BB

BIOTECHNOLOGY AND BIOINFORMATICS

(Theory 54 hours; Practical : 45hours) (Theory Credit 3, Practical Credit1)

BIOTECHNOLOGY (Theory 36 hours ; Practical 26 hours)

Module-1 10 hours

1. Introduction – The concept of biotechnology, landmarks in biotechnology.
2. Plant tissue culture – Principles and techniques.

   Cellular totipotency, in *vitro* differentiation –de differentiation and re-differentiation, callus induction, organogenesis and somatic embryogenesis.

3. Tissue culture medium – Basic components in tissue culture medium – Solid and liquid medium – suspension culture. Murashige and Skoog medium – composition and preparation. Aseptic techniques in tissue culture – sterilization – different methods – sterilization of instruments and glass wares, medium, explants; working principle of laminar air flow and autoclave; preparation of explants – surface sterilization. Inoculation, incubation, subculturing.
4. Micropropagation - Different methods – axillary bud proliferation, direct and indirect organogenesis and somatic embryogenesis. Different phases of micropropagation – hardening, transplantation and field evaluation Advantages and disadvantages of micropropogation. Somaclonal variation.

Module – 2 10 hours

1. *Methods and Applications* of tissue culture - Shoot tip and meristem culure Synthetic seed production, embryo culture, I*n vitro* mutagenesis, Protoplast isolation culture and regeneration – transformation and transgenics, Somatic cell hybridization-cybrids. I*n vitro* secondary metabolite production — cell immobilization, bioreactors *In vitro* production of haploids – anther and pollen culture, *In vitro* preservation of germplasm.

Module – 3 8 hours

Recombinant DNA Technology

Gene cloning strategies – recombinant DNA construction – cloning vectors – plasmids pBR322, bacteriophage based vectors, Ti plasmids. Restriction endonucleases and ligases – Ligation techniques, transformation and selection of transformants – using antibiotic resistances markers, southern blotting; PCR.

Different methods of gene transfer – chemically stimulated DNA uptake by protoplast, transduction, electroporation, microinjection, microprojectiles, *Agrobacterium* mediated gene transfer gene library ,gene banks.

Module – 4 **3 hours**

Application of Biotechnology in :

Medicine -Production of human insulin, human growth hormone and vaccines, gene therapy, monoclonal antibodies, biopharming.

Forensics -DNA finger printing.

Agriculture - Genetically modified crops – Bt crops, Golden rice, Flavr Savr Tomato, Virus herbicide resistant crops, Edible vaccines.

Environment - Bioremediation- use of genetically engineered bacteria- super bug.

Industry - Horticulture and Floriculture Industry, production of vitamins, amino acids and alcohol.

Module – 5 **3 hours**

Scope and relevance of the following technologies:

Microbial biotechnology, Tissue Engineering technology, Embryonic stem cell culture, animal cloning, Micro array technology, Bionanotechnology.

Module-6 **2 hours**

Social and ethical issues, biosafety , biowar, patenting and IPR issues.

PRACTICALS **32 hours**

1. Preparation of nutrient medium – Murashige and Skoog medium, sterilization, preparation of explants, inoculation.
2. Extraction of DNA from plant tissue.
3. Immobilization of whole cells or tissues in sodium alginate.
4. Determination of appropriate flower bud containing uninucleate pollen for anther culture using cytological techniques
5. Study of genetic engineering tools and techniques using photographs/diagram (Southern blotting, DNA finger printing, PCR,)
6. Visit a well equipped biotechnology lab and submit a report along with the practical record.

BIOINFORMATICS **(Theory : 18 hours ; Practical : 10 hours)**

Module-1 **7 hours**

1. Introduction to Bioinformatics, scope and relevance, genome, transcriptome, proteome.
2. Biological data bases –

   Nucleotide sequence database – EMBL, Gen Bank, DDBJ.

   Protein sequence database – PDB, SWISS PROT

   Organismal database – *Saccharomyces* genome database

   Biodiversity database – Species 2000
3. Information retrieval from Biological database, sequence alignment types and tools: pair wise sequence alignment multiple sequence alignment, use of BLAST, FASTA.

Module-2 **6 hours**

1. Genomics : DNA sequencing Sangers procedure-automation of DNA sequencing, genome sequence assembly, Genome projects – Major findings of the following genome projects – Human, *Arabidopsisthaliana*, Rice, *Haemophilus influenza*, Application of genome projects.

2. Proteomics : Protein sequencing- Edman degradation method, automation of sequencing, protein structure prediction and modelling (Brief account only)

Module-3 **5 hours**

A brief account on

1. Molecular phylogeny and phylogenetic trees.
2. Molecular visualization – use of Rasmol.
3. Molecular docking and computer aided drug design.

PRACTICALS **13 hours**

1. Familiarizing with the different data bank mentioned in the syllabus.
2. Molecular visualization using Rasmol.
3. Blast search.

Suggested additional topics

Tissue culture and crop improvement, Genetic transformation and transgenics, Advances in crop biotechnology molecular markers-molecular biology tools in plant breeding, Gene and genome library, Terminator technology, Advances in microbial biotechnology, enzyme technology, Advances in animal biotechnology-stem cell research. Micro array Bioinformatics.

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BOT6BB: BIOTECHNOLOGY AND BIOINFORMATICS

Module	**Hours**	**Part A** **1 Mark** **(8/8)**	**Part B** **2 Marks** **(6/10)**	**Part C** **4 Marks** **(4/6)**	**Part D** **12 Marks** **(2/4)**	**Total Marks**
Biotechnology 1	10	1	1	1	1	19
2	10	1	-	1	-	5
3	8	1	1	-	1	15
4	3	1	1	-	-	3
5	3	1	1	-	-	3
6	2	-	1	-	-	2
Bioinformatics 1	7	1	-	1	1	17
2	6	1	-	1	1	17
3	5	1	1	-	-	3

B.Sc. BOTANY PROGRAMME

SEMESTER VI COURSE 12 BOT6BB

BIOTECHNOLOGY AND BIOINFORMATICS

Time: Three Hours **Maximum: 60 Marks**

Part A

Answer all questions. Each question carries 1 mark

1. What is molecular docking?
2. What are cybrids?
3. What are restriction endonucleases?
4. What is DNA sequencing?
5. Define totipotency.
6. What is BLAST?
7. Define animal cloning.
8. What is biofarming?

(8x1=8marks)

Part B

Answer any six questions. Each question carries 2 marks.

9. What are monoclonal antibodies? What is its role?
10. Write an account on phylogenetic trees.
11. Differentiate dedifferentiation and redifferentiation.
12. Write a note on patenting and IPR issues.
13. Write a note on subculturing.
14. Write an account on bionanotechnology.
15. List out 2 cloning vectors and their application.
16. What is genebank?
17. Explain the principle of PCR.
18. Write an account on ligation techniques.

(6x2=12 marks)

Part C

Answer any four questions (Each question carries 4 marks)

19. Give the scope and relevance of bioinformatics.
20. Give an account of the use of genetically engineered bacteria.

21. Write an account on somatic embryogenesis
22. What are the basic components of a tissue culture media.
23. Give an account on southern blotting.
24. Write a note on the genomic projects in plants.

(4x4 = 16 marks)

Part D

Answer any two questions. Each question carries 12 marks.

25. Give an account of micropropagation.
26. Give an account on proteomics and its applications.
27. Give an account on methods of sterilization.
28. Write an account on nucleotide databases.

(2X12 = 24 marks)

Choice based Core Courses

B.Sc. BOTANY PROGRAMME
SEMESTER VI CORE COURSE CHOICE BASED- BOT6PP
PHYTOCHEMISTRY AND PHARMACOGNOSY
(54 Hours) Theory Credit 3

Module 1. 2 hours

Introduction

Introduction to phytochemical approaches –morphological-organoleptic-microscopic- to study drug and aromatic plants

Module 2 4 hours

Extraction and chacterisation techniques

Cold extraction- hot extraction—soxhlet-clevenger apparatus; Solvents - petroleum ether, chloroform, ethanol, water. Separation technique-TLC, Column, HPLC. Characterization technique-GC/MS, HPTLC, UV Spectra, IR Spectra.

Module 3. 10 hours

Study of the drug plants and their active principles

A. Alkaloids – introduction, properties, occurrence, structure, classification, functions, and pharmacological uses.

B. Triterpenoids. Introduction, properties, occurrence, classification, functions and pharmacological uses.

C. Phenolics. Quinines- benzoquinones, napthoquinones, anthraquinone, and coumarins.

Module 4. 20 hours

Study of the following plants with special reference to

(1) Habit, habitat and systematic position and morphology of the useful part.

(2) Organoleptic, anatomical and chemical evaluation of the officinal part.

(3) Phytochemistry and major pharmacological action of plant drugs.

(4) Ayurvedic formulations using the plant

Tinospora cordifolia, Papaver somniferum, Aegle marmelos , Punica granatum, Plumbago rosea, Adhatoda vasica, Withania somnifera, Achyranthes aspera, Asparagus racemosus, Kaempheria galanga, , Sida acuta, Carica papaya, Azadirachta indica, Glycirrhiza glabra, Phyllanthus neruri, Datura stramonium, , Hemidesmus indicus, Aloe veera, Tylophora indica, , Acorus calamus.

Module 5. 10 hours

Study of the following aromatic plants – volatile oils and methods of extraction *Vetiveria zizanoides, Cinnamomum zeylanica, Sysygium aromaticum, Santalum album, Eucalyptus, Ocimum bacilicum, Rosa, Mentha piperita.*

Module 6.

Pharmocognosy. 4 hours

Introduction, tools for identifying adulteration; methods in pharmocognosy- microscopy, phytochemical methods- study of starch grains of maize, wheat, rice, potato, curcuma

Cultivation of drug and aromatic plants 4 hours

I. Soil as growth medium: formation of soil, physical and chemical nature, soil organisms, soil fertility, soil types.
II. Fertilizers and manures: NPK, organic manures, green manure, farm yard manure, and vermicompost.
III. Plant protection methods- insect and pest control measures: physical ,chemical biological methods.
IV. Plant propagation methods.

Suggested additional topics

1. Basic principles in spectroscopy - UV, NMR, IR etc
2. Use of secondary metabolites for protection against pathogens , herbivores

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BOT6PP: PHYTOCHEMISTRY AND PHARMACOGNOSY

(Maximum Marks = 80)

MODULES	HOURS	PART A 1 Mark 6/6	PART B 2 Marks 7/10	PART C 6 Marks 5/8	PART D 15 Marks 2/4	TOTAL MARKS
1	2	1	-	-	-	1
2	4	1	1	1	-	9
3	10	1	2	2	1	32
4	20	1	3	2	1	34
5	10	1	2	2	1	32
6	8	1	2	1	1	26

B. SC. DEGREE (C.B.C.S.S.) EXAMINATION
SEMESTER VI CHOICE BASED CORE COURSE (BOTANY)
BOT6PP: PHYTOCHEMISTRY AND PHARMACOGNOSY

Time: Three Hours **Maximum: 80 Marks**

PART A

Answer all questions. Each question carries 1 mark.

1. What is meant by organoleptic evaluation of drugs
2. What is an ideal solvent?
3. What are reserpines?
4. Binomial of Indian Ginseng
5. What is the source of Khus oil?
6. What do you mean by soil fertility?
7. Define pharmacognosy
8. What is meant by iodine number?
9. Define palisade ratio
10. What is meant by vein islet?

(10 x 1 = 10)

PART B

Answer any eight questions. Each question carries two marks.

11. Explain hot extraction
12. Give an account of benzoquinones
13. List out the functions of triterpenoids
14. Give the ayurvedic formulation of *Plumbago rosea*
15. Explain the phytochemical constituents of *Tinospora cordifolia*
16. Write note on the chemical constituents of *Adathoda vasica*
17. What are the volatile oils present in Eucalyptus
18. List out the aromatic properties of *Mentha piperata*
19. Explain the merits and demerits of using fertilizers
20. What are the organisms and the methods involved in vermicomposting?

21. Which are the active principles in sandal wood oil?
22. What is meant by supercritical fluid extraction?

(8 x 2 = 16)

PART C

Answer any six questions. Each question carries four marks.

23. Explain the working of IR spectra.
24. How are phenolic compounds classified?
25. List out the chemical components and the pharmacological properties of Bael.
26. How is *Plumbago rosea* useful in pharmacology?
27. Give an account on the methods of extraction of *Cinnaomom zeylanicum*.
28. Explain the volatile oils in *Syzygium aromaticum*.
29. What are the methods of plant propagation?
30. Give a critical account on plant protection methods.

(6 x 4 = 24)

PART D

Answer any two questions. Each question carries fifteen marks.

31. Give an account of the classification and pharmacological uses of alkaloids.
32. Compare the phytochemistry and pharmacological action of *Kaempheria galanga* and *Sida acuta.*
33. Explain the general methods of extraction of volatile oils.
34. Explain the various biofertilizers and their applications.

(2 x 15 = 30)

ST. TERESA'S COLLEGE (AUTONOMOUS), ERNAKULAM
B.Sc. BOTANY PROGRAMME
SEMESTER VI CORE COURSE CHOICE BASED

BOT6AB :AGRIBUSINESS

(54 hours) Theory Credit 3

Module 1. 2 hours

Entrepreneurship

Types, Basic qualities of an Entrepreneur. Financial assistance from Banks, Role of Institutions like MSME Training Institute, Khadi and Village Industries Board, Self Help Groups, Co-operative Sector, Kudumbasree projects and Microenterprises.

Module 2. 8 hours

Value added Food products

Preparation and Preservation Techniques. Causes of Spoilage of Food. Principles of preservation – asepsis, removal of microorganisms, anaerobic situation and special methods – drying, thermal processing – pasteurization, sterilization and canning – low temperature, use of chemical preservatives and food additives. Preparation of wine, vinegar, pickles, jam, jelly, syrups, sauce, dry fruits, dairy products – (cheese, butter, yoghurt, paneer), candies, chocolates, payasam, kondattum.

Module 3. 8 hours

Processing techniques.

Processing of latex – Centrifuged latex products and galvanized rubber products. Processing, storage and marketing of Cocoa, Coconut (Copra ,Coir and Tender coconut), Rice (par boiled, raw rice and rice flour), Pepper, Cardamom, Ginger, Arrowroot, Tapioca, Cashew, Mango, Jack fruit, Guava, Grapes, Lemon, Papaya, Musa, Garcinia. Basic principles of preparation of Lehyam and Decoction.

Module 4. 6 hours

Nursery Management.

Preparation of potting mixtures, polybags. Plant Growth structures – green houses, shaded houses, polyshed, mist chamber, sprinkling system, drip irrigation. Modern strategies in propagation by root initiation of cutting, layering technique, budding and grafting technique –

Micropropagation; Planting, Transplanting and Hardening of seedlings, After care of seedlings. Packing and transporting of seedlings.

Module 5. 6 hours

Organic farming and Composting Techniques.

Organic manures and fertilizers, Composition of fertilizers. NPK content of various fertilizers and preparation of fertilizer mixtures.Common organic manures – bone meal, cow dung, poultry waste, oil cakes, organic mixtures and compost. Preparation of compost –aerobic and anaerobic-advantages and limitations. Vermicompost – preparation - Vermiwash. – preparation. Biofertilizers – Definition and preparation of different types – Trichoderma, Rhizobium, PGPR, PSB, mycorrhiza. Application of Biofertilizers. Biopesticides – Tobacco and Neem decoction. Biological control of disease and pests. Organic traps – Natural dyes.

Module 6. 6 hours

Cultivation of Vegetables, Fruits and Medicinal Plants.

Types – Home gardening, Market gardening and Truck gardening. Packing and Transporting of Vegetables.Organic farming of fruit crops – Packing and Transporting of fruits. Induction of flowering and weed control.Cultivation of Medicinal and Aromatic plants of common use and great demand.

Module 7. 6 hours

Floriculture and Apiculture.

Problems and prospects of Floriculture in Kerala. Scope of growing Anthurium, Orchids and Jasmine in Kerala. Common cut flowers – Rose, Gerbera, Gladiolus, Aster, *Chrysanthemum*, Daisys, Carnation, Golden rod, Anthurium, Orchids, Lilium and Limolium. Common leaves used in flower arrangement – *Cyprus, Podocarpus*, *Asparagus*, Palms, Cycads, Ferns and *Eucalyptus.* Apiculture – Scope and Significance Structure, Installation and maintenance of an Apiarium. Extraction, Processing, preservation and Marketing of Honey.

Module 8. 4 hours

Flower arrangement.

Types -Western, Eastern (Japanese/ Ikebana) and Modern. Wases, Flower Holders and Floral Foam. Wase life of flowers and leaves. After care of flower arrangements – Bouquets. Packing and Maintenance of flowers and leaves.

Module 9. 4 hours

Ornamental Garden designing.

Use of different garden components.

Lawn preparation by seeds, seedling and turfing.

Maintenance of garden by Irrigation, Pruning, Repotting.

Disease and Pest control.

Module 10. 4 hours

Mushroom cultivation and Farming.

Mushrooms – Significance – Nutritive value.

Types of Mushrooms – Button – *Pleurotus, Volvorella*.

Spawn production, storage and marketing.

Growth of Mushrooms on Paddy Straw and Saw dust by Poly bag.

Mushroom growing structures and maintenance of humidity.

Pests and defects of mushrooms.

Storage, Transporting and Marketing of Mushrooms.

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ST. TERESA'S COLLEGE (AUTONOMOUS), ERNAKULAM
B.Sc. BOTANY PROGRAMME
SEMESTER VI CORE - COURSE CHOICE BASED
BOT6PGRM: PLANT GENETIC RESOURCES MANAGEMENT
(54 hours) Theory Credit 3

.

Module 1. 3 hours

Historical developments in crop botany. Centres of origin and diversity of crop plants, primary and secondary centres, Vavilovian concept.

Module 2. 2 hours

Exploration and collection of genetic resources- importance of wild relatives of crop plants and their genetic diversity in crop improvement.

Module 3. 4 hours

Conservation of genetic resources. (i) in situ: biosphere reserves, national parks and wild life sanctuaries; (ii) ex situ- (a) in vivo: botanic gardens, field gene banks; (b) in vitro: seed banks (short term, medium term and long term storage of seeds), tissue culture storage and cryopreservation.

Module 4. 3 hours

Role of Governmental and non-governmental organizations in Plant Genetic Resources Management: Governmental Organisations– Regional – TBGRI and KFRI; National - BSI and NBPGR; International - IPGRI(IBPGR) and ICRISAT.
Non Governmental Organisations – Herbal gardens and Nurseries.

Module 5. 5 hours

Major threat to the genetic resources: human interference and deforestation, over exploitation of resources. Endemism and Hot Spots. Documentation of endangered and threatened plants- red data book. Remote sensing : principle – concept of remote sensing and components of remote sensing. Application of remote sensing in conservation of endangered plants and habitat studies. IUCN- role and activities.

Module 6. 4 hours

Ethnobotany its significance and scope with respect to food, shelter and medicine.Ethnobotany in relation to conservation of genetic resources: mythology and conservation of eco-systems, sacred groves and their role in the conservation of gene pool; taboos for conservation of selected plant species.

Module 7. 18 hours

Important food, medicinal and aromatic plants of Kerala state – taxonomy, cultivation and uses of rice, tapioca, elephant foot yam, cow pea, bitter gourd, ginger, black pepper, nutmeg, cardamom, coffee, vasaka, Aloe and lemon grass.

Module 8. 5 hours

Plantation crops – scope and importance of plantation crops; taxonomy, cultivation and useful products of rubber, cashew, coconut and tea.

Module 9. 3 hours

Importance of fruits: classification of fruits, role of fruits in Indian economy, taxonomy and cultivation of banana, pineapple and mango.

Module 10. 3 hours

Underutilised plants and its importance for future food requirements. Botany and uses of the following under exploited edible plants.
Vegetables; winged bean, sword bean, cluster bean, ridge gourd, bottle gourd, little gourd, lesser yam, Chinese potato.
Fruits; Artocarpus heterophyllus , Artocarpus hirsutus, Anona, Rambutan, rose apple
.

Module 11. 4 hours

Mushroom cultivation and spawn production – paddy straw, oyster and milky mushrooms.

Suggested additional topics

Study the origin and diversity of various crop plants.

Plant Introduction and its importance in creating genetic diversity.

Ethnobotany in relation to crop improvement. Linking it with food,

shelter, cloth and medicine to human.

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B.Sc. DEGREE (CBCSS) BOTANY PROGRAMME

SEMESTER VI -(COMBINED) PRACTICAL

BOT6EEPB(P): ENVIORENMENTALSCIENCE AND ECOTOURISM
&
PLANT PHYSIOLOGY AND BIOCHEMISTRY.

Time 3 Hours. **Total marks- 40**

1. Estimate the (Co2/Cl/Salinity) in the given water sample **A**. Write the procedure. 6

   (Procedure-2.Experiment-3.Result-1.)

2. Conduct experiment **B** and bring out the result. 8
(Requirement -1Procedure -1 setting the experiment-3 Labelled diagram-1 Result and inference-2)
3. Comment on the defects in the experiment set up **C** 3

4. Detect any one organic compound present in the sample **D** 3

5. Find out the density/abundance from the given data **E** 2

6. Identify and write critical note on the given pollutant **F** (photograph/material) 1

7. Prepare a neat hand section of the given material **G** and write the anatomical/morphological adaptation. Draw the labelled diagrams. 4
   (Preparation-2, diagram- 1 adaptation - 1)

8. Submit a report of field visit of a forest with ecotourism significance. 2

9. Comment on the anthropogenic influence on environment deterioration. (Photograph) 1

10. Viva voce.(based on the practicals.) 2

11. Record. 8

Key to experiments

1. **B.** determination of OP by plasmolytic method/compare the stomatal indices of plants varying two environmental conditions/separation of plant pigments by paper chromatography/measurement of rate of photosynthesis/estimate the amount of total chlorophyll.

2. **C**. any experiment in the syllabus for demonstration with minimum two defects. Write the aim and the correct procedure also.

3. **D**. Students should be supplied with samples containing two organic compounds.

4. **G**. any material mentioned in the syllabus.

B.Sc. DEGREE (CBCSS) BOTANY PROGRAMME

SEMESTER VI -(COMBINED) PRACTICAL

BOT6CEBB(P): CELL MOLECULAR BIOLOGY AND EVOLUTION

&

BIOTECHNOLOGY AND BIOINFORMATICS

Time 3 hours **Marks 40**

1. Make acetocarmine squash preparation of the root tips (A) supplied and identify any two stages of mitosis (5)
   Preparation (1)
   Identification (1x2)
   Labelled Diagrams. (1x2)
2. Identify the meiotic stage in the figure/photograph (B). Write a note on the meiotic stage in B. (3) Identification (1)
   Note (2)
3. Work out the problem C (3)
4. Immobilize whole cells / plant tissue (D)in alginate beads (2) Procedure / working (1)
   Results (1)
5. Extract the DNA from plant material (E) using suitable methods (4)
   Requirements (1)
   Working (2)
   Results (1)
6. Sterilize the given explant (F) and inoculate in to the medium supplied. Write down the sequential steps you have followed including the concentration of sterilant and time of sterilization and finial size of the inoculum used. (5)
   Steps followed (2)

Working (3)

7. Comment on G & H (2+2) (4)
8. Using molecular visualization tool Rasmol show the information of given protein I (Insulin/ Haemoglobin) (4)

   Set up the colour of background (Rasmol – Background colour) (1)
   Display $H_{2\ bond}$ /Disulphide bond (1)
   Display the labels specified (amino acids) (1)
   Display the protein structure in model specified (1)

9. Viva voce (based on the practicals) (2)
10. Record (8)

Instruction –Key

1. Preference should be given for metaphase and anaphase stage . Onion root tips may be given
2. Photographs and diagrams of mriotic division may be provided
3. Elementary problems on DNA structure and replication.
4. Yeast cells /any plant tissue (meristem) can be provided
5. Suitable plant material (onion, cauliflower etc.) can be given.
6. Shoot tip/ Stem/Leaf, Nodal segment can be given as explants.
7. Equipment used in Genetic Engineering, Photographs or chemicals,Tools in Genetic Engineering / procedures or protocols/ Home page of NCBI/ Icon of Rasmol /Photographs and diagrams of cell division anomalies like lagging chromosomes, Chrmosome bridge, aneuploidy, polyploidy are to be provided
8. Tool for Rasmol has to be installed in the computer provided to the students

. DEGREE B.Sc (CBCSS) BOTANY PROGRAMME

SEMESTER VI (COMBINED) PRACTICAL

BOT6MLBP(P): MYCOLOGY, LICHENOLOGY AND PLANT PATHOLOGY
&
BRYOLOGY, PTERIDOLOGY, GYMNOSPERMS & PALEOBOTANY

Time 3 hours Marks 40

1. Make suitable micropreparations of A, B and C and identify giving reasons

Preparation	1	
Labeled Diagram	2	
Identifying Characters	1.5	
Identification	0.5	(5 X 3 = 15)

2. Make micropreparations and compare the stelar types of E and F

Identification of two stelar types	1	
Comparison	1	(2 X 1 = 2)

3. Prepare a bed for Oyster mushroom (G) cultivation.

Preparation	2	(2 X 1 = 2)

4. Prepare Bordeaux mixture (H) and write the concentration of the ingredients

Concentration of ingredients	1	
Preparation	2	(3 X 1 = 3)

5. Spot at sight. I, J, K,L

Major group	0.5	
Generic name	0.5	
Part displayed	0.5	(1.5 X 4 = 6)

6. Identify the plant disease M.

Name of the disease	1	
Causative organism	1	(2 X 1 = 2)

7. Viva voce (based on the practicals) (2)
8. Record (8)

Instructions and Key

1. Specimens from Fungi, Bryophytes, Pteridophytes and Gymnosperms. Care should be taken not to provide more than one specimen from a group
2. Stem/Rhizome of Pteridophytes
3. Materials for bed preparation have to be provided.
4. Materials for Bordeaux mixture have to be provided.
5. Specimens from Fungi, Bryophytes, Pteridophytes and Gymnosperms. Reproductive/ vegetative structures of the types prescribed in the syllabus.
6. Diseased plant materials or herbarium of any one plant deceases mentioned in the syllabus

B.Sc. DEGREE (CBCSS) BOTANY PROGRAMME
SEMESTER VI (COMBINED) PRACTICAL
BOT6ASGP(P): ANGIOSPERM MORPHOLOGY, SYSTEMATIC BOTANY AND ECONOMIC BOTANY&GENETICS, PLANT BREEDING AND HORTICULTURE

Time 3 hours **Marks 40**

1. Identify the specimens **A** to the respective family giving key characters at each steps (5)

(Identification - 1; Characters up to series – 1 Family character- 3)

2. Describe the flower **B** in technical terms. Draw the VS, Construct the floral diagram and write the floral formula. (2)
   (Description - ½; VS - ½; Floral Diagram - ½; floral formula - ½)

3. Identify the inflorescence and fruit of **C**&**D.** (1 x 2 = 2)

4. Identify the herbarium specimens $\mathbf{E_1}$ &$\mathbf{E_2}$ by their binomial and family.
   (Binomial - ½; Family ½) (1 x 2 = 2)

5. Identify the product/part by binomial, family & morphology of the useful part of **F** and **G** (1 x2= 2)

6. Submit 25 herbarium and a duly certified field book. (2)

7. Write the binomial and ethno botanical use of the material **H** (1)

8. Work out the problem **I** (5)

9. Match the karyotype with the phenotype in **J** and identify the genetic disorder and make comments on the karyotype and phenotype. (3)

10. Conduct emasculation/budding/grafting/layering on material **K** and draw a diagram and label it (4)

11. Identify the garden design/garden implement L and comment on it (2)
12. Viva voce (based on the practical (2)
13. Record (8)

Instructions and Key

1. Materials from taxonomy
2. Flower or bud
3. Any one from syllabus
4. Herbarium
5. Materials having economic importance mentioned in the syllabus
6. Herbarium preparation
7. Materials having ethanobotanic importance mentioned in the syllabus
8. Genetics problems.
9. Genetics
10. Materials for emasculation or budding
11. Photograph of any garden components given in the syllabus

Complementary Course

B.Sc. BOTANY PROGRAMME

SEMESTER –I COMPLEMENTARY COURSE –I BOT1CGPP

CRYPTOGAMS, GYMNOSPERMS AND PLANT PATHOLOGY

(Theory: 36 hrs; Practical: 36 hrs) (Theory credit 2 Practical Credit 1)

Module-1 **28 hours**

Cryptogams

1. Viruses :General account, structure of Tobacco Mosaic Viruses (TMV), mode of infection- T phages 2 hrs

2. Bacteria: Classification, structure, nutrition chemosynthesis, respiration, reproduction(binary fission). Economic importance – agriculture, industry and medicine. Archaebacteria. 2 hrs

3. Algae (Phycology)Classification, main features of structure, and life history of the following groups

Cyanophyceae: *Nostoc*
Chlorophyceae :*Volvox*
Oedogonium
Cladophora
Phaeophyceae : *Ectocarpus*
Rhodophyceae: *Polysiphonia*
Economic importance of Algae (general account) 8 hrs

4. Fungi (Mycology**) :**Classification, main features of structure, and life history of the following groups.

Phycomycetes : *Phytophthora*
Ascomycetes : *Peziza*
Basidiomycetes: *Puccinia*
Economic importance of Fungi (general account) 7 hrs

5 Lichens (Lichenology**):** Classification and general account.

Type *Usnea* : 2 hrs

6. Bryophytes (Bryology): General account of Bryophytes

Type: *Riccia* 3 hrs

7. Pteridophytes (Pteridology)**: G**eneral account of Pteidophytes

Type: *Selaginella* 4 Hrs

Module-2Gymnosperms

General account of Gymnosperms

Type: *Cycas* 4 hrs

Module-3Plant Pathology **4** Hrs

1. Classification of plant diseases on the basis of causative organism and symptoms

2. Study of the following diseases with name of disease, causative organisam, symptoms and control measures:
   a. Nut fall of Arecanut
   b. Bacterial blight of Rice
   c. Leaf mosaic of Tapioca

PRACTICAL **36 Hrs**

Student should be able to

1. Identify Cryptogamic and Gymnosperm specimens and their parts prescribed in the syllabus; make micro-preparations wherever necessary
2. Identify plant diseases mentioned in the syllabus.

Suggested additional topics

1. The five kingdom classification – proposed by Whittaker (1969)
2. Advanced anatomical and reproductive characters of Gnetum

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15. Pandey B. P(2007), College Botany Vol II, S. Chand and Company
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BOT1CGPP- CRYPTOGAMS, GYMNOSPERMS AND PLANT PATHOLOGY

(Maximum Marks = 60)

MODULE	HOURS	Part A 1 Mark (8/8)	Part B 2 Marks (6/10)	Part C 4 Marks (4/6)	Part D 12 Marks (2/4)	TOTAL MARKS 60
1	28	7	7	3	3	69
2	4	1	1	2	-	11
3	4	-	2	1	1	18

B. Sc. BOTANY (C.B.C.S.S.) DEGREE EXAMINATION

SEMESTER I COMPLEMENTARY COURSE 01

BOT1CGPP- CRYPTOGAMS, GYMNOSPERMS AND PLANT PATHOLOGY

Time: Three Hours **Maximum: 60 Marks**

Part A

Answer all questions.(Each question carries 1 mark.

1. What is meant by a coenobium? Give an example.
2. Differentiate between anisogamy and oogamy.
3. Describe the rhizoids in *Riccia*.
4. What are cap cells?
5. Explain mycelium and hyphae.
6. What is alternation of generation?
7. Explain why bryophytes are called amphibians of plant kingdom.
8. What are coralloid roots?

(8X1=8marks)

Part B

Answer any six questions. Each question carries 2 marks.

9. Write a short note on the morphology of rhizophore.
10. Explain the process of branching in *Cladophor*a.
11. Describe the symptoms of Bacterial blight of rice.
12. Explain the pigments in algae.
13. Write notes on the industrial uses of fungi.
14. Differentiate nanandrous and macrandrous forms in *Oedogonium*.
15. What are the xerophytic adaptations of *Cycas* leaf?
16. Explain the general features of Bryophytes
17. Distinguish between homospory and heterospory with examples.
18. How plant diseases are classified based on causative organisms.

(6X2=12 maks)

Part C

Answer any four questions. Each question carries 4 marks.

19. Give an account on the symptoms, causative organism and control measures of Leaf Mosaic of Tapioca.
20. What are the characters of Lichens?

21. Describe the sexual reproduction in *Volvox*.
22. Give an account on the male and female reproductive features of *Cycas*.
23. Describe the structure of apothecium in *Usnea.*
24. Explain the characteristic features of Gymnosperms.

(4X4 = 16 marks)

Part D

Answer any two questions. Each question carries 12 marks

25. Describe the economic importance of bacteria.
26. Explain with diagram the sexual reproduction in *Selaginella*.
27. Give an account on the different types of thallus organization in Algae
28. Write an essay on the disease Nut Fall of Arecanut.

(2X12 = 24 marks)

B.Sc. BOTANY PROGRAMME

SEMESTER –II COMPLEMENTARY COURSE –II

BOT2PP: PLANT PHYSIOLOGY

(Theory 36 hours, Practicals 36hours)Theory credit 2 Practical Credit 1

Module 1 10 hours

1. Water relations of plants: (a) Physical aspects of water absorption –imbibition, diffusion and osmosis. Plant cell as an osmotic system. Diffusion pressure deficit, water potential, plasmolysis (b) Mechanism of absorption of water. Active and passive absorption. (4 hrs)
2. Transpiration – types, structure and mechanism of stomtal transpiration, (theories) significance and factors affecting transpiration, antitranspirants, Guttation. (4 hrs)
3. Stress Physiology – Water and salt stress,adaptations (2 hrs)

Module 2 (14 hrs)

Photosynthesis: Structure of chloroplast, Pigments, Red drop and Emerson's enhancement effect: Two pigments systems, light and dark reaction C_3 – C_4 and CAM mechanisms. Factors affecting Photosynthesis: External and Internal, photo respiration.

Module 3 (12 hrs)

1. Translocation of organic solutes: Path and mechanism of Translocation, Munch mass flow hypothesis. (3 hrs)
2. Nitrogen fixation, Nitrogen Cycles. (2 hrs)
3. Dormancy of seeds, factors causing dormancy, photoblastisms, techniques to break dormancy, germination – mobilization of food reserves, physiology of fruit ripening. (2 hrs)

4 Growth and Movements: Sigmoid curve, measurement of growth, regions of growth, general account of natural growth hormones, synthetic auxins (brief account) effect of ABA. Senescence and Abscission. Tropic and nastic movements with reference to geotropism, phototropism,. Seismonastic and nyctinastic movements. Photoperiodism and Vernalization. (5 hrs)

PRACTICAL 36 hours

Student should be trained to carry out or demonstrate the following experiments

Core Experiments:

1) Determination of osmotic pressure by plasmolytic method
2) Separation of Chlorophyll pigments by paper chromatography.
3) Effect of carbon dioxide concentration on the rate of photosynthesis by *Hydrilla* plants
4) Demonstration of osmosis using plant membrane

Demonstration Experiments:

1 .Determination of transpiration under different environmental conditions using Ganong's / Farmer's Potometer

2. Relation between transpiration and absorption
3. Evolution of O_2 during photosynthesis
4. Light screen expt.
5. Mohl's experiment
6. Experiment with variegated leaf
7. Measurement of growth using Arc Auxanometer
8. Experiment with Kleinostat.
9. Effect of hormones on growth

(36 hrs)

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BOT2PP- PLANT PHYSIOLOGY

(Maximum Marks = 60)

MODULE	HOURS	Part A 1 Mark (8/8)	Part B 2 Marks (6/10)	Part C 4 Marks (4/6)	Part D 12 Marks (2/4)	Total Marks
1	10	3	2	2	1	27
2	14	2	3	2	1	28
3	12	3	5	2	2	45

B. Sc. BOTANY (C.B.C.S.S.) DEGREE EXAMINATION
SEMESTER II COMLEMENTARY COURSE 02
BOT2PP- PLANT PHYSIOLOGY

Time: Three Hours **Maximum: 60 Marks**

Part A

Answer all questions. Each question carries 1 mark

1. What is diffusion?
2. Differentiate wall pressure and turgor pressure.
3. Describe the light reaction.
4. What is red drop?
5. Explain nitrogen cycle.
6. What is a phytohormone?
7. Explain imbibition.
8. What are antitranspirants?

(8x1=8marks)

Part B

Answer any six questions. Each question carries 2 marks.

9. Write a short note on plant movements.
10. Explain the process of guttation.
11. Describe the term DPD.
12. Explain a hydathode.
13. Write notes on pigment systems.
14. Differentiate auxins and cytokinins.
15. What are the factors causing seed dormancy?
16. Explain the symbiotic method of nitrogen fixation.
17. Distinguish between endosmosis and exosmosis.
18. How nitrogen is important for plants?

(6x2=12 marks)

Part C

Answer any four questions. Each question carries 4 marks

19. Give an account on vernalization.
20. What are the characters of C4 plants?
21. Describe the structure of chloroplast with a neat labelled diagram.
22. Give an account on stress physiology.

23. What is photoperiodism? Describe long day plants and short day plants.
24. Explain the various nastic movements.

(4x4 = 16 marks)

Part D

Answer any two questions. Each question carries 12 marks.

25. Describe the CAM pathway.
26. Explain the theories and process of translocation of organic solutes.
27. Give an account on transpiration. Why is it considered a necessary evil?
28. Write an essay on Plant Movements.

(2x12 = 24 marks)

B.Sc. DEGREE (CBCSS) EXAMINATION

B.Sc. ZOOLOGY PROGRAMME – SECOND SEMESTER

COMPLEMENTARY BOTANY PRACTICAL COURSES 1&2

BOT2CGPP(P) – CRYPTOGAMS, GYMNOSPERMS, PLANT PATHOLOGY & PLANT PHYSIOLOGY

Time : 2 Hours **Maximum : 40 Marks**

1. Make suitable micropreparations of A and B. Stain and mount in glycerine, draw, label the parts and identify giving reasons.
   (Preparation -2, Diagram – 1, Identification – 0.5, Reasons – 1.5)
   5X2 = 10 marks

2. Identify C with diagrams and reasons.
   (Identification – 1, Reasons – 1 & Labelled diagram – 1) 3 marks

3. Identify D,E, F and G.
   (Genus – 0.5, Part displayed – 0.5) 4x1 = 4 marks

4. Write notes on pathological interest of H.
   (Name of disease – 0.5, Causative organism – 0.5 & Symptoms – 1) 2 marks

5. Conduct experiment I. Write the Requirements, Aim and Procedure.
   (Requirements – 1, Aim – 1, Working – 3 & Procedure – 2) 7 marks

6. With suitable diagram, write the aim and working of the experiment J.
   (Aim – 1, Working – 2 & Diagram – 1) 4 marks

7. Viva 2 mark
8. Record 8 marks

KEY TO SPECIMENS

A & B – Fungi, Bryophyte, Pteridophyte & Gymnosperms.

C – Specimen from Algae.

D,E,F& G - Fungi, Lichen, Bryophyte, Pteridophyte and Gymnosperms.

H – Any Plant Disease.

I – From list of Core Experiments.

J – From Demonstration Experiments.

B.Sc. BOTANY PROGRAMME
SEMESTER –III COMPLEMENTARY COURSE –03

BOT3ATE:ANGIOSPERM TAXONOMY AND ECONOMIC BOTANY

(Theory 54 hours; Practical 36 hours)(Theory credit 3 Practical Credit 1)

Module 1.Angiosperm Taxonomy (Theory 36 hours; Practical 24 hours)

1. Importance of plant classification, types of classification, binomial nomenclature; ICBN, cytotaxonomy, chemotaxonomy. 4 Hrs

2. Herbarium techniques :Field study, field note, vasculum, plant press, disinfecting and mounting, labeling, importance of herbarium. 3 Hrs

3. Bentham and Hooker's system of classification. 3 Hrs

4. Morphology of Angiosperms – flowers, inflorescence, fruits 4 Hrs

5. Study of the following families of Bentham and Hookers system of classification with special reference to major identifying characters and economic importance : Annonaceae, Malvaceae, Rutaceae, Leguminosae, Apiaceae (Umbelliferae), Rubiaceae, Asteraceae, Apocynaceae, Lamiaceae (Labiatae), Euphorbiaceae, Arecaceae (Palmae), Poaceae (Gramineae). 22 Hrs

Module 2.Economic Botany(Theory 18 hours, Practical 12 hours)

1. Classification of economic plants based on their uses. (Cereals, legumes and pulses. tuber crops, spices, beverages etc.) 3 Hrs

2. Study of the following economic plants with special reference to their botanical name, family, morphology of useful part, economic products and uses. 10 Hrs

   Cereals : Paddy, Wheat.

   Pulses : Green gram, Bengal gram.

Tuber crops	: Tapioca.
Spices	: Pepper, Cardamom.
Beverages	: Tea, Coffee.
Oil yielding plants	: Coconut, Groundnut
Fibre yielding plants	: Cotton, Coir.
Timber yielding plants	: Teak, Rose wood.
Latex yielding plants	: Para rubber.
Bio pesticides	: Neem, Tobacco.
Ornamental plants	: Rose, Orchids, Anthurium.

3. Study of the following medicinal plants with special reference to their binomial, family, morphology of useful parts and uses. 5 Hrs

   1. *Adhatoda*, 2. *Aloe*, 3. Brahmi (*Bacopa*),4. *Catharanthus*, 5. *Eclipta*, 6. Neem,7. *Ocimum*, 9. *Phyllanthus amarus*, 9. *Rauvolfia*, 10. *Sida*.

PRACTICALS **36 hours**

1. Students should be able to identify typical plants belonging to the families prescribed in the syllabus. They should be able to describe the floral parts in technical terms.

2. Students should study the botanical name, family, morphology of the useful part and the uses of the plants listed in the syllabus.

Suggested additional topics

1. Classification of Angiosperms proposed by Adolf Engler, John Hutchinson and Arthur Cronquist.
2. Origin of agriculture and crop plants; centers of origin of crop plants proposed by N.I Vavilov.
3. Ethnobotany – significance and methods of ethnobotanical research.

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BOT3ATE:ANGIOSPERM TAXONOMY AND ECONOMIC BOTANY

(Maximum Marks - 60)

Module	**Hours**	**Part A (1 Mark) (8/8)**	**Part B (2 Marks) (6/10)**	**Part C (4 Marks) (4/6)**	**Part D (12 Marks) (2/4)**	**Total Marks**
1	36	4	8	5	4	88
2	13	4	2	1	0	12

BOTANY (C.B.C.S.S.) DEGREE EXAMINATION

SEMESTER –III COMPLEMENTARY BOTANY COURSE

BOT3ATE: ANGIOSPERM TAXONOMY AND ECONOMIC BOTANY

Time: 3 hrs **Maximum Marks:60**

Part A

Answer all questions. Each question carries one mark.

1. What is an aggregate fruit?
2. Name the type of Androecium in Asteraceae.
3. Mention the fruit type of family Rutaceae.
4. What is the binomial of green gram?
5. Who proposed binomial nomenclature?
6. Write the binomial; of Brahmi
7. Give any two examples for spices
8. Any two uses of Sida (8 x 1 = 8 marks)

PartB

Answer any six questions. Each question carries two marks.

9. Write the salient features of family Rubiaceae.
10. Describe the inflorescence of family Labiatae.
11. Distinguish between Umbel and Corymb.
12. What is aestivation?
13. Describe Caryopsis.
14. Describe the androecium of the family Malvaceae.
15. What is Chemotaxonomy?
16. What are dry dehiscent fruits?
17. Write the binomial family useful part of rice.
18. Write the binomial, family , and uses of Coffee

(6 x 2 = 12 marks)

Part C

Answer any four questions. Each question carries four marks.

19. Describe various types of placentation seen in Angiosperms.
20. Compare and contrast Androecium in Malvaceae and Rutaceae
21. Describe the floral characters of Malvaceae
22. Explain different systems of classification; give one example for each
23. Write the binomial, family and morphology of useful part of any three medicinal plants
24. Explain papilionaceous corolla

(4 x 4 = 16 marks)

Part D

Answer any twoquestions. Each question carries twelve marks.

25. Describe the floral characters of Asteraceae. Mention four evolved characters of the family.
26. Describe Bentham and Hooker's system of classification. List out its merits and demerits.
27. Compare the vegetative and floral characters of the three subfamilies of Leguminosae.
28. Write an essay on different types of inflorescence. (12 x 2=24 marks)

B.Sc. BOTANY PROGRAMME
SEMESTER –IV COMPLEMENTARY COURSE 04

BOT4AAB:ANATOMY AND APPLIED BOTANY

(Theory 54 hours; Practical 36 hours) Theory credit 3 Practical Credit 1

Module 1: Anatomy (Theory 30 hours; Practical 24 hours)

1. Cell types, electron microscopic studies on plant cell – living and non living inclusions, cell wall – ultra structure of cell wall (brief account only) 4 Hrs
2. Tissues: simple and complex; meristems, secretary tissues. 4 Hrs
3. Cambium: origin, structure, function, role in budding and grafting. 2 Hrs
4. Primary structure of stem and root in dicots and monocots 3 Hrs
5. Secondary thickening in dicot stem and dicot root; growth rings, heart wood and sap wood; hard wood and soft wood; ring porous wood and diffuse porous wood, Anomalous secondary thickening in *Bignonia*. 5 Hrs
6. Anatomy of monocot and dicot leaf. 3 Hrs
7. Ecological anatomy: Study of the morphological and anatomical adaptations of the following groups; Hydrophytes (*Nymphaea*), Xerophytes (*Nerium*), Epiphytes (*Vanda*) and Halophytes (*Avicinia/ Rhizophora*). 9 Hrs

Module 2:Applied Botany (Theory 24 hours)

1. Plant breeding: Objectives, sexual and asexual reproduction; apomixis, apogamy, apospory,amphimixis, parthenogenesis, parthenocarpy, polyembryony. 5 Hrs
2. Methods of plant improvement
   a. Plant introduction, acclimatization plant quarantine.
   b. Selection: Mass selection; pureline selection and clonal selection.
   b. Hybridization; intervarietal, interspecific and intergeneric; procedure of hybridization. 5 Hrs

3. Special methods of plant breeding.

   a. Mutation breeding.

   b. Polyploidy breeding. 3 Hrs

4 Horticultural practices
Propagation through cutting, layering, budding and grafting 5Hrs

5 Tissue culture
Principles, techniques and applications; culture media, asepsis, callus, organogenesis, somatic embryogenesis, anther culture, artificial seeds.

PRACTICALS

a.Types of tissue – simple and complex.

b. Primary structure of stem and root of dicots and monocots.

c. Structure of dicot stem and dicot root after secondary thickening.
d. Anomalous secondary thickening in *Bignonia.*
e. Anatomy of monocot and dicot leaf.
f. Morphological and anatomical adaptations of Hydrophytes (*Nymphaea* petiole), Xerophytes (*Nerium* leaf), Epiphytes (Velamen root of *Vanda*), Halophyte (Pneumatophore and vivipary of *Avicinia* or *Rhizophora*).
g. Emasculation of pea or *Caesalpinia* flower.
h. 'T'budding , approach grafting, air layering.
i. Demonstration of tissue culture techniques: culture media, callus induction and organogenesis..

Suggested additional topics

1. Anomalous secondary thickening in monocots.
2. Wood – seasoning, properties and uses.
3. Industrial uses of cellulose.
4. Contributions of Dr. Norman S. Borlaug and Dr. M.S. Swaminathan in the field of green revolution

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1. Christopher, E.P. 1958. *Introductory Horticulture*. McGraw – Hill, New York.
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6. Pandey, B.P. 1984. *Plant Anatomy*. S. Chand and Company , New Delhi.
7. Vasishta, V.C. 1978. *Plant Anatomy*. S. Nagin and Company, Jallundhur.

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BOT4AAB:ANATOMY AND APPLIED BOTANY

(Maximum Marks - 60)

Module	**Hours**	**Part A (1 Mark) (8/8)**	**Part B (2 Marks) (6/10)**	**Part C (4 Marks) (4/6)**	**Part D (12 Marks) (2/4)**	**Total** Marks
1	36	4	6	3	2	52
2	13	4	4	3	2	48

BOTANY (C.B.C.S.S.) DEGREE EXAMINATION, OCTOBER, 2016

SEMESTER –IV COMPLEMENTARY BOTANY COURSE

BOT4AAB: ANATOMY AND APPLIED BOTANY

Time: 3 hrs **Max.Marks:60**

Part A

Answer all questions. Each question carries one mark

1. What are Raphides
2. Describe tonoplasm
3. Who proposed totipotency of plants
4. Name the scleride with the shape of branched hair?
5. Define aposopry?
6. Epical cell theory
7. What is plant quarentine
8. Explain hetrosis (8 x 1 = 8 marks)

PartB

Answer any six questions. Each question carries two marks.

9. What are the functions of endoplasmic reticulum..
10. Draw and label a bordered pit
11. . List out the reason for polyembryony.
12. Why growth rings are not prominent in Teak wood
13. Briefly explain periderm formation .
14. Explain the structure of simple and complex tissues.
15. Give an account of glandular tissues seen in plants.
16. Explain mutation breeding?
17. Write on acclimatization.
18. Explain the objectives of plant breeding.

(6 x 2 = 12 marks)

Part C

Answer any four questions. Each question carries four marks.

19. Compare the anatomy of a dicot leaf with that of a monocot leaf.
20. What are the different methods of crop improvement? Explain briefly.
21. What are the applications of tissue culture?
22. Describe secondary thickening in dicot root.
23. Explain polyploidy breeding.
24. Explain the function and formation of cambium.

(4 x 4 = 16 marks)

Part D

Answer any two questions. Each question carries twelve marks.

25. With the aid of diagram, explain anomalous secondary thickening in Bignonia stem.
26. Explain the principle, techniques, and application of tissue culture.
27. Explain the steps involved in hybridization.
28. Write morphological and anatomical adaptations seen in xerophytes and hydrophytes**.**

(12 x 2=24 marks)

B.Sc. ZOOLOGY PROGRAMME

SEMESTER –IV Practical Course Complementary Botany3&4(Combined)
BOT4ATEAAB(P): ANGIOSPERM TAXONOMY, ECONOMIC BOTANY ANATOMY AND APPLIED BOTANY

Time 3 hours **Marks-40**

Questions

I. Assign **A** to its family giving diagnostic characters.

Name of the family	1	
Diagnostic characters	3	4X1= 4marks

2. Draw L.S. Construct floral diagram and write the floral formula of **B**

L.S of the flower	2	
Floral diagram	1	
Floral formula	1	4X1= 4marks

3. Identify **C** and **D** Write notes

Identification	½	
Reason	1½	1½ X 2=3marks

4. Write the binomial, family and morphology of the useful part of**E** and**F**

Binomial	1	
Family	½	
Morphology	½	2X2= 4marks

5. Make stained transverse section of specimen **G**, mount in glycerin and identify giving diagnostic characters.

Preparation	3	
Diagram	2	
Identification with characters	3	8X1= 8marks

6. Identify the given T S of the material **H** 1 1x1= 1 mark

7. Identify the cell inclusion '**I**' with reason. 1 1x1= 1 mark

8. Assign **'J'** to the ecological group with reasons.

Ecological group	½	
Reasons	1½	2X1= 2 marks

9. Carry out emasculation / budding / grafting / layering in '**K**'

Demonstration	2	
Aim & procedure	1	3X1= 3marks

10. Viva 2 marks

11. Record 8 marks

Key to Specimens

I. **A:** typical plant twigs with flowers included in the syllabus from different subclasses of dicotyledons.

II. **B:** Fresh large flowers included in the syllabus.

III **C** frominflorescences, D from fruits

IV. **E**and **F:** Economic Botany specimens included in the syllabus.

V**.** **G :**Stem or Root – Normal secondary thickening or Anomalous

secondary thickening in *Bignonia*

VI. **H:** Slides of Primary Structure of Stem or Root**.**

VII. I: Non living inclusion (cystolyth/ raphide)

VIII. **J:** Specimens from ecological group mentioned in the syllabus.

IX **K:** Suitable materials for emasculation/ budding / grafting/ layering