

KONGUNADU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
COIMBATORE – 641 029



DEPARTMENT OF BOTANY (UG)

CURRICULUM AND SCHEME OF EXAMINATIONS
(CBCS)

(2026 – 2027 onwards)

KONGUNADU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
COIMBATORE – 641 029

DEPARTMENT OF BOTANY

VISION

- Disseminate knowledge and feasible strategies for obtaining sustainable benefits from plants and their utility to the society

MISSION

- Designing the curriculum by frequently updating the syllabi according to the present need.
- Preparing the students with more aptitude, skill and leadership quality by educating them.
- Make the students as entrepreneurs in plant based industries.
- Identification and encouragement to turn the students into eminent Scientists/Laurels.

PROGRAMME OUTCOMES (PO)

PO1

- ❖ Botany has immense carrier potential in areas such as Taxonomy, Genetics, Cell Biology, Biotechnology, Pharmaceuticals, Agriculture, Forestry and Environmental Science.

PO2

- ❖ Students get an ample opportunity to enrich scientific knowledge on botanical and ecological dimension of many plants and to study the species richness of the plant kingdom.

PO3

- ❖ Students were able to acquire knowledge and understand the range of plant diversity in terms of structure, function and environmental relationship from primitive to highly evolved plant groups of various life forms.

PO4

- ❖ Gain introductory experience on various biochemical pathways and their role in plant systems

PO5

- ❖ Apply contextual knowledge on the importance of ethical environmental principles, norms and consequent responsibilities relevant to biodiversity conservation practice and sustainable use of plants.

PO6

- ❖ Address the socioeconomic challenges related to plant sciences and to disseminate knowledge on various aspects of medicinal plants and appropriate considerations on human health problems.

PO7

- ❖ Knowledge on conservation of natural bio-resources and various other hotspots augment students to explore their therapeutic values economically, culturally and aesthetically.

PO8

- ❖ Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and development of information to provide valid conclusions.

PROGRAMME SPECIFIC OUTCOMES (PSO)**PSO1**

- ❖ Students can gain knowledge on the local and scientific names, recognize the plant and microbial diversity, present status, resource conservation and related environmental issues and comprehend the relationships between lower and higher taxa of plants, fossils and living plants along their relationships with the environment.

PSO2

- ❖ Students gain and understand the fundamental knowledge and skills in plant sciences, including basic categorization, anatomical features, the complex interactions with other plants, organisms and the environment.

PSO3

- ❖ Students can attain knowledge on measurable skills, statistical, instrumental, computational analyses, the nature of basic elements in physical and chemical sciences, their interactions and their applications for the benefit of life, techniques concerning ethics for improving the societal and environmental benefits of important edible, medicinal, ornamental, and industrial plants.

PSO4

- ❖ Students will expand sufficient knowledge on plant identification, distribution, plant diseases, causative organisms and preventive measures as well as relatively significant intellectual knowledge on biology to become entrepreneurs in the cultivation, necessary property rights/legal frameworks and marketing of economically important micro and macro plant species.

PSO5

- ❖ Students will acquire the capacity to understand basic and modern techniques, and practical exposures in the fields of internal organization of plants, cellular and molecular organization, plant processes, proficiency in in-vitro techniques like plant molecular biology, genetics, plant tissue culture, plant biotechnology and nanobiology, interpretation of data, and development of reports to provide valid conclusions.

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Programme Name: **B.Sc., Botany**

Curriculum and Scheme of Examination under CBCS

(Applicable to the students admitted during the Academic Year 2026-2027 and onwards)

Semester	Part	Subject code	Title of the Paper	Instruction Hours / Cycle	Exam. Marks			Duration of Exam.(hours)	Credit
					CIA	ESE	Total		
I	I	26TML101	Language I @	6	25	75	100	3	3
	II	26ENG101	English – I	6	25	75	100	3	3
	III	26UBO101	Core Paper 1- Plant Diversity – I	7	25	75	100	3	5
			Core Practical 1	2	-	-	-	-	-
		26UZO1A1	Allied Paper -1 Zoology – I	5	20	55	75	3	4
			Allied Practical - Zoology – I	2	-	-	-	-	-
	IV	26EVS101	Environmental studies**	2	-	50	50	3	2
	Total			30	-	-	425	-	17
II	I	26TML202	Language II @	6	25	75	100	3	3
	II	26ENG202	English – II	6	25	75	100	3	3
	III	26UBO202	Core Paper 2 - Plant Diversity - II	7	25	75	100	3	5
		26UBO2CL	Core Practical 1	2	40	60	100	3	2
		26UZO2A2	Allied Paper - 2 - Zoology – II	5	20	55	75	3	4
		26UZO2AL	Allied Practical - Zoology	2	20	30	50	3	2
	IV	26VED201	Value Education - Moral and Ethics**	2	-	50	50	3	2
	Total			30	-	-	575	-	21
III	I	26TML303	Language III @	6	25	75	100	3	3
	II	26ENG303	English – III	6	25	75	100	3	3
	III	26UBO303	Core Paper 3 – Anatomy and Embryology of Angiosperms	5	25	75	100	3	4
			Core Practical 2	2	-	-	-	-	-
		26UCH3A3	Allied Paper - 3 - Chemistry – 1	4	20	55	75	3	4
			Allied Practical – Chemistry	3	-	-	-	-	-
	IV	26UGC3S1	Skill Based Subject –I Basics of Cyber Security	2	100	-	100	3	3
		26TBT301/ 26TAT301/ 26UHR3N1	Basic Tamil* / Advanced Tamil**/ Non Major Elective - I**	2	-	75	75	3	2
	Total			30	-	-	550	-	19
IV	I	26TML404	Language IV @	6	25	75	100	3	3
	II	26ENG404	English IV	6	25	75	100	3	3
	III	26UBO404	Core Paper 4- Cytology, Genetics and Plant Breeding	5	25	75	100	3	4

		26UBO4CM	Core Practical 2	2	40	60	100	3	2
		26UCH4A4	Allied Paper - 4 - Chemistry – 2	4	20	55	75	3	4
		26UCH4AL	Allied Practical - Chemistry	3	20	30	50	3	2
	IV	26UBO4S2	Skill based subject - 2 Plant Tissue Culture – Concepts and Applications	2	25	75	100	3	3
		26TBT402/ 26TAT402 26UWR4N2	Basic Tamil*/ Advanced Tamil**/ Non Major Elective-II **	2	-	75	75	3	2
	Total			30	-	-	700	-	23
V	III	26UBO505	Core Paper 5 - Fundamentals of Computer and Bioinformatics	4	25	75	100	3	4
		26UBO506	Core Paper 6 - Taxonomy of Angiosperms and Economic Botany	4	25	75	100	3	4
		26UBO507	Core Paper 7 – Plant Ecology, Phytogeography and Resource Conservation	4	25	75	100	3	4
		26UBO508	Core Paper 8 - Biophysics and Biostatistics	4	25	75	100	3	4
		26UBO5CN	Core Practical 3	2	40	60	100	3	2
		26UBO5CO	Core Practical 4	5	40	60	100	3	3
		26UBO5E1	Major Elective 1	5	25	75	100	3	5
	IV	-	EDC - Extra Departmental course	2	100	-	100	3	3
		26UBO5IT	Internship Training****	Grade					
Total			30	-	-	800	-	29	
VI	III	26UBO609	Core Paper 9 – Biochemistry and Bioinstrumentation	7	25	75	100	3	5
		26UBO610	Core Paper 10 - Plant Physiology	6	25	75	100	3	5
		26UBO611	Core Paper 11- Microbiology and Plant Pathology	5	25	75	100	3	4
		26UBO6CP	Core Practical 5	5	40	60	100	3	3
		26UBO6E2	Major Elective- 2	5	25	75	100	3	5
		26UBO6Z1	Project & Viva – Voce ***	-	20	80	100	-	5
		26UBI6S3	Skilled Based Subject 3- Basics of Intellectual Property Rights	2	100	-	100	3	3
			Total	30	-	-	700	-	30
	V	26NCC ⁵ /NSS/ YRC/PYE/ECC/ RRC/ WEC101 [#]	Co curricular Activities*	-	50	-	50	-	1
Grand Total				-	-	-	3800	-	140

Note:

CBCS – Choice Based Credit system
CIA – Continuous Internal Assessment
ESE – End of Semester Examinations

^{\$}For those students who opt NCC under Co-curricular activities will be studying the prescribed syllabi of the UGC which will include Theory, Practical & Camp components. Such students who qualify the prescribed requirements will earn an additional 24 credits.

@Hindi/Malayalam/ French/ Sanskrit - 26HIN/MLM/FRN/SAN101 - 404

* - No End-of-Semester Examinations. Only Continuous Internal Assessment (CIA)

** - No Continuous Internal Assessment (CIA). Only End-of-Semester Examinations (ESE)

*** - Project Report - 60 marks; Viva-voce - 20 marks; Internal - 20 marks

**** The students shall undergo Internship training / field work for a minimum period of 14 working days at the end of the fourth semester during summer vacation and submit the report in the fifth semester which will be evaluated for 100 marks by the concerned guide and followed by an Internal Viva voce by the respective faculty or HOD as decided by the department. According to their marks, the grades will be awarded as given below.

Marks %	Grade
85-100	O
70-84	D
60-69	A
50-59	B
40-49	C
<40	U (Reappear)

Major Elective Papers

(4 papers are to be chosen from the following 10 papers)

1. Forestry
2. Biotechnology
3. Food Science
4. Seed Biology
5. Pharmacognosy
6. Horticulture
7. Mushroom Cultivation Technology
8. Medicobotany
9. Introduction to Industry 4.0
10. Industrial Botany

Non-Major Elective Papers

1. Human Rights
2. Women's Rights
3. Consumer Affairs

Sub code & Title of the Extra Departmental Course (EDC)

26UBO5X1 - Medicinal Botany and Human Welfare

List of Co-Curricular Activities:

1. National Cadet Corps (NCC)
2. National Service Scheme (NSS)
3. Youth Red Cross (YRC)
4. Physical Education (PYE)
5. Eco Club (ECC)
6. Red Ribbon Club (RRC)
7. Women Empowerment Cell (WEC)

Note: In core/allied subjects, no. of papers both theory and practical are included wherever applicable. However, the total credits and marks for core/allied subjects remain the same as stated below:

Tally Table:

S. No.	Part	Subject	Marks	Credits
1.	I	Language - Tamil/Hindi/Malayalam/ French/ Sanskrit	400	12
2.	II	English	400	12
3.	III	Core - Theory/Practical	1600	60
		Allied	400	20
		Elective/Project	300	15
4.	IV	Basic Tamil / Advanced Tamil (OR) Non-major electives	150	4
		Skill Based subject	300	9
		Extra Departmental Course (EDC)	100	3
		Environmental Studies	50	2
		Value Education	50	2
5.	V	Co-curricular Activities	50	1
		Total	3800	140

- 100 % CIA for Basics of Cyber Security, EDC and Basics of IPR.
- The students should complete **Health and Wellness Programme (26UHW401)###** in the **4th semester** and the completion marks should be submitted through the HoD to the Controller of Examinations. Extra credits will be given to the candidates who have successfully completed.
- The students may be encouraged to complete any **MOOC course available for Online learning platforms like SWAYAM, NPTEL, Coursera^{\$\$}, IIT Bombay Spoken Tutorial, e-Pathshala etc.**, before the completion of the **5th semester** and the course completion certificate should be submitted through the HoD to the Controller of Examinations. Appropriate credits will be given to the candidates who have successfully completed.
- ^{\$\$}**Note:** One course to be taken from coursera for all the under graduate students. **Appropriate extra credits@@@** and certification as applicable shall be awarded to the students who have completed the course.

- @@@**Note:** Course Duration

Duration	Extra Credits
< 10 hours	0
> =10 hours and < = 20 hours	1
> 20 hours	2

- An **Onsite Training** preferably relevant to the course may be undertaken as per the discretion of the HoD.
- Extra credits shall be awarded for innovative products/ individual paper presentations and publications in reputed national/ international proceedings and in indexed journals by the UG Students for their original research contributions.
- Product development through Technology Readiness Levels:
- Phase 1 Level (TRL 1-3): Basic research: 1 credits
 - Phase 2 Level (TRL 4 -6): Development and validation : 2 credits
 - Phase 3 Level (TRL 7-9): Deployment: 3 credit
- National / International level paper presentation in conferences and publications of full papers in reputed Scopus/ web of Science indexed journals
- National Level : 1 credit/ paper
 - International Level : 2 credits/ paper
 - Open access Journals are not included
- Extra credits shall be awarded to students who prefer to opt any course out of their programme on self-learning mode. No internal components. 100% ESE.

Teaching Pedagogy

Smart Class Room / Power point presentation/Seminar/Quiz/Discussion/Flipped Classroom/Peer Learning/Experimental Learning/Blended learning

Flipped Classroom

Preamble:

- Under flipped classroom model, students review foundational content before class, with class time dedicated to practice, discussion, and problem – solving where the role of the teachers will be facilitating discussions and enabling students to embark on a holistic learning perspectives

Work instructions:

- One flipped session / unit is made mandatory and the course In-charge shall identify and specify the topic to be covered in the flipped session in the lesson plan.
- Detailed session plans must be intimated to all students at least one week in advance.
- Curated content such as LORs, video lectures, animations, and other relevant digital content shall be provided to students in advance to facilitate effective preparation for the flipped classroom session.

Peer Learning

Preamble:

- Peer Assisted learning enables students to learn from each other sharing knowledge in a collaborative learning environment.

- Development of leadership skills and student engagement through student to student academic support.
- Reduce drop out/failure rates of the students and create a supportive academic culture where a high performing or trained student assists peers academically.

Work Instructions:

- Course In-charge shall supervise the programme by periodically reviewing its implementation, conducting review meetings, and monitoring the progress reports.
- Course In-charge shall identify 5 to 6 fast learners based on their academic performance in internal and external examinations.
- Course In-charge shall also identify students who require additional academic support and assign 4 to 5 such students to each fast learner to facilitate peer learning.
- This team will operate remedial classes on a peer learning mode as per the following:
 - a) One session / week / course and each session shall be for 30 minutes in duration, with follow-up learning activities.
 - b) The faculty In-charge shall review attendance records and monitor the academic progress of the students.

Blended learning

Preamble:

- Blended learning integrates traditional in class instruction with digital tools exposing students to a myriad options for learning from subject experts across the globe
- It is provided with online learning sessions on recorded videos, lecture captured sessions (included under guided library hours), digital resources, and guided sessions facilitated by internal faculty members and external experts through Zoom meets etc.,

Work Instructions:

- For every course, students will be motivated to attend additional webinar/online courses through any interactive learning tools such as, telepresence systems, podcasts, interactive videos etc. with minimum of 2 sessions/course and maximum of 3 sessions/course.

Components of Continuous Internal Assessment (CIA)

Components		Marks	Total
Theory			
CIA I	75	(75+75 = 150/10) converted to 15	25
CIA II	75		
Objective capacity Testing */Seminar		5	
Attendance		5	
Practical			
CIA Practical		25	40
Observation Notebook		10	
Attendance		5	
Project			
Review		15	20
Regularity		5	

Components of Continuous Internal Assessment (Allied):

Components		Marks	Total
Theory			
CIA I	55	(55+55) converted to 10	20
CIA II	55		
Objective Capacity Testing*/Seminar		5	
Attendance		5	
Practical (Allied) (External: 30 marks)			
CIA Practical	External: 30 Marks (30 converted to 10)		20
Observation Notebook	5		
Attendance	5		

* Objective Capacity Testing:

- For the first assessment, questions shall be set from 2 ½ units (25 questions) and evaluation for 5 marks. The assessment shall be conducted through any authentic online platform, one week prior to the commencement of I CIA theory examinations.
- For the second assessment, questions shall be set from 2 ½ units (25 questions) and evaluation for 5 marks. The assessment shall be conducted through any authentic online platform, one week prior to the commencement of II CIA theory examinations.
- The average of the first and second assessment scores shall be considered for the final **5 marks** allocation.

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

**K1 - Remembering; K2 - Understanding; K3 - Applying; K4 - Analyzing;
K5 - Evaluating**

1. ESE Theory Examination - Part I, II & III

(i) CIA I & II and ESE: 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1 Q1 to 10	A (Answer all)	10 x 1 = 10	MCQ	75
K1 – K5 Q11 to 15	B (Either or pattern)	5 x 5 = 25	Short Answers	
K2 - K5 Q16 to 20	C (Either or pattern)	5 x 8 = 40	Descriptive / Detailed	

(ii) CIA I & II and ESE: 55 Marks (Allied):

Knowledge Level	Section	Marks	Description	Total
K1 Q1 to 10	A (Answer all)	10 x 1 = 10	MCQ	55
K2 – K4 Q11 to 15	B (Either or Pattern)	5 x 3 = 15	Short Answers	
K2 - K5 Q16 to 20	C (Either or Pattern)	5 x 6 = 30	Descriptive/ Detailed	

2. ESE Practical Examination:

Knowledge Level	Section	Marks	Total
K3	Experiments & Record Work	50	60
K4		10	
K5			

ESE Practical Examination (Allied):

Knowledge Level	Section	Marks	Total
K3	Experiments & Record Work	25	30
K4		05	
K5			

3. ESE Project Viva Voce:

Knowledge Level	Section	Marks	Total
K3	Project Report & Viva voce	60	80
K4		20	
K5			

Scheme of Evaluation - Health and Wellness Programme (26UHW401)^{###}

Part	Description	Mark
A	Report	40
B	Attendance	20
C	Activities (Observation during Practice)	40
Total		100

**KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)
COIMBATORE - 641029**

**THE MODALITIES FOR THE CONDUCT OF 100% CIA
EXAMINATIONS**

PREAMBLE

As per the recommendations of the Curriculum Development Cell in its meeting held on 27.08.2021, and decision taken in the General Board of Studies meeting held on 16.03.2022, the courses **Cyber Security and Information Security** were introduced in the III semester for all the UG programmes and in the even semester for the PG programme respectively for the students admitted from the academic year 2022-2023 and onwards. Also, it was unanimously decided to conduct 100 % CIA examinations (No End of Semester Examinations) for these courses. The name of the Courses Cyber Security and Information Security are renamed as **Basics of Cyber Security** and **Fundamentals of Information Security** as per the decision taken in the General Board of Studies meeting held on 26.03.2026 for the students to be admitted from the academic year 2026-2027 & onwards. As per the recommendations of the Curriculum Development Cell in its meeting held on 07.03.2022, it was approved in the BOS meeting held on 19.03.2022 to conduct 100% CIA Examinations for the **Extra Departmental Courses** offered in the UG and PG Programmes for the students admitted from the academic year 2022-2023 and onwards. The cited decisions had been approved by the Academic council in its meeting held on 18.04.2022. As per the recommendations of the Curriculum Development Cell in its meeting held on 27.02.2024, and decision taken in the General Board of Studies meeting held on 02.05.2024, the course **Basics of IPR** was introduced in the VI semester for all the UG programmes for the students admitted from the academic year 2024-2025 and onwards and decided to conduct 100 % CIA examinations (NO End of Semester Examinations) for the course.

Hence, the modalities is recommended for the following:

- (i) Conduct of I & II CIA Examinations
- (ii) Question Paper Pattern
- (iii) CIA Examination Mark Breakup
- (iv) Attendance Calculation

CONDUCT OF I & II CIA EXAMINATIONS

1. The CIA Examinations I & II for the above said courses must be conducted along with the other courses under centralized system.
2. The students must appear I & II CIA Examinations compulsorily, since **End of Semester Examinations will NOT be conducted** for the above said courses.
3. If any of the student (s) could not appear for CIA Examinations for the above said courses, with reasons mentioned in the College Calendar, re-examination shall be conducted as per the existing procedures.

QUESTION PAPER PATTERN

The following question paper pattern will be followed for the above said courses:

Section A - Multiple Choice	(10 × 1 = 10 Marks)
Section B - Either or Type	(5 × 5 = 25 Marks)
Section C - Either or Type	(5 × 8 = 40 Marks)

Maximum Marks : 75

Duration : 3 Hours

CIA EXAMINATION MARK BREAKUP

The CIA Examination mark breakup for the courses **Basics of Cyber Security, Fundamentals of Information Security and Basics of IPR** is given below:

S.No.	Distribution Component	Marks
1	CIA I – 75 Marks Converted to 30	30
2	CIA II – 75 Marks Converted to 30	30
3	Seminar/Objective Capacity Testing	10
4	Seminar/Objective Capacity Testing	10
5	Attendance	05
6	Any Case Study related to Cyber Security (as a Group)	15
	Total	100

The CIA Examination mark breakup for the **Extra Departmental Courses** offered for UG/PG Programmes is given below:

S.No.	Distribution Component	Marks
1	CIA I – 75 Marks Converted to 40	40
2	CIA II – 75 Marks Converted to 40	40
3	Seminar/Objective Capacity Testing	05
4	Seminar/Objective Capacity Testing	05
5	Attendance	05
6	Others (Group Discussion, Flipped Class room, etc.,)	05
	Total	100

ATTENDANCE CALCULATION

1. Separate attendance register must be maintained for **Basics of Cyber Security, Fundamentals of Information Security and Basics of IPR** in the Department and the final consolidated Attendance must be submitted to the COE along with the assessment Marks.
2. The attendance must be calculated by using the following formula:
$$\text{Attendance percentage} = \frac{\text{Number of Classes attended}}{\text{Number of Classes conducted}} \times 100$$
3. The students should be allowed to write the CIA examinations as per the existing norms related to attendance. The staff in charge of the respective courses have the responsibility to calculate the attendance percentage and submit the same to the Coordinator of the CIA Examination Committee during the I CIA and II CIA Examinations.
4. If the staff in charge finds that students have not put up enough attendance during the I CIA Examinations, he/she shall counsel the student(s) appropriately so that at the end of the course they have sufficient Attendance.




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**MODALITIES FOR THE CONDUCT OF OPEN BOOK EXAMINATION
SYSTEM FOR THE COURSES BASICS OF CYBER SECURITY AND
FUNDAMENTALS OF INFORMATION SECURITY FOR ALL UG AND
PG PROGRAMMES RESPECTIVELY**

PREAMBLE

The Curriculum Development Cell (CDC) meeting was convened on 16.10.2025 and recommended to implement an open book examination system for the courses, Basics of Cyber Security and Fundamentals Information Security for all UG and PG programmes to improvise conceptual understanding skills, promote deep learning, enhance assessment quality and strengthen comprehensive skills, for the students to be admitted from the academic year 2026-2027 and onwards.

1.Purpose

To provide guidelines for conducting open book examinations that encourage critical thinking, application of knowledge, and analytical skills.

2.Scope

Applicable to Basics of Cyber Security and Fundamentals of Information Security courses for the undergraduate and postgraduate programmes respectively.

3. Examination Guidelines

Question Paper Design

- ❖ Questions should be Focused on higher-order thinking (analysis & evaluation)
- ❖ Avoid direct recall questions

Communication to Students and Staff Members

- ❖ Inform students in advance about the format, rules, and allowed resources.

- ❖ Provide sample questions to familiarize them with the OBE style.
- ❖ All the Staff members should be familiar about the prescribed Books of the Basics of Cyber Security and Fundamentals of Information Security.
- ❖ Students are permitted to carry the prescribed Books (in original or xerox copy) duly signed by the respective staff in charge of courses to the examination Hall.
- ❖ Invigilators of the respective examination halls should permit the students with the prescribed book (in original or xerox copy) and not to allow the students with other than the prescribed Books.




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**MODALITIES FOR THE CONDUCT OF 100% CIA FOR THE ONE
CREDIT SELF- STUDY COURSE AND THE MARK DISTRIBUTION
PATTERN FOR THE PART III THEORY PAPER OF APPLICABLE
COURSE**

PREAMBLE

The Curriculum Development Cell (CDC) meeting was convened on 16.10.2025 and recommended to have one credit Self Study Course for applicable programmes in both UG & PG programme in the V and II semester respectively for the students to be admitted from the academic year 2026-2027 and onwards.

In order to foster independent learning, enhance academic flexibility, and encourage students to explore knowledge, the institution introduces the One Credit Self Study Course. This initiative is designed to provide students with an opportunity to pursue structured self-learning during the regular programme of study.

The one credit Self Study Course for applicable UG & PG programme in the V and II semester respectively, for the students admitted from the academic year 2026-2027 and onwards.

1. CIA COMPONENTS FOR ONE CREDIT COURSE

CIA shall be conducted by the department concerned.

CIA I	50 (Converted to 10)	20	25
CIA II	50 (Converted to 10)		
Case Study		5	

QUESTION PAPER PATTERN

Duration : 2 Hours

Knowledge Level	Section	Marks	Description	Total
K1 Q1 to Q6	A (Answer all)	6 x 1 = 6	MCQ	50
K2 – K4 Q7 to Q 10	B (Either or pattern)	4 x 5 = 20	Short Answers	
K2 – K5 Q11 to Q 13	C (Either or pattern)	3 x 8 = 24	Descriptive / Detailed	

2. PART III THEORY APPLICABLE COURSE

(CIA : 20 MARKS, ESE : 55 MARKS)

CIA: 20 Marks

CIA I	55	(55+55)	20
CIA II	55	Converted to 10	
Objective Capacity Testing /Seminar		5	
Attendance		5	

ESE : 55 Marks**QUESTION PAPER PATTERN**

Knowledge Level	Section	Marks	Description	Total
K1 Q1 to 10	A (Answer all)	10 x 1 = 10	MCQ	55
K2 – K4 Q11 to 15	B (Either or pattern)	5 x 3 = 15	Short Answers	
K2 – K5 Q16 to 20	C (Either or pattern)	5 x 6 = 30	Descriptive / Detailed	




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**KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)
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**THE MODALITIES FOR THE CONDUCT OF 100% CIA PRACTICAL
EXAMINATIONS (For EDC Courses)**

CONDUCT OF 100% CIA PRACTICAL EXAMINATIONS

1. The Students shall appear for **TWO** CIA practical examinations which are evaluated as 100% internal examinations.
2. The students must appear **TWO** CIA practical examinations compulsorily, since End of Semester examinations will NOT be conducted for the above said course.
3. If any of the student(s) could not appear for CIA Examinations, as per reasons mentioned in the College Calendar, re-examination shall be conducted as per the existing procedures and norms.

The CIA Practical Examination mark breakup for the Extra Departmental Courses (EDC) offered for the UG & PG Programme is given below:

S.No.	Component Distribution	Marks
1.	CIA Practical I – 60 marks converted to 30	30
2.	CIA Practical II – 60 marks converted to 30	30
3.	Continuous assessment of practical (Observation to be submitted*) (15 Experiments/Programs x 2 = 30 marks)	30
4.	Record	05
5.	Attendance	05
Total		100

* In case a student is absent for an Experiment/Program conducted on a particular day, the student will not be allowed to compensate that Experiment/Program and will be awarded zero for that particular Experiment/Program and shall be marked absent. In case any student has an attendance lack; the concerned faculty handling the course in consultation with HoD may permit the student who has an attendance lack to compensate one or two Experiment/Programs as the case may be to enable them to become eligible with mandate of 75% attendance to appear for the Continuous Internal Practical Examinations. However the compensated Experiment/Programs will not be awarded any marks whatsoever.



PRINCIPAL

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Kongunadu Arts & Science Col
Coimbatore - 641 029

**KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)
COIMBATORE – 641029**

**MODALITIES FOR THE AWARD OF APPROPRIATE EXTRA CREDIT
TO THE STUDENTS WHO PREFER TO OPT ANY COURSE OUT OF
THEIR PROGRAMME ON SELF LEARNING MODE**

PREAMBLE

The Curriculum Development Cell (CDC) meeting was convened on 16.10.2025 and recommended to motivate the students to opt any course(s) other than their core programme of study (theory papers only) through self-learning mode and extra credits can be awarded on their successful completion. However, such students availing this option shall not opt for any of the 100% CIA courses. This skill set will broaden intellectual horizons, foster holistic and integrative learning and equip diverse skill sets. This is applicable for the students to be admitted from the academic year 2026-2027 and onwards.

1. Semester Restriction:

Students may choose the courses offered only within their current semester. Courses beyond the semester in which they are enrolled shall not be permitted.

2. Course Type:

Only **theory courses** may be opted under this provision. Practical courses, Extra Departmental Courses (EDC), and courses assessed entirely through Continuous Internal Assessment (CIA) shall not be eligible.

3. Evaluation Method:

A **100% End of Semester Examination (ESE)** shall be conducted for the chosen course.

4. Marks & Scheme:

The ESE shall be conducted in accordance with the marks prescribed for the particular course in the approved scheme, along with its corresponding credit allocation.

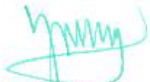
5. **Conversion of Marks:**

The marks obtained by the student in the ESE shall be converted to a scale of **100 marks** for uniformity.

6. **Award of Credits:**

The credits allotted to the course in the scheme shall be transferred to the student as **Extra Credit**, provided the student secures the prescribed pass mark in the ESE.




PRINCIPAL

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Kongunadu Arts & Science College
Coimbatore - 641 029

Programme Code: 05		B.Sc., BOTANY			
Core Paper 1: PLANT DIVERSITY – I					
Batch 2026-2027	Semester I	Hours / Week 7	Total Hours 105	Credits 5	Skill Development

COURSE OBJECTIVES

- To acquire knowledge on evolution of Thallophytes and to know about the diversity patterns of lower life forms on earth.
- To understand the distribution, structure, reproduction and life cycle patterns of lower life forms like algae, fungi and lichens.
- To know the economic value aspect of lower organisms.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO1	Know about the distribution and mode of nutrition of algal and fungal species
	CO2	Differentiate, identify and classify the algal species using algal pigments and to study the structure, reproduction and life cycle patterns of algae.
	CO3	Gain thorough knowledge on the symbiotic nature of fungi associated with tree species and improve soil fertility
	CO4	Apply knowledge on the involvement and beneficial aspects of fungi to mankind.
K5	CO5	Apply their knowledge on the involvement of lichens as the indicators of pollution

SYLLABUS

UNIT I

(21 HOURS)

Phycology: Introduction and detailed study of habits, habitats and distribution. Algal components, Fritsch system of Classification, 1945 (Outline). Detailed study of occurrence, thallus structure, reproduction and life cycle of Cyanophyceae – *Nostoc*, Chlorophyceae – *Volvox*, *Caulerpa*.

UNIT II

(21 HOURS)

Phycology: Occurrence, thallus structure, reproduction and life cycle of Bacillariophyceae – *Diatoms*; Phaeophyceae – *Saragassum*; Rhodophyceae – *Polysiphonia*. *Economic importance of algae.

UNIT III

(21 HOURS)

Mycology - General characters - Structure and reproduction. Outline classification of fungi by Alexopoulos and Mims (1979) Detailed study of occurrence, structure, reproduction and life cycle of Oomycetes - *Albugo*, Zygomycetes – *Pilobolous*.

UNIT IV**(21 HOURS)**

Mycology - Occurrence, thallus structure, reproduction and life cycle of Ascomycetes – *Saccharomyces*, Basidiomycetes – *Puccinia*, Deuteromycetes – *Cercospora*. Economic importance of Fungi. Mycorrhizae and their significance.

UNIT V**(21 HOURS)**

Lichenology: Study of habits and habitats, functional role of Phycobionts and Mycobionts. Outline classification of lichens by Alexopoulos and Mims (1979). Thallus anatomy and reproduction of Ascolichen. Economic importance of Lichens*

*** Self study****TEXTBOOKS**

1. Gangulee, Das & Kar. 2001. College Botany Vol. II. New central Book agency Pvt. Ltd., Calcutta.
2. O.P. Sharma (2002) Text book of Fungi. Tata McGraw-Hill Publications, New Delhi.
3. B.R. Vashishta, A.K. Sinha, V.P. Singh, Botany for Degree Students: Algae (Revised Ed. 2020/2021), S. Chand Publications, New Delhi
4. B.R. Vashishta, (1998). The Algae. S. Chanda & Company, New Delhi
5. C.L. Chopra, (2021). Algae. S. Chanda & Company, New Delhi

REFERENCE BOOKS

1. O.P. Sharma, Textbook of Thallophytes: Algae, Fungi, Bacteria, Lichens, Viruses (2nd Ed., 2023/2025), MedTech Science Press, New Delhi.
2. G.M. Smith, (1955) Cryptogamic Botany. Algae and Fungi Vol. I M. Vadamalai media Pvt. Ltd. Bangalore
3. F.E. Fritsch, (2011) The structure and reproduction of Algae Vol. I & II.
4. Watson (1974) Structure and life cycle of Bryophytes. B.I. Publications, New Delhi.
5. O.P. Sharma, Fundamentals of Algae (2024/2026) 3rd Edition, McGraw Hill Education (India) Publisher, New Delhi.
6. E.A. Bessey, (1971) Morphology and Taxonomy of Fungi. Hafner Publication Company, New York.
7. K.S. Bilgrami, and R.N. Verma, (1978) Physiology of Fungi. Vikas Publishing House.
8. B.R. Vashista, Dr. A.K. Sinha and V.P. Singh, (2013) Botany- Algae, S. Chand and Company Ltd, New Delhi
9. Constantine J. Alexopoulos, Charles W. Mims, and Meredith Blackwell (reprint, 2018) Introductory Mycology, 4th Edition. Wiley India Pvt. Ltd. Noida.

WEB RESOURCES:

1. <https://uou.ac.in/sites/default/files/slm/MSCBOT-502.pdf>
2. <https://uou.ac.in/sites/default/files/slm/BSCBO-104.pdf>
3. <http://www.vpscience.org/materials/Algae.pdf>
4. <https://mariomairal.com/wp-content/uploads/2020/12/Phycology-Robert-Edward-Lee.pdf>
5. https://www.dbscience.org/wp-content/uploads/2022/08/Classification-of-Fungi-Sem-I-Paper-II-Unit-I_compressed.pdf
6. <http://eagri.org/eagri50/PATH171/lec03.pdf>

7. https://www.researchgate.net/profile/Amol-Deshmukh-3/publication/348214383_2Fungi_General_characters_reproduction_and_nomenclature/link/s/5ff3f91892851c13feeb5a18/2Fungi-General-characters-reproduction-and-nomenclature.pdf8.
8. <http://www.vpscience.org/materials/Fungi%20general%20characters.pdf>
9. <https://egyankosh.ac.in/bitstream/123456789/16691/1/Unit-12.pdf>
10. <https://dthingcollegeonline.co.in/attendance/classnotes/files/1588754032.pdf>

MAPPING

CO \ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	L	H	S	M
CO2	H	M	S	H	S
CO3	H	H	M	S	H
CO4	S	M	H	S	M
CO5	S	H	M	S	H

S - Strong

H - High

M - Medium

L - Low

Content Prepared by (Based on Inputs) Dr. P. Revathi Signature of the Course in-charge	Signature of the HOD
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Programme Code: 05		B.Sc., BOTANY			
Core Paper: 2 - PLANT DIVERSITY – II					
Batch 2026-2027	Semester II	Hours / Week 7	Total Hours 105	Credits 5	Skill Development

COURSE OBJECTIVES

- To know about the diversity of Cryptogams and Phanerogams.
- To understand the life cycle patterns of Bryophytes, Pteridophytes and Gymnosperms.
- To study the fossil remains of plants belonging to various eras of Palaeobotany.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO1	Acquire knowledge on diversity among Bryophytes, Pteridophytes and Gymnosperms.
	CO2	Understand the internal structure and reproduction of Cryptogams and Phanerogams
	CO3	Apply the medicinal and economic aspect of Bryophytes, Pteridophytes and Gymnosperms for the benefit of human welfare.
	CO4	Implement knowledge on the structural organization and life cycle patterns of Gymnosperms
	CO5	Compare and evaluate the Cryptogamic and Phanerogamic characters along with fossil forms and their past evidences for the identification and determination of their age through radiocarbon dating.

SYLLABUS

UNIT I

(21 HOURS)

Bryophytes: Introduction and general characters of Bryophytes. Classification of Bryophytes (Smith, 1955). Occurrence, structure, reproduction and life cycle of *Marchantia*[#] and *Anthoceros*[#]. Economic importance of Bryophytes.

UNIT II

(21 HOURS)

Pteridophytes: Introduction and general characters of Pteridophytes. Classification of Pteridophytes (Riener, 1954). Occurrence, structure, reproduction and life cycle of *Lycopodium*[#] and *Equisetum*[#].

UNIT III

(21 HOURS)

Pteridophytes: Occurrence, structure, reproduction and life cycle of *Ophioglossum*[#] and *Adiantum*[#]. Vascular organization and Stelar evolution in Pteridophytes. Heterospory and Seed habit, Apogamy and Apospory. Economic importance of Pteridophytes*.

UNIT IV

(21 HOURS)

Gymnosperms: Introduction and general characters of Gymnosperms. Classification of Gymnosperms (Sporne, 1965). Detailed study of the structure and reproduction of *Cycas*[#] and *Gnetum*[#]. Economic importance of Gymnosperms.

UNIT V**(21 HOURS)**

Palaeobotany: Introduction, Geological time scale, fossilization and types. Radiocarbon dating. Study of the following fossils – *Rhynia*, *Lepidodendron*, *Lepidocarpon* and *Williamsonia*.

(Developmental studies are excluded)

* Self study

TEXT BOOKS

1. P.C Vashista (1992). Pteridophyta. Chand & Co., New Delhi.
2. B.P. Pandey (1981). Gymnosperms. Chand & Co., New Delhi.
3. P.C., Vashista, Sinha and Anil Kumar (2008). Text book of Bryophytes. Chand & Co., New Delhi.
4. Shukla and Mishra (1982). Essentials of Paleobotany. Vikas Publishing House, Pvt Ltd., New Delhi.
5. H.N.srivastava (2005). Bryophytes. Pradeep Publications, Jalandhar, India
6. H.N.srivastava (2005). Fundamentals Pteroidophytes. Pradeep Publications, Jalandhar, India
7. H.N.srivastava (2005). Gymnosperms. Pradeep Publications, Jalandhar, India

REFERENCE BOOKS

1. B.P. Pandey, (1994). A Text book of Botany - Pteridophyta. Chand & Co. New Delhi.
2. Rashid, (1995). An introduction to Pteridophytes. Vikas Publishing House, Pvt. Ltd., New Delhi.
3. K.R. Sporne (1980). Morphology of Petridophytes -B.I. Publications, New Delhi
4. G.M. Smith, (1955). Cryptogamic Botany Vol. II. Tata McGraw Hill Publications, New Delhi.
5. M.A., F.R.A. Seward (1991). Fossil Plants. Today and Tomorrows Printer and Published, New Delhi
6. K.R. Surange (1996). Botanical Monogrrpph no-4 Indian Fossil Pteridophytes, Council of Scientific and Industrial Research, New Delhi
7. V. Verma, (2010). Botany, Ane Book Pvt. Ltd., New Delhi.
8. A.C. Dutta, (2007). Botany, Oxford University Press, New Delhi

WEB RESOURCES

1. <https://www.biologydiscussion.com> › Pteridophytes
2. <https://www.biologydiscussion.com> › Plants
3. <https://www.biologydiscussion.com> › Biology
4. <https://unacademy.com> › ... › Biology
5. <https://www.sciencedirect.com> › topics › paleobotany

MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	H	S	M
CO2	S	M	H	H	M
CO3	H	L	S	M	H
CO4	S	H	M	H	M
CO5	S	M	H	S	M

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs) Dr. D. Moorthy Signature of the Course in-charge	Signature of the HOD
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Programme Code: 05		B.Sc., BOTANY			
Core Practical 1: PLANT DIVERSITY – I & II					
Batch 2026-2027	Semester I & II	Hours / Week 2	Total Hours 60	Credits 2	Skill Development

COURSE OBJECTIVES

- To enable students to know about the diversity of lower organisms.
- To understand the life cycle pattern of Bacteria, Virus, Algae, Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms and Palaeobotany.
- To study the fossil remains of plants in the division of Palaeobotany.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K3  K5	CO1	Understand the primitive and advanced nature of Thallophytes
	CO2	Appraisal of the morphological features of lower life form habitats
	CO3	Examine variations in structural organization and reproduction of Cryptogams
	CO4	Examine the internal structural organization of Cryptogams and Phanerogams
	CO5	Demonstrate the nature of occurrence and reproduction patterns of Lichens

SYLLABUS

I. PLANT DIVERSITY I

1. **Algae:** Internal and reproductive structures of the following: -

Nostoc
Volvox
Caulerpa
Diatoms
Sargassum
Polysiphonia

2. **Fungi:** Structure and reproduction of the following: -

Albugo
Pilobolous
Saccharomyces
Puccinia
Cersospora

3. **Examination of Mycorrhizal colonization in roots**

4. **Lichen:** Structure and reproduction of *Usnea*.

II. PLANT DIVERSITY - II

Structure and reproductive characters of the following: -

Bryophytes

Marchantia

Anthoceros

Pteridophytes

Lycopodium

Equisetum

Adiantum

Gymnosperms

Cycas

Gnetum

Palaeobotany

Rhynia

Lepidodendron

Lepidocarpon

Williamsonia

MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	S	H
CO2	H	S	H	H	M
CO3	S	H	M	S	S
CO4	S	H	S	S	M
CO5	S	S	M	H	M

S - Strong

H - High

M - Medium

L - Low

Content Prepared by (Based on Inputs) Dr. D. Moorthy Signature of the Course in-charge	Signature of the HOD
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KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)
COIMBATORE - 641 029

UG MODEL QUESTION PAPER (PRACTICALS)

End of semester Examination Question Paper Pattern

(For the candidates admitted from the academic year 2026-2027 onwards)

Time: 3 Hours

Max. Marks: 60 Marks

BREAK UP OF MARKS

Core Practical: 1 - PLANT DIVERSITY I & II

I	Micro-preparation	25 Marks
II	Identify the given specimen to its class and specify their general characters	08 Marks
III	Plant systematic position spotters	03 Marks
IV	Spotters (7 × 2)	14 Marks
Record		<u>10 Marks</u>
Total		<u>60 Marks</u>

Content Prepared by (Based on Inputs)	
Dr. D. Moorthy Signature of the Course in-charge	Signature of the HOD

Programme Code: 05		B.Sc., BOTANY			
Core Paper 3: ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS					
Batch 2026-2027	Semester III	Hours/Week 5	Total Hours 75	Credits 4	Entrepreneurship

COURSE OBJECTIVES

- To inculcate knowledge on tissues and anatomical features of plants
- To differentiate the primary and secondary anatomical structure of dicot and monocot plants
- To understand the key aspects of reproductive systems of flowering plants

COURSE OUTCOME

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO1	Know about the various developmental aspects of Angiospermic plants.
	CO2	Compare and identify the structural differences existing among the vascular plants.
	CO3	Acquire knowledge on secondary growth of Angiosperms.
	CO4	Imply the embryological and anatomical knowledge to differentiate the plant taxa.
K5	CO5	Recognize the evolutionary studies of dicot and monocot embryo

SYLLABUS

UNIT I

(15 HOURS)

Scope and significance of plant anatomy: Apical organization: Origin and structure of primary meristem (Angiosperm). Theories of Root Apical Meristem and Shoot Apical Meristem, Structure and function of simple tissues and complex tissues

UNIT II

(15 HOURS)

Epidermal tissue system: Stomata - types and functions; Trichomes - Types and functions, structure and functions of secretory trichomes in *Drosera* and *Nepenthes*, Types of external and internal secretory structures - salt gland, collectors, floral and extrafloral nectaries, resin duct, oil glands and laticiferous (articulated and non-articulated). Primary structure of dicot and monocot root, stem and leaf

UNIT III

(15 HOURS)

Vascular cambium and cork cambium: Structure and function. Secondary xylem and phloem: Structure and functions. Anomalous secondary growth: Dicotyledons – *Bougainvillea*, *Achyranthes*, *Mirabilis jalapa* and *Nyctanthes*, Monocotyledons - *Dracaena*. Types of Wood: Heart wood, Sap wood, Porous, non-porous, patterns and distribution, physical, chemical and mechanical properties and Annual rings. Plant fibres - Distribution, structure and commercial importance of coir, jute and cotton.

UNIT IV

(15 HOURS)

Embryology: Angiosperm life cycle*. Microsporangium: Structure and development of anther, wall of microsporangium, Tapetum - structure, types and functions, Pollen morphology – NPC formula, pollen wall features, pollen kit. Megasporangium: Structure, types of ovule, ultrastructure of mature embryo sac (*Polygonum*).

UNIT V

Fertilization: Double fertilization. Endosperm: Nuclear, Cellular, Helobial and Ruminate types, haustorial behavior of endosperm and function. Embryogeny: Types, Embryogeny in Dicotyledons (*Capsella bursapastoris*) and Monocotyledons (*Najas lacerata*). Polyembryony & Parthenocarpy: Classification, types and applications. Apomixis: types and significance.

* Self study

TEXT BOOKS

1. A. Fahn, (1982). Plant Anatomy. (3rd edition). Pergamon Press, Oxford.
2. B.P.Pandey, (1978). Plant Anatomy. Chand and Co, New Delhi.
3. K.Esau, (1985) - Anatomy of Seed Plants -John Willey
4. Singh, Pandey and Jain, (2007). Anatomy of Seed plants, Rastogi Publications. New Delhi.
5. S. S. Bhojwani, S. P. Bhatnagar, (1985). Embryology of Angiosperms, Vikas Publishing House, Noida.
6. P. Maheswari, (1950). Introduction to the embryology of Angiosperms. Vikas Publishing House, New Delhi.
7. Anatomy and Embryology of Angiosperms by Dr. V. Singh, Dr. P.C. Pande, Dr. D.K. Jain (Rastogi Publications)
8. Plant Anatomy and Embryology by Dr. Dharmendra (Academic Guru Publishing House, 2024)

REFERENCE BOOKS

1. De Roberties (1989). Cell and Molecular Biology. Mc Graw Hill, New Delhi.
2. Annie Regland (2000). Developmental Botany -Saras Publication, Kanyakumari
3. A. Fahn, (1985) Plant Anatomy. Pergamon Press, Great Britain.
4. K. Esau, (1991) Plant Anatomy. Wiley Eastern Ltd. New Delhi. 7th Edition
5. B. P. Pandey, (1985). Embryology of Angiosperms. S. Chanda and Company Ltd., New Delhi.
6. V. Raghavan, (1997). Molecular Embryology of Flowering Plants. Cambridge University Press, Cambridge.
7. B.M. Johri, (2011). Embryology of Angiosperms. Berlin Heidelberg, New York.
8. Annie Regland (PlantAnatomy and Microtechniques. Saras Publication, Kanayakumari (ISBN: ISBN-10: 9384826006; ISBN-13: 978-9384826000.

WEB RESOURCES

1. <https://nickrentlab.siu.edu/PlantAnatomyWeb/>
2. <https://uou.ac.in/sites/default/files/slm/BSCBO-202.pdf>
3. https://jrc.ac.in/working_folder/DOWNLOAD-D-12-180-618C09F7D0115.pdf
4. https://www.uomustansiriyah.edu.iq/media/lectures/6/6_2017_12_16!02_12_30_PM.pdf
5. <http://ngc.digitallibrary.co.in/bitstream/123456789/150/1/Plant%20Development>.
6. https://mis.alagappauniversity.ac.in/siteAdmin/ddeadmin/uploads/2/PG_M.Sc._Botony_346%2022_Plant%20Anatomy%20and%2

MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	M	H
CO2	H	H	M	S	M
CO3	S	H	S	H	H
CO4	H	S	H	M	M
CO5	M	H	S	H	H

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs) Dr. M. Parveen Signature of the Course in-charge	Signature of the HOD
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Programme Code: 05		B.Sc., BOTANY			
Core Paper 4: CYTOLOGY, GENETICS AND PLANT BREEDING					
Batch 2026-2027	Semester IV	Hours / Week 5	Total Hours 75	Credits 4	Skill Development

COURSE OBJECTIVES

- To learn the cellular details, cell organelles and their functions
- To acquire knowledge on genes and their interactions
- To gain knowledge on plant breeding methods and crop improvement programmes

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑	CO1	Understand the structural organizations of cells and their cellular mechanisms
	CO2	Understand and explain scientific principles behind nature and function of genes and their process of inheritance.
	CO3	Apply the acquired knowledge on character exchanges among the individuals due to crossing over.
	CO4	Understand the role of genetic mechanisms during evolution
K5 ↓	CO5	Study the techniques behind the production of superior crop varieties

SYLLABUS**UNIT I****(15 HOURS)**

Cytology: Cell Wall- Structure, function, biogenesis and growth, cell differentiation. Plasma Membrane - Membrane architecture, Plasmodesmata - Structure role in movement of molecules and macromolecules, comparison with gap junction, Cell Organelles - Mitochondria, Endoplasmic reticulum, Golgi apparatus, Chloroplast, Ribosome, Nucleus and Chromosomes.

UNIT II**(15 HOURS)**

Cytology: DNA as a genetic material, structure, properties, replication of DNA (Conservative, semi- conservative and dispersive methods) and functions. RNA - types and functions. Cell division - Cell cycle, Amitosis, Mitosis & Meiosis and their significances.

UNIT III**(15 HOURS)**

Genetics: Field of Genetics, Mendels experiments, Mendels laws of inheritance, monohybrid and dihybrid cross. Gene Interaction - Incomplete dominance, Codominance, Collaborator genes, Epistasis, Complementary genes, Duplicate genes and Lethal genes.

UNIT IV**(15 HOURS)**

Genetics: Multiple alleles – Blood groups in human, Rh factor, Linkage - Complete and incomplete, Crossing over - mechanism, kinds & controlling factors, Cytoplasmic inheritance in plants - male sterility in maize.

UNIT V**(15 HOURS)**

Plant Breeding: Introduction and Objectives, Breeding methods - Pureline selection, mass selection and clonal selection, Hybridization, Heterosis, *National and International Organizations for crop improvement, Achievements in crop improvement - Sugarcane and Cotton, Artificial Intelligence in Current breeding practices.

Self study*TEXT BOOKS**

1. Lodish et al: Molecular Cell Biology: Freeman & Co, USA (2004).
2. P.K. Gupta & M.S. Swaminathan. (2000). Cytology, Genetics and Evolution. Rastogi Publication, Meerut.
3. Alberts et al: Molecular Biology of the Cell: Garland (2002).
4. Cooper: Cell: A Molecular Approach: ASM Press (2000).
5. B.D. Singh, (2000). Plant Breeding-Principles and Methods. Kalyani Publishers, New Delhi.
6. Watson et al. Molecular Biology of the Gene. Pearson (2004).
7. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman (2004)
8. V. B. Rastogi (2016). Introductory Cytology, KedarNath & RamNath, Meerut
9. P. K.Gupta (2017). Biomolecules and Cell Biology, Rastogi Publication, Meerut
10. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons Inc., U.S.A. 5th edition.
11. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition.

REFERENCE BOOKS

1. H.K. Chaudhari, (2005). Elementary principles of plant breeding (25th Ed.). Oxford & IBH Publishing Co. (P) Ltd., New Delhi.
2. W. Edmund, L.C. Sinnott, Dunn and T. Dobzhansky. 1900. Principles of Genetics, 5th Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi.
3. Benjamin A. Pierce (2012). Genetics – A conceptual approach, W.H. Freeman and Company, New York, England.
4. Eldon J. Gardner, (2004). Principle of Genetics, John Wiley and Sons, New York.
5. S. Sundara Rajan. (2003). Introduction to Cell Biology, Vikas Publishing House Pvt. Ltd., New Delhi.
6. Gupta, P.K., (2007), Genetics Classical to Modern, Rastogi Publications, Meerut
- K. Sahoo (2017), Biomolecules and Cell Biology, Kalynai Publishers, New Delhi.

WEB RESOURCES

1. <https://plato.stanford.edu/entries/cell-biology/>
2. <https://education.nationalgeographic.org/resource/resource-library-cell-biology>
3. <https://www.cdc.gov/genomics/about/basics.html>
4. <https://learn.genetics.utah.edu/content/basics/>
5. <https://www.nifa.usda.gov/topics/plant-breeding>

MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	S	H
CO2	H	S	S	H	S
CO3	S	H	H	M	H
CO4	H	M	H	S	H
CO5	S	H	H	S	H

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs) Dr. R. Rekka Signature of the Course in-charge	Signature of the HOD
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Programme Code: 05		B.Sc., Botany			
Core Practical 2: ANATOMY, EMBRYOLOGY OF ANGIOSPERMS, CYTOLOGY, GENETICS AND PLANT BREEDING					
Batch 2026 – 2027	Semester III & IV	Hours/Week 2	Total Hours 60	Credits 2	Skill Development

COURSE OBJECTIVES

- To learn about the special structures associated with plants
- To obtain knowledge on primary, secondary and anomalous structures of plants
- To understand and solve the biological related problems

COURSE OUTCOME

K3 ↑ K5 ↓	CO1	Analyze various internal and external structures of the plants
	CO2	Dissect and examine different stages of embryos of <i>Tridax</i> plant
	CO3	Analyze the progress of cell division and their significance
	CO4	Understand basic principles of gene inheritance
	CO5	Demonstrate methods used in plant breeding

SYLLABUS**I. PLANT ANATOMY**

1. To study the stomatal index and different types of stomata
2. Localization of laticiferous cells of any Apocynaceae and Asclepiadaceae members
3. Primary structure of dicot and monocot root stem and leaf
4. Plant fibres - Cotton
5. Anomalous secondary thickening - Dicot – *Bougainvillea*, *Nyctanthus*, *Achyranthes*. and *Mirabilis jalapa*. Monocot - *Dracaena*

II. EMBRYOLOGY OF ANGIOSPERMS

1. Structure of pollen grains using whole mount (*Hibiscus*, *Catharanthus* species etc.,)
2. Calculate the percentage of germinated pollen grain by Hanging Drop Method (*Catharanthus*)
3. Dissection and display of any two stages of embryo in *Tridax*
4. Identification using permanent slides
 - i. T.S. of anther
 - ii. Morphology of pollen grains
 - iii. Types of ovules
 - iv. Ultrastructure of embryonic sac
 - v. Endosperm types
 - vi. Types of embryos
 - vii. Polyembryony

III. CYTOLOGY, GENETICS & PLANT BREEDING

1. Study of cell wall structure and cell organelles (plasma membrane, mitochondria, ER, Golgi apparatus, chloroplast, ribosomes, nucleus and chromosomes) through slides and photographs
2. Study of mitosis using onion root tip
3. Study of meiosis using *Rheo* flower buds
4. Simple problems in genetics (Monohybrid and Dihybrid cross, Incomplete dominance, Codominance, Collaborator genes, Epistasis, Complementary genes, Duplicate genes and Lethal genes)
5. Selection, mass selection and clonal propagation methods.
6. Emasculation technique

MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	H	H
CO2	H	M	H	S	M
CO3	S	H	M	H	H
CO4	S	H	M	H	S
CO5	S	H	S	S	M

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs) Dr. R. Rekka Signature of the Course in-charge	Signature of the HOD
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**KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)
COIMBATORE - 641 029**

UG MODEL QUESTION PAPER (PRACTICALS)

End of Semester Examination Question Paper Pattern

(For the candidates admitted from the academic year 2026-2027 onwards)

Time: 3 Hours

Max. Marks: 60 Marks

BREAK UP OF MARKS

**CORE PRACTICAL: 2 – ANATOMY, EMBRYOLOGY OF ANGIOSPERMS,
CYTOLOGY, GENETICS AND PLANT BREEDING**

I. Anatomy section (A & B)	- 12 Marks
II. Pollen germination Test (C)	- 06 Marks
III. Embryo dissection (D)	- 06 Marks
IV. Any two stages of Mitosis/Meiosis (E)	- 06 Marks
V. Genetics Problem (F& G)	-10 Marks
IV. Spotters (H, I, J, K & L)	- 10 Marks
Record	- 10 Marks
TOTAL	60 Marks

Content Prepared by (Based on Inputs)	
Dr. R. Rekka Signature of the Course In-Charge	Signature of the HOD

Programme Code: 05		B.Sc., BOTANY			
Core Paper: 5 - FUNDAMENTALS OF COMPUTER AND BIOINFORMATICS					
Batch 2026-2027	Semester V	Hours / Week 4	Total Hours 60	Credits 4	Skill Development

COURSE OBJECTIVES

- To acquire basic knowledge about computers
- To know how to create databases
- To impart knowledge on biological information's available in the databases

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO1	Inherit computer knowledge and internet usage.
	CO2	Understand the components of computers and usage of biological databases.
	CO3	Applying technical skills to know the sequences of nucleic acids and amino acids in genes and protein molecules.
	CO4	Identify the structure of various biomolecules using biomolecular visualization techniques.
	CO5	Evaluate evolutionary relationships using sequence alignments.

SYLLABUS**UNIT I****(12 HOURS)**

Introduction to Computers: Applications, Classification, Types, Evolution and Generations of Computers, and their Capabilities and Limitations. **Components of Computer System:** Basic Structure and Functional Units. **Hardware:** Central Processing Unit (CPU) – Structure and Functions; Input and Output Devices; Memory Units (Primary and Secondary memory); Auxiliary Storage Devices and their Types.

UNIT II**(12 HOURS)**

Computer Architecture and Software: Fundamentals of Computer Architecture and Number Systems. Classification of Software, including System and Application Software. Programming Languages, including Machine and High-Level Languages, along with translators such as Compilers and Interpreters. Overview of Operating Systems with emphasis on DOS and Windows environments.

UNIT III**(12 HOURS)**

Office Applications and Database Management: Overview of Windows (2011) Operating System and its Features. Introduction to MS Excel, including Preparation of Worksheets, Workbooks, and Charts. MS PowerPoint features and Creation of Slide Presentations. Concepts of Database Management, including Database Languages, Data Independence, and the Role of a Database Administrator. Introduction to Data Warehousing and Data Mining. Basic Concepts and Tools of Adobe Photoshop.

UNIT IV**(12 HOURS)**

Introduction to Bioinformatics and Omics Technologies: Fundamentals of Bioinformatics and Regulation of Gene Expression in Prokaryotes and Eukaryotes. **Genomics:** Definition, Basic Principles, Methodology, and Types (overview), including Structural, Functional, and Comparative Genomics, along with Epigenomics, Metagenomics, and Pharmacogenomics, and their Applications. **Proteomics:** Definition, Principles, and Methodology, with an outline of Types such as Expression, Functional, Structural, and Quantitative Proteomics, and their Applications.

UNIT V**(12 HOURS)**

Biological Databases and Computational Analysis: Importance and Classification of Biological Databases, including Primary and Secondary Databases. Gene Prediction Methods and Sequence Alignment, with emphasis on the Evolutionary Basis of Alignment, Global and Local Alignment approaches, and similarity searching using Scoring Matrices such as PAM and BLOSUM, along with Gap Penalties. Introduction to Biomolecular Visualization, Phylogenetic Analysis, and Computer-Aided Drug Design (CADD).

Self study*TEXT BOOKS**

1. Mani, K and N. Vijayaraj (2002). Bioinformatics for beginners. Kalaikathir Achakam, Coimbatore.
2. David W. Mount (2001). Bioinformatics -Sequence and Genome analysis. Cold Spring Harbor Laboratory Press.
3. V. Rajaraman, (2004). Fundamentals of computer. Prentice Hall of India Pvt Ltd.
4. Reema Thareja (2019). Fundamentals of Computers. Second Edition, Oxford University Press, Oxford, UK
5. Vinay Sharma, Ashok Munjal and Asheesh Shanker (2008). A Text Book of Bioinformatics, Rastogi Publications, Meerut, U.P. India
6. S. Harisha (2013). Fundamentals of Bioinformatics. R.K. International Pvt. Ltd., New Delhi, India

REFERENCE BOOKS

1. A.D. Baxevanis and B.J. Francis (Eds.). (1998). Bio-informatics - A practical guide to the analyzing of gene protein. John Wiley and sons.
2. Stuart M. Brown (2000). Bioinformatics- A biologists guide to bio computing and the internet. Eaton Publishing Co.
3. Arthor M. Lesk (2002). Introduction to Bioinformatics. Oxford University Press, UK. T.K. Attwood and Parry-Smith (2007).
4. Teresa k Attwood, David J. Parry-Smith and Samiron Phukan (2007). Dorging Kindersley (India) Pvt. Ltd., Nodia, India
5. D.R. Westhead, J.H. Parish and R.M. Wyman (2003). Instant Notes in Bioinformatics. BIOS Scientific Publishers, Milton Park, England
6. Pradeep K. Sinha and Priti Sinha (2004). BPB Publications, New Delhi

WEB RESOURCES

1. <https://www.slideshare.net/slideshow/ms-excel-ppt-presentation/16073919>
2. <https://www.gacbe.ac.in/pdf/ematerial/18BCS5EL-U5.pdf>
3. <https://www.hpuniv.ac.in/hpuniv/upload/uploadfiles/files/236.pdf>
4. <https://microbenotes.com/local-global-multiple-sequence-alignment/>
5. <https://microbenotes.com/genomics/>

MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	S	H
CO2	S	S	S	H	M
CO3	H	H	S	M	S
CO4	S	H	H	S	M
CO5	H	S	L	M	H

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs) Dr. P. Sumathi Signature of the Course in-charge	Signature of the HOD
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Programme Code: 05		B.Sc., BOTANY			
Core Paper 6: TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY					
Batch 2026-2027	Semester V	Hours / Week 4	Total Hours 60	Credits 4	Skill Development

COURSE OBJECTIVES

- To study morphology of Angiospermic plants
- To learn the technical terms / descriptors to know the morphological features
- To recognize plant families of major flowering plants and their diagnostic features.
- To acquire basic knowledge on the principles of phylogeny and biosystematics.
- To familiarize knowledge on plants with immense economic values.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO1	Understanding the systems of classification of Angiosperms, plant morphological terminologies and identifying morphological peculiarities
	CO2	Understand nomenclature principles of flowering plants and gain hands on experience on herbarium preparation techniques
	CO3	Recognize members of major Angiospermic families by identifying their diagnostic features
	CO4	Analyzing the comparative account among the families of Angiosperms
	CO5	Evaluate the economic and beneficial aspects of plants to human mankind

SYLLABUS

UNIT I

(12 HOURS)

Aims and objectives of taxonomy. Natural System of Classification (Bentham and Hooker, 1862- 1983), its merits and demerits. **Parts of Angiospermic plants** – Root and Stem: Characteristics, types and modifications; Leaf: parts, stipules, types, phyllotaxy, venation and modifications. Inflorescence: Racemose, Cymose and Special; Flower: structure and symmetry; Fruit and Seed: parts and classification, seed dispersal.

UNIT II

(12 HOURS)

Herbarium techniques and uses. Machine learning using Digitalized herbarium specimens. Botanical Survey of India; National herbarium - CNH - Regional herbarium - MH. Nomenclature - ICN, A J C Bose Indian Botanic Garden; Binomial - principles. Typification, Author citations, Effective and valid publication. Retention and rejection of names.

UNIT III

(12 HOURS)

Detailed study of the following families with reference to Morphology, Taxonomy and their economic importance. Annonaceae, Nymphaeaceae, Capparidaceae, Rutaceae, Anacardiaceae, Caesalpiniaceae, Mimosaceae, Myrtaceae, Curcubitaceae, Apiaceae, Rubiaceae, Asteraceae, Sapotaceae and Apocynaceae.

UNIT IV**(12 HOURS)**

Detailed study of the following families with reference to Morphology, Taxonomy and their economic importance. Solanaceae, Acanthaceae, Verbenaceae, Lamiaceae, Amaranthaceae, Euphorbiaceae, Orchidaceae, Zingiberaceae, Liliaceae, Amaryllidaceae, Arecaceae and Poaceae.

UNIT V**(12 HOURS)**

Economic Botany- study of botany, cultivation and utilization of the following: Fiber yielding plants (*Gossypium hirsutum*), sugar yielding plant (*Saccharum officinarum*) and food crops - (cereals - paddy and pulses - soybean). Spices and condiments (*Piper nigrum* and *Curcuma longa*)*.

*** Self Study****TEXT BOOKS**

1. A.V.S.S. Sambamoorthy (2005). Taxonomy of Angiosperms. Dreamtech Press, New Delhi.
2. V. Verma, (2006). A textbook of Economic Botany. Emky Publication, New Delhi.
3. B.K. Verma, (2010). Introduction to Taxonomy of Angiosperms, Prentice-Hall of India Pvt. Ltd., Delhi
4. Sharma, O.P. Plant Taxonomy (Second edition) (2010) The Mc Graw Hill Companies
5. O.P. Sharma, (2017). Plant Taxonomy. Mc Graw Hill Education, New York.
6. Flowering Plants Angiosperms, Lalit M. Tewari & Jeewan S. Jalal (2011) Jagdamba Publishing Company, New Delhi.
7. Flowering Plants Angiosperms, Lalit M. Tewari & Jeewan S. Jalal (2011) Jagdamba Publishing Company, New Delhi.
8. N.B. Saxena and Shamindra Saxena (2019). Plant Taxonomy. Pragati Prakashan, Meerut

REFERENCE BOOKS

1. Lawrence G.H.M (1951). Taxonomy of Vascular plants Macmillan, New York
2. V. Singh and D.K. Jain (1997). Taxonomy of Angiosperms. Rastogi Publications, New Delhi.
3. B.P. Pandey, (1997). Taxonomy of Angiosperms. Chand & Co., New Delhi.
4. S.K. Jain and R.R. Rao (1977). A. Handbook of Field and Herbarium methods. Today and Tomorrow Publishers, New Delhi.
5. A.N. Henry and Chandrabose (1982). An aid to the international code of botanical nomenclature. BSI Calcutta.
6. Gurucharan Singh (2004). Plant systematic-theory and practices. Oxford and IBH publishers, New Delhi.
7. V. Singh and D.K. Jain (2015). Taxonomy of Angiosperms. Rastogi Publications, New Delhi.
8. Dixit, M.O. Siddiqui and A. Pathak (2016). Taxonomy of Angiosperms: Basic Concepts, Molecular Aspects and Future Prospect. Studera Press, New Delhi.
9. Pullaiah T and Karuppusamy S (2018) Taxonomy of Angiosperms. Regency Publication, New Delhi.

WEB RESOURCES

1. [https://uou.ac.in/sites/default/files/slm/BOT\(N\)-201.pdf](https://uou.ac.in/sites/default/files/slm/BOT(N)-201.pdf)
2. <https://gacbe.ac.in/pdf/ematerial/18BBO53C-U1.pdf>
3. https://www.bdu.ac.in/cde/SLM/B.Sc.%20Botany/III%20Year/B.Sc.Botany_Morphology%20Taxonomy%20and%20Phytogeography_III-Year_SPS.pdf
4. <https://www.botanybrisbane.com/plants/rubiaceae/>
5. <https://egyankosh.ac.in/bitstream/123456789/83804/1/Unit-7.pdf>

MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	M	H
CO2	S	M	H	S	S
CO3	H	H	M	H	S
CO4	S	H	S	M	H
CO5	H	S	M	S	H

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs) Dr. R. Rekka Signature of the Course in-charge	Signature of the HOD
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Programme Code: 05		B.Sc., BOTANY			
Core Paper 7: PLANT ECOLOGY, PHYTOGEOGRAPHY AND RESOURCE CONSERVATION					
Batch 2026-2027	Semester V	Hours / Week 4	Total Hours 60	Credits 4	Skill Development

COURSE OBJECTIVES

- To understand the principles of ecosystem.
- To acquire basic knowledge about community succession
- To ensure knowledge on resource conservation and related environmental acts

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1  K5	CO1	Pertain knowledge on principle factors controlling the environment.
	CO2	Understand the pattern of distribution of plant species in various communities and their adaptive features.
	CO3	Assess the structure and functions of various ecosystems.
	CO4	Explore knowledge on the pattern of distribution of natural resources.
	CO5	Evaluation of management practices for the sustainable utilization of natural resources.

SYLLABUS**UNIT I****(12 HOURS)**

Principles of Ecology. Climatic factors - role and importance of light, temperature, wind and rainfall on the growth of plants. Edaphic factors, Biotic factors - Characters of community and methods of studying plant communities (quadrat and transect methods alone).

UNIT II**(12 HOURS)**

Community succession - Kinds and causes. Structural and functional changes in communities (Hydrosere and Xerosere - Lithosere). Climax concept. Morphological and anatomical adaptations of Hydrophytes, Xerophytes, Halophytes and Epiphytes.

UNIT III**(12 HOURS)**

Ecosystem - Basic structure and functions: Major Ecosystems of India, Distribution and Climatic patterns of Plants in tropical and temperate regions. Invasive and Alien Plants, Plants - indicator of pollution. Disaster Management.

UNIT IV**(12 HOURS)**

Phytogeographical realms of the world. Origin of cultivated plants. Botanical regions of India. Continental drift. Age and area hypothesis, theory of Island biogeography, endemism, plant distribution, migration and barriers.

UNIT V**(12 HOURS)**

Resource conservation - types of resources, conservation of soil, water, agriculture resources, range, forest and freshwater bodies. Carbon sequestration. World Biodiversity Hotspots- Criteria, Biodiversity Hotspots in India, CITES, Important Environmental acts in India, Application of Artificial Intelligence in Ecology. Remote sensing techniques in ecology.

Self study*TEXT BOOKS**

1. P.D. Sharma, (2000). Ecology and Environment. Rastogi Publications, New Delhi
2. R.S. Shukla and P. S. Chandal (2000). Plant Ecology and soil science. Chand & Co. Ltd., New Delhi.
3. P.C. Vasishta, (1993). Plant Ecology. II Edition. Vishal Publications.
4. Verma and Agarwal (1998). Principles of Ecology, Chand & Co. Ltd., New Delhi.
5. H.D. Kumar, (1994), General Ecology, Vikas Publishing Co. New Delhi

REFERENCE BOOKS

1. R.S. Ambasht, (1992). Text book of Plant Ecology, Students and Friends & Co. Varanashi.
2. A.F. Schimper, (1960). Plant geography. Lubrecht & Cramer Ltd., New York.
3. S.Richard, Ostfeld and William H. Schlesinger. (2011). The year in Ecology and conservation Biology, Willey - Blackwell Publications.
4. E.P. Odum, (1971) Fundamentals of Ecology, N.B.Saundes Co. Ltd. Philadelphia
5. K.C. Misra, (1980). Manual of Plant Ecology. Oxford and IBH Publishing Co, New Delhi
6. Krebs (1985) Ecology. C.J.Hapes an Rao, Newyork
7. Weaver ND Clements (1929). Plant Ecology. Tata McGraw Hill publishing Co. NewDelhi
8. C.K.Varshney, (1989). Water pollution and Management. S.P. Printers. Noida

WEB RESOURCES

1. [https:// sleepyclasses.com](https://sleepyclasses.com). environmental conservation
2. <https://www.cell.com> › current-biology › fulltext
3. <https://www.biologydiscussion.com> › Plant Taxonomy
4. <https://www.biologydiscussion.com> › Biodiversity
5. <https://www.sciencedirect.com> › science › article › pii

MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	H	S
CO2	H	H	S	M	H
CO3	S	M	H	H	M
CO4	H	H	H	M	S
CO5	S	H	S	M	S

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs) Dr. D. Moorthy Signature of the Course in-charge	Signature of the HOD
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Programme Code: 05		B.Sc., BOTANY			
Core paper 8: BIOPHYSICS AND BIOSTATISTICS					
Batch 2026-2027	Semester V	Hours / Week 4	Total Hours 60	Credits 4	Skill Development

COURSE OBJECTIVES

- To understand the nature, pathways and applications of light energy.
- To learn the basic principles of Biostatistics.
- To impart knowledge to solve biological problems.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

↑ ↓ K1	CO1	Recognize the dual nature of light and its reactions with reference to plants.
	CO2	Understand basic concepts of radioactivity and methods of detection.
	CO3	Gain knowledge on the tools of biostatistics.
	CO4	Analyze and solve the biology related problems using biostatistical formulae.
	CO5	Evaluate scientific findings through various statistical tools.

SYLLABUS**UNIT I****(12 HOURS)**

Biophysics: Introduction, scope and importance. Electromagnetic radiation and Characteristics and properties, law of absorption, Excitation and de-excitation. Thermodynamic laws (enthalpy, entropy, free energy). Applications of Law of Thermodynamics.

UNIT II**(12 HOURS)**

Radioactivity and Biological traces: Characteristics and properties of Alpha, beta and gamma radiations. Radioactive isotopes and half-life period. Ionization and detection - biological effects of ionizing radiation - Applications of radiation interactions. Autoradiography, Geiger- Muller and Scintillation counter.

UNIT III**(12 HOURS)**

Biostatistics: Definition and significance, systematic steps in statistics, law of statistical regularities, law of inertia of large numbers. Data sources, collection methods - census and sampling method. Probability of sampling - simple, random sampling, stratified random sampling, cluster sampling, non- probability sampling - judgment sampling, quota sampling and convenient sampling (theory only).

UNIT IV**(12 HOURS)**

Biostatistics: Classification of data and Frequency distribution-Simple, Discrete and Continuous series. Diagrammatic representation of data - one dimensional (Line, Bar), proportional (Pie diagram), symbolic representation (cartogram and Pictogram)*, graphical representation-Time series graph, histogram and ogives.

UNIT V**(12 HOURS)**

Biostatistics: Measures of central tendency - Mean [Arithmetic only] median and mode. Dispersion or deviation- range, average deviation, variance, standard deviation and standard error. Test of significance- Chi- square test and t- test. Statistical Package for the Social Sciences (SPSS).

*** Self study****TEXT BOOKS**

1. S. Palanichamy, (2011). Principles of Biophysics. Paramount Publication, Palani.
2. S. Palanichamy and M. Manoharan. (2001). Recent reprints (2018-2021) Statistical Methods for Biologists. Paramount Publication, Palani.
3. N. Arumugam, (2003). Basic Concepts of Biostatistics. Saras Publications, Nagarcoil.
4. N. Arumugam, V. Kumaresan (2012), Principles and Techniques in Biophysics Saras Publication, Nagarcoil.
5. S.P. Gupta, (2001). Statistical Methods. Sultan Chand & Sons, Educational Publishers, New Delhi.
6. S. Thiraviyaraj, (2009). Biophysics. Saras Publications, Nagarcoil, Tamil Nadu.

REFERENCE BOOKS

1. Salil Bose. (2011). Basic Biophysics for Biologist, published by Agrobios India.
2. I.D. Khan and A. Khanum. (1994-sixth revised edition and reprint dated 2024). Fundamentals of Biostatistics. Ukaaz Publications, India
3. Vasantha Pattabhi and N. Gautham. (2004). Biostatistics. Narosa Publishing House, Chennai.
4. R.S.Chandel, (1975 reprints dated 2021). A Hand Book of Agricultural Statistics, Achal Prakashan Mandir
5. Radha Mohan (2016). Fundamentals of Agricultural Statistics. Radha Mohan (2016). Fundamentals of Agricultural Statistics
6. K.A. Gomez, and A.A. Gomez, (1984, recent reprints dated 2024). Statistical Procedures for Agricultural Research. John Wiley and Sons
7. M. Daniel, (1989). Basic Biophysics for Biologists, Agro-Botanical Publisher, Bikaner, India
8. P. Narayanan, (2023). Essentials of Biophysics (4th edition). Second New Age International Publishers
9. P.N. Arora and P.K. Malhan (2025). Biostatistics, Himalaya Publishing House, Delhi.

WEB RESOURCES

1. https://mis.alagappauniversity.ac.in/siteAdmin/dde-admin/uploads/4/___PG_M.Sc._Zoology_350%2043_Biophysics,%20Biostatistics%20and%20Bioinformatics_Binder_5823.pdf
2. <https://gtu.ge/book/book%20-%20Appl%20BioPhysics%20%202021.pdf>
3. http://lib.ysu.am/disciplines_bk/af9040120f62bd97482eb65dc03f72a8.pdf
4. http://www.lscollge.ac.in/sites/default/files/econtent/Laws%20of%20Thermodynamics_0.pdf
5. <https://gyansanchay.csjmu.ac.in/wp-content/uploads/2021/11/Radioactive-Isotopes-27-April-20.pdf>

6. https://www.jsscacs.edu.in/sites/default/files/Department%20Files/Unit%204%20Radioactivity%20%20bioanalytical%20techniques.%20Dr.%20Bhavya%20G_11zon.pdf
7. https://www.researchgate.net/publication/350955149_Fundamental_characteristics_and_application_of_radiation/link/607bcc26881fa114b40e176c/download?_tp=eYJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIn19
8. <https://uou.ac.in/sites/default/files/slm/MSCBOT-606.pdf>
9. <https://mgscience.ac.in/wp-content/uploads/2020/07/Dr.-B.-K.-Jain-What-is-Statistics.pdf>
10. <https://egyankosh.ac.in/bitstream/123456789/85252/3/Unit-3.pdf>
11. https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/bioinformatics/02._basic_biostatistics/_introduction_to_statistics_and_bio_statistics/et/5227_et_04_et.pdf
12. https://mlsu.ac.in/econtents/3938_Measures%20of%20Central%20Tendency.pdf
13. <https://egyankosh.ac.in/bitstream/123456789/90487/1/Block-3.pdf>

MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	S	H	M
CO2	S	H	M	H	H
CO3	H	S	H	M	S
CO4	S	H	M	H	M
CO5	S	H	M	H	H

S - Strong

H - High

M - Medium

L - Low

Content Prepared by (Based on Inputs) Dr. P. Revathi Signature of the Course in-charge	Signature of the HOD
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Programme Code: 05		B.Sc., BOTANY			
Core Practical 3 - FUNDAMENTALS OF COMPUTER AND BIOINFORMATICS					
Batch 2026-2027	Semester V	Hours/Week 2	Total Hours 30	Credits 2	Skill Development

COURSE OBJECTIVES

- To insist basic knowledge on the components of computer.
- To create a document, table, chart and database using MS Office.
- To learn sequence and structure of genes and protein molecules.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K3 ↑ K5	CO1	Apply knowledge to create biological databases.
	CO2	Apply knowledge on preparation and presentation of data base
	CO3	Analyze secondary structure predictions of any protein molecules using appropriate biological software.
	CO4	Examine macromolecular structures through visualization tools.
	CO5	Evaluate pattern of phylogenetic interrelation ship among plants

SYLLABUS**I. FUNDAMENTALS OF COMPUTER**

1. Creating, Editing and Printing a Document and Table using MS-Word.
2. Data Entry and Chart Preparation using MS-Excel.
3. Creating a Presentation using MS-PowerPoint.

II. BIOINFORMATICS

1. Similarity search using BLASTs (nBLAST and pBLAST).
2. Protein Structure Prediction using GOR-IV and SOPMA.
3. Bio-Molecular Visualization using RASMOL.
4. Multiple sequence alignment using Clustal Omega (Clustal Ω) and Phylogenetic analysis using ClustalX / ClustalW.

MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	H	M	H
CO2	S	M	S	M	H
CO3	H	S	S	H	M
CO4	H	S	H	M	H
CO5	S	H	S	H	M

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs) Dr. P. Sumathi Signature of the Course in-charge	Signature of the HOD
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KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)

COIMBATORE - 641 029

UG MODEL QUESTION PAPER (PRACTICALS)

End of Semester Examination Question Paper Pattern

(For the candidates admitted from the academic year 2026-2027 onwards)

Time: 3 Hours

Max. Marks: 60 Marks

BREAK UP OF MARKS

Core Practical: 3 - FUNDAMENTALS OF COMPUTER AND BIOINFORMATICS

I. Write Algorithms for A, B & C (10 + 10 + 08) - **28 Marks**

II. Results for A, B & C (04 + 04 + 04) - **12 Marks**

III. Viva-voce for A, B & C (04 + 04 + 02) - **10 Marks**

Record - **10 Marks**

TOTAL - **60 Marks**

Content Prepared by (Based on Inputs)	
Dr. P. Sumathi Signature of the Course in-charge	Signature of the HOD

Programme Code: 05		B.Sc., BOTANY			
Core practical 4: TAXONOMY OF ANGIOSPERMS, ECONOMIC BOTANY, PLANT ECOLOGY, PHYTOGEOGRAPHY, RESOURCE CONSERVATION, BIOPHYSICS AND BIOSTATISTICS					
Batch 2026- 2027	Semester V	Hours/Week 5	Total Hours 75	Credits 3	Skill Development

COURSE OBJECTIVES

- To learn the morphological, taxonomical and economic values of plants
- To impart knowledge on the determination of types of vegetation's using quantitative ecological characters
- To study the different types of ecosystem
- To study the cellular details, genetic constitution and plant breeding techniques.

COURSE OUTCOMES

K3 ↑ K5 ↓	CO1	Provide lab based training in writing short species descriptions and illustrations
	CO2	Apply knowledge on identification of plants and assigning their families based on diagnostic features
	CO3	Determine the distribution of vegetation's in a given habitat using various quadrat methods.
	CO4	Apply knowledge on the pattern of distribution of plants in any ecological niche
	CO5	Enhancement of microbial culture

SYLLABUS

I. TAXONOMY OF ANGIOSPERMS & ECONOMIC BOTANY

1. Identification of plant specimens with reference to their families prescribed in the syllabus following Bentham & Hookers system of classification
2. Identification of economically important products with reference to their plant name and family
3. Technical description of plant parts, including floral parts (L.S. of flower, floral diagram and floral formula) with reference to the families mentioned in the theory
4. Field visit to nearby floristic regions for the study of flora
5. Submission of 25 herbarium sheets (relevant to syllabi) with field notes for internal and external valuation

II. PLANT ECOLOGY, PHYTOGEOGRAPHY & RESOURCE CONSERVATION

1. Quadrat - determination of frequency and density of vegetation in the surrounding areas of college premises.
2. Line transects - frequency determination of vegetation in the surrounding areas of college premises

3. Belt transects - frequency determination of vegetation in the surrounding areas of college premises
4. Observation of adaptive morphological and anatomical features of xerophytes hydrophytes, halophytes and epiphytes
5. Ecosystems (pond, forest and grasslands)
6. Community succession patterns - hydrosere and lithosere
7. Locate major Phytogeographical zones of India using photographs

III. BIOPHYSICS

1. Nature of Electromagnetic Radiation (EMR) and Spectrum.
2. Diagrams of Fluorescence, Phosphorescence, Delayed light emission, Autoradiography, Geiger-Muller counter and Scintillation counter

IV. BIOSTATISTICS

Simple problems in biostatistics:

1. Mean
2. Median
3. Mode
4. Standard Deviation
5. Standard Error
6. Chi-Square Test
7. t- test

MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	S	H	S
CO2	H	H	H	M	H
CO3	S	M	H	S	M
CO4	S	H	M	S	H
CO5	H	S	M	H	M
S - Strong		H - High	M - Medium	L - Low	

Content Prepared by (Based on Inputs) Dr. R. Rekka Signature of the Course in-charge	Signature of the HOD
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KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)
COIMBATORE - 641 029
UG MODEL QUESTION PAPER (PRACTICALS)
End of Semester Examination Question Paper Pattern

 (For the candidates admitted from the academic year 2026-2027 onwards)

Time: 3 Hours
Max. Marks: 60 Marks
BREAK UP OF MARKS
**CORE PRACTICAL 4: TAXONOMY OF ANGIOSPERMS, ECONOMIC BOTANY,
PLANT ECOLOGY, PLANT PHYTOGEOGRAPHY,
RESOURCE CONSERVATION, MICROBIOLOGY AND
PLANT PATHOLOGY**

I. Family description (A & B)	- 06 Marks
II. Identification of Family (C & D)	- 04 Marks
III. Economic Botany (E & F)	- 04 Marks
IV. Ecology experiment (G)	- 08 Marks
V. Phytogeography (H)	- 03 Marks
VI. Biostatistics (I & J)	- 10 Marks
VIII. Spotters – K, L, M, N & O	- 10 Marks

HERBARIUM - 05 Marks

RECORD - 10 Marks

TOTAL

60 Marks

Content Prepared by (Based on Inputs)	
Dr. R. Rekka Signature of the Course in-charge	Signature of the HOD

Programme Code: 05		B.Sc., BOTANY			
Core Paper 9 – BIOCHEMISTRY AND BIOINSTRUMENTATION					
Batch 2026-2027	Semester VI	Hours / Week 7	Total Hours 105	Credits 5	Skill Development

COURSE OBJECTIVES

- To study the structure of atom and chemical bonds
- To learn the metabolism of chemical reactions in a cell
- To seed the basic knowledge about instruments
- To make students understand the applications of instruments and to train the students handle and maintain instruments.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ K5 ↓	CO1	Gain knowledge on chemical bonds, atoms and molecules.
	CO2	Understand the chemical structure of macro molecules.
	CO3	Assess the structural organization of biomolecules
	CO4	Analyze the working principles and mechanisms of instruments
	CO5	Evaluate the direct applications and benefits of instruments used for biological experiments

SYLLABUS**UNIT I****(21 Hours)**

Basic concepts of atoms and molecules, types of bonding: primary chemical bonds-covalent, hydrogen bonds, isotopes and isomerism. Acids, bases, solutions, colloids, pH and buffer systems, Introduction to phytoconstituents

UNIT II**(21 Hours)**

Carbohydrates - classification, Monosaccharaides-structure (glucose), open chain and cyclic (or) ring structure. Biological functions. Oligosaccharides (sucrose) - glycosidic linkages and biological functions. Polysaccharides (cellulose). **Lipids**-classification, structure, properties and functions. Fatty acids - saturated and unsaturated.

UNIT III**(21 Hours)**

Amino acids: Structure, classification, properties and biosynthesis. **Proteins** - classification, structure and configuration of proteins, denaturation. **Enzymes:** introduction, properties and classes of enzymes, mode of action and factors affecting enzyme activity.

UNIT IV**(21 Hours)**

Principle, working mechanism, types and applications: pH meter, Micrometry, Microscopy – light (simple, compound, stereoscopic, phase contrast and dark field) and electron (TEM and SEM), Centrifugation, Autoclave and Laminar air flow chamber. Photometry: Colorimetry and UV-visible spectrophotometry.

UNIT V

PCR and Gel Electrophoresis (AGE and PAGE). Principle, working mechanism and applications: Paper chromatography*, Thin layer chromatography (TLC), Column chromatography, Ion exchange chromatography, affinity chromatography and Lyophilization.

Self study*TEXT BOOKS**

1. Richard Notmahn (1988). Principles of Bioinstrumentation, Wiley Publishers
2. H. S. Srivastava, (1993). Elements of Biochemistry. Rastogi Publications, Meerut.
3. J.L. Jain, (2002). Fundamentals of Biochemistry. S. Chand & Co. New Delhi
4. B.K. Sharma, (2005). Instrumental Methods of Chemical analysis. 24th Revised Edition, Goel Publishing House, Meerut.
5. L. Veerakumari, L (2009). Bioinstrumentation. MJP Publishers, New Delhi, India
6. L.M.Narayanan, Dulsy Fathima, K.Nallasingam, R.P. Meyyan Pillai, N.Arumugam, S.Prasanna Kumar. (2010). Biochemistry. Saras Publication

REFERENCE BOOKS

1. J.H. Weel, (1990) General Biochemistry. Wiley Eastern Ltd.
2. Skoog and Leary (1992). Principles of Instrumental analysis, 4th Edition. Saunderson College Publishing, New York
3. Holme and Peck (1998). Analytical Biochemistry, 3rd Edition, Pearson Education Ltd, Essex, England
4. K. Wilson, and J. Walker, (2000). Principles and Techniques of Practical Biochemistry, 5th edition, Cambridge University Press, Cambridge.
5. Albert L. Lehninger (2002). Principles of Biochemistry. ICAR, Delhi.
6. V. Satyanarayana, (2005). Essentials of Biochemistry. Arunabha Sen & Allied Pvt., Ltd
7. Jeremy M. Berg, John, Tymoczko, Gregory J. Gatto and Lubertstryer (2015). Biochemistry, Macmillan, Publishers, New York.

WEB RESOURCES

1. <https://testbook.com/chemistry/atoms-and-molecules>
2. <https://gyansanchay.csjmu.ac.in/wp-content/uploads/2022/11/Acid-base-buffer.pdf>
3. <https://microbenotes.com/carbohydrates-structure-properties-classification-and-functions/>
4. https://dspmuranchi.ac.in/pdf/Blog/lecture_notes_ch8_lipids_current.pdf
5. https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/2017/AminoAcids-Peptides-Proteins-Notes.pdf
6. <https://rjsfsc.edu.in/pdf/notes/bsc-bio/odd-sem/5th-Sem-BIOCHEMISTRY-VI.pdf>
7. <https://microbenotes.com/microscope/>
8. <https://microbenotes.com/uv-vis-spectroscopy/> <https://archive.nptel.ac.in/content/storage2/courses/102103047/PDF/mod3.pdf>
9. https://udrc.lkouniv.ac.in/Content/DepartmentContent/SM_0271c695-0513-4008-a1eb-162c8e4621ba_32.pdf

MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	H	M	H
CO2	S	H	M	L	S
CO3	H	H	S	M	H
CO4	S	M	H	H	M
CO5	S	S	H	M	M

S - Strong

H - High

M - Medium

L – Low

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Programme Code: 05		B.Sc., BOTANY			
Core Paper 10: PLANT PHYSIOLOGY					
Batch 2026-2027	Semester VI	Hours/Week 6	Total Hours 90	Credits 5	Skill Development

COURSE OBJECTIVES

- To study about water potential and its components
- To understand the mechanism of various metabolic process in plants
- To acquire inherent knowledge on mineral nutrients, growth and development in plants

COURSE OUTCOME

On successful completion of the course, the students will be able to

K1	CO1	Gain knowledge on the relationship of complementary metabolic process in energy acquisition and understand the water potential and its effects on cellular functions
	CO2	Learn about the movement of sap and absorption of water in plant body
	CO3	Assess the process of photosynthesis and respiration in higher plants with particular emphasis on aerobic and anaerobic respiration
	CO4	Analyze the physiological effects of growth regulators in plants
K5	CO5	Validate the biosynthetic pathways of plant growth regulators

SYLLABUS**UNIT I****(18 HOURS)**

Plant - water relationship - structure, properties and biological significance of water, water potential and its components, physical forces involved in absorption of water - diffusion, osmosis, imbibition. Absorption of water - mechanism and affecting factors. Absorption of minerals - mechanism (Active and Passive).

UNIT II**(18 HOURS)**

Ascent of sap - path and mechanism; Translocation of organic solutes - directions, path, mechanism, assimilates partitioning and controlling factors. Transpiration - kinds, mechanism of stomatal transpiration, significance and factors affecting stomatal movement and Guttation.

UNIT III**(18 HOURS)**

Photosynthesis – pigment types, pigment system (PS-I & II), Monitoring Photosynthetic pigments using Remote Sensing. Mechanism - Light reaction, Dark reaction - Calvin cycle, Hatch and Slack pathway and CAM pathway, Photorespiration and Factors controlling photosynthesis. Respiration- Glycolysis, (preparatory and pay-off phases), Fermentation. Kreb's cycle, Electron Transport Chain, oxidative phosphorylation, chemiosmotic hypothesis, balance sheet of ATP yield, Respiratory quotient, respiratory inhibitors. Growth and maintenance of respiration.

UNIT IV**(18 HOUR)**

Nitrogen metabolism - Nitrogen cycle, Biological Nitrogen Fixation - Symbiotic and Non- Symbiotic. Formation of root nodules in leguminous plants, Structure and function of nitrogenase, hydrogenase and leg-hemoglobin, biochemical regulation of nitrogen fixation process. Nitrogen metabolism, inorganic nitrogen species (NO_2 , NO_3 , and NH_4) and their reduction to amino acids. Factors controlling biological nitrogen fixation

UNIT V**(18 HOURS)**

Definition and classification of plant growth regulators: Phytohormones, endogenous - Discovery, site of synthesis, biosynthetic pathways, Specific signaling pathways Specific Physiological effects of Auxins, Gibberellins, Cytokinins, Absciscic acid, Ethylene, Brassinosteroids and Methyl Jasmonate. Physiology of flowering: Photoperiodism - Phytochrome, Vernalization. Seed dormancy*.

Self study*TEXT BOOKS**

1. V.K. Jain, (1993). Fundamentals of plant physiology. S. Chand & Co. New Delhi
2. Chopra. (1995). A text book of Plant Physiology. EMKAY Publications, New Delhi.
3. S.K. Verma, (1999). A textbook of Plant physiology. S. Chand & Co. New Delhi
4. Annie Ragland, Rajkumar, Rajaatnam and Jayakumar. (2007). Plant Physiology. Saras Publications, Nagarcoil.
5. S.N. Pandey and B.K.Sinha, (2009). Plant Physiology, 4th Edition, Vikas Publishing Company, Noide, UP

REFERENCE BOOKS

1. Noggle and Fritz (1992). Introductory plant physiology. Prentice Hall of India. Pvt. Ltd. New Delhi.
2. Malik. (2002). Plant physiology. Kalyani Publishers, New Delhi.
3. Devlin, (1986). Plant physiology. CBS Publishers and distributors, New Delhi.
4. S.K. Sinha, (2004). Modern Plant Physiology. Narosa Publishing House, New Delhi
5. John Charles Walker (1997). Plant Physiology, McGraw Hill Book Company, New York.
6. L. Taiz and E. Zeiger, (2002). Plant Physiology. III Edition, Sinauer Association
7. Devlin and Witham (1996). Plant Physiology. CBS Publishers and Distributors, Delhi
8. F.B. Salisbury and C.W. Ross (1993). Plant Physiology. IV Edition Wadsworth Publishing Company, California

WEB RESOURCES

1. <http://eagri.org/eagri50/PPHY261/lec04.pdf>
2. <http://eagri.org/eagri50/PPHY261/lec05.pdf>
3. <http://eagri.org/eagri50/PPHY261/lec11.pdf>
4. <https://northgauhaticollegeonline.co.in/attendance/classnotes/files/1715951714.pdf>

5. <https://www.slideshare.net/slideshow/cellular-respiration-glycolysis-krebs-cycle-electron-transport/236497285>
6. https://filesccsu.blr1.cdn.digitaloceanspaces.com/public/pdf/ccsum/Departmentnews/2020-05-08_98.pdf
7. <https://egyankosh.ac.in/bitstream/123456789/94876/1/Unit-7.pdf>
8. <https://www.egyankosh.ac.in/bitstream/123456789/106600/1/Unit-11.pdf>

MAPPING

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	M	H	M
CO2	H	H	S	M	H
CO3	S	M	H	H	S
CO4	H	S	S	M	H
CO5	S	H	H	S	H

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs) Dr. K. Karthika Signature of the Course in-charge	Signature of the HOD
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Programme Code: 05		B.Sc., BOTANY			
Core Paper 11: MICROBIOLOGY AND PLANT PATHOLOGY					
Batch 2026-2027	Semester VI	Hours / Week 5	Total Hours 75	Credits 4	Skill Development

COURSE OBJECTIVES

- To attain knowledge on major groups of microbes.
- To understand the exploitation of microbes in industries.
- To learn the different pathogenic organisms of plants causing various diseases

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO1	Recognize evolutionary relationships of microorganisms through various classifications
	CO2	Understand the use of microbes in industries for the welfare of mankind.
	CO3	Apply knowledge on microbial technology for the production of antibiotics.
	CO4	Knowledge on plant pathogen interactions on disease development
	CO5	Implement the plant disease management techniques under field level

SYLLABUS

UNIT I

(18 HOURS)

Introduction to microbiology - Historical account, Scope of microbiology and classification – five kingdom concept & three kingdom classification system. Bacteria – classification (Bergey's manual of Bacteriology), General characteristics - morphology, size and shape, ultrastructure, reproduction - conjugation, transformation and transduction.

UNIT II

(18 HOURS)

General characters of viruses, classification of plant viruses. Viral replication - Lytic and lysogenic cycles. Morphology of Bacteriophage (T₂ and T₄). Microbiology techniques – sterilization, culture methods - culture media (Agar and broth) preparation, pour plate, spread plate and streak plate methods. staining techniques (Gram staining) and Bacterial growth curve.

UNIT III

(18 HOURS)

Fermentation - Aerobic and anaerobic fermentation (outline). Industrial production and applications of ethanol, penicillin, vinegar. Food microbiology - Milk and milk products (yoghurt and cheese): physical and chemical composition, pasteurization - microbial flora of fresh food - microbial examination of poisoning – Botulism.

UNIT IV

(18 HOURS)

Introduction and milestones in phytopathology - classification of diseases, biotic and abiotic factors, symptoms of plant diseases, dissemination of diseases, Koch's postulates, Defense mechanism in plants: structural and biochemical, Integrated disease management.

UNIT V**(18 HOURS)**

Symptoms, causative organisms, life cycle and control measures. Virus - Tobacco Mosaic disease* and Cucumber Mosaic disease; Bacteria - Citrus canker, Rice bacterial blight disease; Fungi - Tikka disease of ground nut and Red rot of sugarcane.

Self study*TEXT BOOKS**

1. R.S. Mehrota and Ashok Aggarwal (2003). Plant Pathology, Second Edition, Tata Mc. Graw Hill Publishing Co. Ltd., New Delhi.
2. George N. Agrios (2004). Plant Pathology. 5th Edition. Elsevier Academic Press. Amsterdam, Netherlands.
3. R.C. Dubey and D.K. Maheshari (2005). A Text Book of Microbiology' S. Chand and Company Limited, New Delhi.
4. Michael J. Pelczar, E.C.S. Chan and Noel R. Krieg (2008). 'Microbiology' 5th edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi.
5. P.C. Trivedi, Sonali Pandey, Seema Bhadauria (2010). Text Book of Microbiology. Aavishkar Publications, Distributors. Jaipur, India.
6. K.R. Aneja, Pranay Jain and Raman Aneja (2018). A text Book of Basic and Applied Microbiology. New Age International Publishers, New Delhi.

REFERENCE BOOKS

1. G. Rangaswamy, (1972). Diseases of crop plants in India. Prentice Hall of India. Pvt., Ltd., New Jersey.
2. K.H. Steindrans, (1983). Hand Books of Indigenous fermented food parcel. Edition Inc, New York.
3. R.S. Singh, (1990). Plant diseases (6th ed.) Oxford and IBH, New Delhi.
4. H.B. Schiesel, (1993). General microbiology, 6th Edition, Cambridge University Press.
5. Alexander N. Glazer and Hiroshi Nikaido. (2007). Microbial Biotechnology, Second Edition. Cambridge University Press, Cambridge, UK.
6. Sanjai Saxena (2015). Applied Microbiology. Springer, New Delhi.
7. S.B. Sullia, and S. Shantharam, (2017). General Microbiology, Second Edition, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

WEB RESOURCES

1. <https://microbenotes.com/bergeys-manual-of-systematic-bacteriology-and-determinative-bacteriology/>
2. <https://www.aakash.ac.in/important-concepts/biology/bacteria>
3. <https://microbenotes.com/what-are-viruses/>
4. <https://www.khanacademy.org/science/biology/biology-of-viruses/virus-biology/a/bacteriophages>
5. <https://repository.poltekkes-kaltim.ac.id/1145/1/food-microbiology-3rd-ed.pdf>
6. <https://repository.poltekkes-kaltim.ac.id/1145/1/food-microbiology-3rd-ed.pdf>
7. <https://agrimoon.com/wp-content/uploads/Fundamental-of-Plant-Pathology.pdf.pdf>
8. <https://microbenotes.com/plant-pathology-phytopathology/>
9. <https://agritech.tnau.ac.in/pdf/8.pdf>
10. <https://k8449r.weebly.com/uploads/3/0/7/3/30731055/plant-pathogens-principles-of-plant-pathology-signed.pdf>

MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	H	M	H
CO2	S	H	H	H	M
CO3	H	S	M	S	H
CO4	S	H	H	H	M
CO5	S	H	H	M	S

S - Strong

H - High

M - Medium

L - Low

Content Prepared by (Based on Inputs) Dr. K. Sowndhararajan Signature of the Course in-charge	Signature of the HOD
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Programme Code: 05		B.Sc., BOTANY			
Core Practical 5: BIOCHEMISTRY, BIOINSTRUMENTATION, PLANT PHYSIOLOGY, MICROBIOLOGY AND PLANT PATHOLOGY					
Batch 2026-2027	Semester VI	Hours/Week 5	Total Hours 75	Credits 3	Skill Development

COURSE OBJECTIVES

- To acquire skills on handling of the instruments
- To learn principles and applications of instruments
- To provide hands-on techniques on instruments
- To learn metabolic process of the plants

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K3 ↑ ↓ K5	CO1	Quantification of the amount of macromolecules in a given sample
	CO2	Apply the principles in any biological experiments
	CO3	Apply in depth knowledge on instrumentation techniques and knowledge on handling and troubleshooting of instruments in any biological experiments
	CO4	Acquire basic knowledge on mechanism of various metabolic processes in plants
	CO5	Apply problem solving skills using statistical tools

SYLLABUS**I. BIOCHEMISTRY**

1. Preparation of Phosphate Buffers.
2. Estimation of Carbohydrate by Anthrone method
3. Estimations of aminoacids by Ninhydrin method.
4. Estimation of protein by Lowry's method.

II. BIOINSTRUMENTATION

1. Analyze the pH of samples (soil, water and plant extract)
2. Colorimetry
3. Soxhlet apparatus
4. Clevenger apparatus
5. Column Chromatography
6. Centrifugation
7. PCR and Agarose Gel Electrophoresis (Demo)

III. PLANT PHYSIOLOGY

1. Determination of osmotic pressure of cell sap of onion/*Rheo* leaf.
2. Separation of plant pigments by paper chromatography.
3. Measurement of oxygen evolution using different light intensities using Wilmott's bubbler.
4. Determination of photosynthetic rate in water plants under different CO₂ concentration.
5. Measurement of rate of respiration using flower buds/ germinated seeds with simple Respiroscope.
6. Effect of light intensity on transpiration using Ganong's photometer.
7. Determination of absorption and transpiration ratio in plants.
8. Estimation of leghemoglobin in Root nodules of legumes
9. Extraction and colorimetric estimation of IAA from plant tissues
10. Effect of Absciscic acid (ABA) on stomatal movement

IV. MICROBIOLOGY AND PLANT PATHOLOGY

1. Preparation of culture media for bacteria and fungi.
2. Isolation of microbes from soil by pour plate and spread plate techniques.
3. Pure culture technique - Streak plate method.
4. Differential staining of bacteria using Gram stain.
5. Methylene blue reductase test for milk.
6. Antimicrobial assay - disc - diffusion / agar well method
7. Preparation and quantification of ethanol content in wine.
8. Plant Pathology – Virus - Tobacco Mosaic disease & Cucumber Mosaic disease.
Bacteria - Citrus canker & Rice bacterial blight disease.
Fungi - Tikka disease of ground nut & Red rot of sugarcane.

MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	S	H
CO2	S	S	S	H	M
CO3	H	H	M	H	S
CO4	S	H	H	M	S
CO5	S	H	S	S	M

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs)	
Dr. K. Sowndhararajan Signature of the Course in-charge	Signature of the HOD

**KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)
COIMBATORE - 641 029**

UG MODEL QUESTION PAPER (PRACTICALS)

End of Semester Examination Question Paper Pattern

(For the candidates admitted from the academic year 2026-2027 onwards)

Time: 3 Hours

Max. Marks: 60 Marks

BREAK UP OF MARKS

**CORE PRACTICAL: 5 – BIOCHEMISTRY, BIOINSTRUMENTATION, PLANT
PHYSIOLOGY, MICROBIOLOGY AND PLANT
PATHOLOGY**

I	Biochemistry (A)	-	10 Marks
II	Bioinstrumentation (B)	-	10 Marks
III	Physiology Experiment (C)	-	10 Marks
IV	Microbiology Experiment (D)	-	07 Marks
V	Plant Pathology (E)	-	03 Marks
VI	Spotters F, G, H, I & J	-	10 Marks
RECORD			10 Marks
TOTAL			60 Marks

Content Prepared by (Based on Inputs)	
Dr. K. Sowndhararajan Signature of the Course in-charge	Signature of the HOD

Programme Code: 05		B.Sc., BOTANY			
PROJECT & VIVA – VOCE					
Batch 2026-2027	Semester VI	Hours / Week -	Total Hours -	Credits 5	Skill Development

COURSE OBJECTIVES

- To know the practical problems in various fields of Botany
- To understand and collect related data in the selected fields
- To apply suitable skills and solve selected problems through proper execution

COURSE OUTCOMES

On successful completion of the project work, the students will be able to

K3 ↑ ↓	CO1	Apply theoretical skill sets in lab oriented experiments
	CO2	Analyze the importance of project work while collecting necessary data
	CO3	Evaluate variations between theories and experiments.
	CO4	Apply principles and concepts in research components
K5	CO5	Execute standard operating procedures and interpretation of appropriate results.

Group project work will be allotted to a group of students under the supervision and guidance of the Faculty members during VI Semester. Project works will be given based on the various fields of specialization of the supervisors under whom the students are allotted. They are allotted based on the lot system. The fields of specialization are Systematic Botany, Microbiology and Plant Pathology, Medicobotany, Ecology and Conservation Biology. The students shall do their projects under their supervisor and submit their dissertation at the end of VI Semester. Both the Internal and External Examiners shall jointly evaluate the project report submitted by the students and marks will be awarded on the basis as mentioned below.

Guidelines for the Distribution of Marks:

CIA	Project Review	15	20
	Regularity	5	
ESE	Project Report Present	60	80
	Viva – Voce	20	
	Grand Total		100

UBO49

26UBO6Z1

MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	S	M	S
CO2	S	S	H	S	H
CO3	S	H	S	H	S
CO4	S	H	M	S	M
CO5	H	M	S	M	L

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs)	
Dr. K. Thenmozhi Signature of the Course in-charge	Signature of the HOD

MAJOR ELECTIVE PAPERS

UBO51

Programme Code: 05	B.Sc., BOTANY			
	Major Elective: 1 - FORESTRY			
Batch 2026-2027	Hours / Week 5	Total Hours 75	Credits 5	Skill Development

COURSE OBJECTIVES

- To understand the basic concepts of forest and their distribution types
- To acquire knowledge on forest resources and their utilization
- To gain knowledge on laws of conservation of forest

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO1	Recognize the importance of forest produce to mankind.
	CO2	Understand the economic aspects of forest and their importance to the society.
	CO3	Reclamation of wastelands with suitable tree species.
	CO4	Implement the socio - economic benefits of trees in day to day life
K5	CO5	Evaluate the plants used as source of food

SYLLABUS

UNIT I

(15 Hours)

Introduction to Forests: General introduction to forests, Natural, man-made forest. Classification of forest (Champion and Seth, 1968). Tropical, subtropical, temperate, evergreen, semi-ever green and deciduous forests. Mangrove forests-species

UNIT II

(15 Hours)

Silviculture - concept, scope; clear felling, uniform shelter, wood selection, coppice. Conservation systems – *Ex situ* and *In situ*. Silviculture of some of the economically important species in India- *Casuarina*, *Dalbergia sisso* and *Tectona grandis*.

UNIT III

(15 Hours)

Social and Agro forestry. Selection of species and role of multipurpose trees. food, fodder, energy and avenue plantation. Sacred grooves - definition and importance. Significance of sacred trees - *Terminalia arjuna*, *Aegle marmelos* and *Ficus religiosa*

UNIT IV

(15 Hours)

Introduction to forest laws: Forest laws, necessity, General principles, Indian forest act, 1927, Forest conservation act (1980), Indian forest law (1988), Wild life protection act (1972) and their amendments, Endangered species act (1982).

UNIT V

(15 Hours)

Plants as sources for food, fodder, fibres, spices, beverages, drugs, narcotics, insecticides, timber, gums, resins and dyes. Ethnobotany in human welfare*, Major Botanical garden - Kew.

***Self study**

TEXT BOOKS

1. K.P. Sagreiya, (1994). Forests and Forestry (Revised by S.S. Negi). National book trust. New Delhi.
2. Tribhawan Mehta, (1981). A handbook of forest utilization. Periodical Expert Book Agency, New Delhi.

REFERENCE BOOKS

1. Kollmann and Cote (1988). Wood Science and Technology. Vol.I & II Springer verlag.
2. P.D. Sharma, (2004). Ecology and Environment. Rastogi Publications, Meerut
3. M.P. Singh and Vinita Vishwakarma (1997). Forest Environment and Biodiversity. Daya Publishing House, New Delhi
4. K.M. Tiwari, (1983). Social forestry in India.
5. Gray L. Rolfe, Johan, M. Edgington, I. Irving Holland and Gayle C. Fortenberry. (2005). Forests and Forestry. International book distributing Co., Lucknow.
6. B.S.Chundawat & S.K. Gautams (1996). Textbook of Agroforestry. Oxford and IBH Publishnig Co., Pvt. Ltd., Kolkatta
7. Anil Kumar Dhiman (2003). Sacred Plants and their medicinal uses. Daya publishing house, New Delhi.
8. P.E. Bedell, (1998). Seed Science & Technology. Allied Publishers Ltd.

WEB RESOURCES

1. <https://rvsagri.ac.in/modules/academics/timetable/FOR%20111.pdf>
2. https://agri-bsc.kkwagh.edu.in/uploads/department_course/FRST-121_Forerstry_notes.pdf
3. <https://www.drishtias.com/to-the-points/Paper2/indian-forest-act-1927>
4. <https://www.lawteacher.net/free-law-essays/international-law/the-indian-forest-and-wildlife-acts-international-law-essay.php>
5. <https://uou.ac.in/sites/default/files/slm/MSCBOT-608.pdf>
6. https://krupajal.ac.in/upload/file_2904240649560.pdf

MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	H	S
CO2	H	H	S	M	S
CO3	S	M	H	H	H
CO4	H	S	H	H	M
CO5	S	M	H	H	H

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs)	
Dr. H. Abdul Kaffoor Signature of the Course in-charge	Signature of the HOD

UBO53

Programme Code: 05	B.Sc., BOTANY			
	Major Elective: 2 - BIOTECHNOLOGY			
Batch 2026-2027	Hours / Week 5	Total Hours 75	Credits 5	Skill Development

COURSE OBJECTIVES

- To familiarize the fundamental principles of biotechnology
- To obtain knowledge on various developments and potential applications of gene cloning technology and genetic transformation and their application in plants
- To know the basic principles, knowledge and applications of bio-fertilizers, waste water treatment and biomass and bioenergy production
- To acquire inherent knowledge on the basic principles and applications of bioethics and biosafety

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ ↓	CO1	Gain the basic concepts of biotechnology
	CO2	Understand and gain knowledge on gene cloning techniques, methods of gene transfer in plants and various applications and tools in molecular biology
	CO3	Acquire knowledge and applications of microbes used for biofertilizer preparation, waste water treatments, biomass and energy production
	CO4	Analyze the principles of biosafety assessment procedures of food related products
K5	CO5	Evaluate the acquired biotechnological knowledge in their practical life

SYLLABUS

UNIT I

(15 HOURS)

History of Biotechnology- Scope and importance, Genetic Engineering–Definition, and importance, Enzymes used in gene cloning - Polymerases, Restriction endonucleases, Ligases, Vectors for gene cloning - General properties of a vector, Plasmid, Gene cloning procedure. Tools and Techniques for Molecular Biology- PCR-working principle, procedure and applications and Agarose gel electrophoresis.

UNIT II

(15 HOURS)

Methods of gene transfer in plants - Mechanism of T-DNA transfer- *Agrobacterium* mediated (Ti and Ri plasmids) and Gene gun (Particle bombardment) method, Applications of genetic engineering- Golden rice, Flavr Savr, Bt cotton, and herbicide resistance (EPSPs).

UNIT III

(15 HOURS)

Microbial Biotechnology: Scope and importance, Bioinoculants–Definition and types, advantages, mass cultivation and application techniques of *Rhizobium*, *Azospirillum*, *Azolla* and AM.

UNIT IV

(15 HOURS)

Environmental Biotechnology: Definition, concept, scope and application, wastewater treatment. Treatment of paper and distillery effluents - oxidation ponds*.

UBO54

Source of alternate fuel - biomass and bioenergy production of biogas and its advantage. Vermitechnology - definition, scope, importance and advantages.

UNIT V (15 HOURS)

Bioethics: Principles, Scope and importance. **Biosafety:** Definition of Biosafety. Requirements, Biosafety for human health and environment, use of genetically modified organisms and their release into the environment, Biosafety assessment procedures for biotech foods & related products.

*Self study

TEXT BOOKS

1. S. Ignacimuthu, (1997). Plant Biotechnology. Tata McGraw Hill Publishing Company Ltd., New Delhi.
2. S. Shantharam and Jane F. Montgomery, (1999), Biotechnology Biosafety, and Biodiversity, Scientific and Ethical Issues for Sustainable Development, CC Now Science Publishers.
3. R.C. Dubey, (2014). A Text Book of Biotechnology. S Chand & Company P. Ltd, New Delhi.
4. V.K. Kumaresan, (2015). Biotechnology. Saras Publications, Nagercoil, Tamil Nadu.

REFERENCE BOOKS

1. Chhatwal, (1995). Text book of Biotechnology. Anmol Publications Pvt. Ltd., New Delhi.
2. P.K. Gupta, (2004). Elements of Biotechnology, Rastogi Publications, Meerut.
3. S.B. Primrose and R.Twyman, (2006). Principles of Gene Manipulation and Genomics. 7th Edition, Blackwell Publishing, Malden, MA, USA.
4. Colin Ratledge and Bjorn Kristiansen. (2006). Basic Biotechnology. 3rd Edition, Cambridge University Press.
5. P.K. Moapatra,(2006). Textbook of Environmental Biotechnology. IK International Publishers.
6. Slater, Scott and Fowler, (2008). Plant Biotechnology, 2nd Edition, Oxford University Press
7. U. Sathyanarayanan, (2018). Biotechnology, Generic Publisher
8. Kalyan Kumar De (2020). Plant tissue culture. New Central Book Agency (NCBA), Kolkata, West Bengal.

WEB RESOURCES

1. <https://www.onlinebiologynotes.com/enzymes-used-recombinant-dna-technology/>
2. <https://pmc.ncbi.nlm.nih.gov/articles/PMC9274631/>
3. <https://pmc.ncbi.nlm.nih.gov/articles/PMC9445558/>
4. <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/waste-water-treatment>
5. https://link.springer.com/chapter/10.1007/978-3-031-96212-7_3
6. <https://pmc.ncbi.nlm.nih.gov/articles/PMC7121592/>

UBO55

MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	L	M
CO2	S	M	H	S	H
CO3	H	S	H	M	S
CO4	H	H	M	H	M
CO5	S	S	H	H	H

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs)	
Dr. R. Thirugnanasampandan Signature of the Course in-charge	Signature of the HOD

UBO56

Programme Code: 05	B.Sc., BOTANY			
	Major Elective: 3 - FOOD SCIENCE			
Batch 2026-2027	Hours / Week 5	Total Hours 75	Credits 5	Skill Development

COURSE OBJECTIVES

- To know about the food groups and preparations
- To understand food processing technology and preservation methods
- To analyze and disseminate knowledge on food related issues

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO1	Acquire knowledge on manufacturing processes and technologies used in the production of food products
	CO2	Understand the nutritive value, process of food product development and their environmental considerations.
	CO3	Explain the functional properties of food in human nutrition.
	CO4	Develop skills in researching, analyzing and communicating food related issues.
	CO5	Assess the chemical and physiological changes during food processing techniques.

SYLLABUS

UNIT I

(15 Hours)

Food groups: Basic groups- basic four, five and seven, food in relation to health. Preliminary preparation of food- cleaning, peeling, stinging, cutting and grating, soaking, marinating, sprouting, fermenting, grinding, drying and filtering - their advantages and disadvantages.

UNIT II

(15 Hours)

Cereals and cereal products - structure, composition and nutritive value - Wheat and wheat products; fermented and unfermented products.

UNIT III

(15 Hours)

Biotechnology in food - biofortification, nutraceuticals, space food. Fruits and vegetables - classification, composition and nutritive value. Milk and milk products* - processing, clarification, pasteurization and homogenization. Tea processing and marketing.

UNIT IV

(15 Hours)

Food preservation by high and low temperatures- outline. Preservation by high osmotic pressure, high concentration of sugar, jam and jelly preparation. High concentration of salts. Principles and preparation of pickles- preservation by dehydration. Principles and methods of drying - freeze drying, sun drying, mechanical driers - spray drying and foam mat drying and by smoking.

UNIT V**(15 Hours)**

Packing of food- classification of package, materials used for packing, active food packing, packing of fruits and vegetables. Nutrition labeling - principles, codex guidelines. Recent development on the food labeling front in India.

Self study*TEXT BOOKS**

1. RaheenaBegum (1989). A Text Book of Foods Nutrition and Dietetics. Sterling Publisher, New Delhi
2. James M. Jay. (1987). Modern Food Microbiology. CBS, Mylapore, Chennai.
3. D. Manley, (2000). Tech of Biscuits, Crockers and Cookies. 2nd Cec Press
4. B. Srilakshmi, (2003). Food science. New Age International Pvt. Ltd., New Delhi
5. B. Srilakshmi, (2016). Food Science. New Age International Pvt. Ltd., New Delhi.

REFERENCE BOOKS

1. Lal G. Siddapa and G.L. Tandon. 1986. Preservations of Fruits and Vegetables'. ICAR
2. H.D. Belttz, (1999). Food Chemistry. Springer Vellag, DeManJM
3. D. Janet, Ward and T. Larry. (2002). Principles of Food Science. Good Heart, Wilcox, Illinois.
4. S.C. Dubey, (2002). Basic Baking. The society of India Bakers, New Delhi
5. R. Coles, D. McDowell and M.J. Krwan, (2003). Food Packaging Tech. CRC, Press
6. G. Subbulakeshmi, (2003). Food processing and preservation. New Age International Pvt. Ltd.
7. B. Srilakshmi, (2005). Food and Health. National Institute of Nutrition, ICMR, Hyderabad.
8. P.J. Fellows, (2005). Food Processing Technology: Principle and Practice, 2nd Edition, CRC.

WEB RESOURCES

1. <https://www.slideshare.net/slideshow/nutrition-and-dietetics-pdf-in-food-category/271150973>
2. <https://www.slideshare.net/slideshow/preliminary-preparationpptx/255921234>
3. <https://uou.ac.in/sites/default/files/slm/BHM-101T.pdf>
4. <https://www.slideshare.net/slideshow/biofortification-in-fruit-crops/239016957>
5. <https://www.slideshare.net/slideshow/methodsofcookingpdf/255587258>
6. <https://www.slideshare.net/slideshow/principles-and-methods-of-preservation-by-drying/75358683>

UBO58

MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	M	S
CO2	S	S	H	S	M
CO3	H	M	H	M	H
CO4	H	H	M	H	M
CO5	S	S	M	S	H

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs)	
Dr. M. Parveen Signature of the Course in-charge	Signature of the HOD

UBO59

Programme Code: 05	B.Sc., BOTANY			
	Major Elective: 4 – SEED BIOLOGY			
Batch 2026-2027	Hours / Week 5	Total Hours 75	Credits 5	Skill Development

COURSE OBJECTIVES

- To study the structure of Angiospermic seeds
- To analyze various products produced by seeds.
- To assess and examine the germination capacity of seeds.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

↑ K1 ↓ K5	CO1	Recognize physical and chemical properties of seeds
	CO2	Understand the factors responsible for seed germination
	CO3	Apply various methods of processing of seeds for storage
	CO4	Implement knowledge to break seed dormancy and enhance plant growth
	CO5	Compare various methods of seed treatment and trace their patterns of growth in Angiospermic seeds

SYLLABUS

UNIT- I (15 Hours)

Scope of seed biology - Structure of monocot and dicot seeds / grains. Albuminous (endospermic) and ex-albuminous (non-endospermic) seeds. Chemical composition - cereals (Paddy) - Oil seed (Castor) - Fibre (Cotton) and Pulses (Bean).

UNIT- II (15 Hours)

Seed germination: Factors affecting germination. Methods of germination test (using paper, sand and soil) - Seed viability (Tetrazolium test), vigour (Direct and Indirect test). Concept of seed vigour.

UNIT- III (15 Hours)

Seed drying, Process and Equipments. Methods of moisture determination of seed. Seed cleaning and upgrading - Equipments involved. Seed testing and quality control.

UNIT- IV (15 Hours)

Seed dormancy: Primary and Secondary dormancy - significance - Factors involved - methods used to break dormancy*.

UNIT- V (15 Hours)

Seed treatment - methods of seed treatment, seed treating formulations and equipments, seed disinfestations, identification of treated seeds; Pelleting and their significance, packaging, bagging, labeling, storage and marketing.

*Self study

TEXT BOOKS

1. J.D. Bewley and M. Black (1978). Seed Biology Vol. I & II Academic press, New York
2. R.L. Agarwal, (1982). Seed Technology -. Oxford and IBH Publishing Company, New Delhi.
3. GV. Basavaraju, P. Ravishankar and S. Gowdiperu, (2014). A Text book of seed science
4. N. Rakesh Singh, C. Naveen and P. Deepti (2000). Treasure of Seed Science and Technology, Jain Brothers, New Delhi
5. S. Padmavathi, M. Prakesh, S. Ezhil kumar, G. Sathiyarayanan and A. Kamaraj (2021). A Text Book of Seed Science and Technology, New India Publishing Agency.

REFERENCE BOOKS

1. T.T. Kozlowski, (1972). Seed Biology- Importance, Development and Germination. Volume I, Academic Press, INC, New York
2. D.R. Murray (1984). (Ed.) Seed physiology. Vol. I & II Academic Press: Sydney - New York- London
3. J.D. Bewley and M. Black. (1985). (Eds.) Seeds; Physiology of development and germination Plenum Press: New York.
4. A.A. Khan (Latest Edition) (Ed.). The Physiology and Biochemistry of seed Dormancy and germination. North-Holland Publishing Company: Amsterdam- New York- Oxford.
5. A.K. Joshi and B.D Singh (2004). Seed Science and Technology, Kalyani Publishers, New Delhi
6. S.W. Adkins, S. Ashmore and S.C. Navie (2007). Seeds: Biology, Development and Ecology, CAB International, Wallingford, Oxfordshire, UK
7. Elgi and B. Dennis, (2017). Seed Biology and Yield of grain crops, 2nd Editions, CAB International, Wallingford, Oxfordshire, UK
8. Jose C. Jimenez-Lopez (2017). Advances in seed Biology. Intech. Janeza Trdine, Croatia

WEB RESOURCES

1. <http://eagri.org/eagri50/AGRO101/lec08.pdf>
2. <file:///C:/Users/User/Downloads/Unit-10.pdf>
3. <https://seednet.gov.in/PDFFILES/Chapter%2014.pdf>
4. <https://annamalaiuniversity.ac.in/studport/download/agri/gen/resources/GPB%20329%20PRINCIPLES%20OF%20SEED%20PRODUCTION,%20SEED%20QUALITY%20REGULATION%20AND%20STORAGE.pdf>
5. <https://www.slideshare.net/slideshow/seed-dormancy-133074445/133074445>
6. <http://eagri.org/eagri50/GPBR112/lec29.html>

UBO61

MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	M	S
CO2	S	S	H	H	S
CO3	H	S	H	M	H
CO4	H	H	M	S	H
CO5	M	M	H	H	S

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs) Dr. K. Karthika Signature of the Course in-charge	Signature of the HOD
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UBO62

Programme Code: 05	B.Sc., BOTANY			
	Major Elective: 5 – PHARMACOGNOSY			
Batch 2026-2027	Hours / Week 5	Total Hours 75	Credits 5	Entrepreneurship

COURSE OBJECTIVES

- To study the drug development from medicinal plants
- To understand the traditional systems of medicines like Ayurveda, Siddha & Unani
- To know the pharmacological actions of plant drugs

COURSE OUTCOME

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO1	Acquire knowledge on the therapeutic uses of plant drugs.
	CO2	Understand the traditional and modern systems of medicine.
	CO3	Relate physiological action of various plant drugs.
	CO4	Recognize the nature of pharmaceutical bioactive components in plant sources.
	CO5	Predict the identification and purity of natural drug source for their efficacy and safety.

SYLLABUS

UNIT I (15 Hours)

Definition, history and scope of Pharmacognosy. Study of various system of classification of drugs. Traditional system of medicine (AYUSH - Ayurveda Siddha, Unani and Homeopathy). Glossary of medicinal plants

UNIT II (15 Hours)

A general survey of biological sources, Geographical sources and cell cultures in the production of drugs. Factors involved in the production of drugs.

UNIT III (15 Hours)

Pharmacological action of plant drugs - act on central nervous system- Lysergic acid Diethylomids, cannabis, Cocaine and reserpine. Action on heart muscles - Digitalis, Quinidine, Papaverine and Ergotamine.

UNIT IV (15 Hours)

Drugs of plant origin - Phytochemical tests and application of plant derived phenols, resins, alkaloids, flavonoids, terpenoid, steroids, glycosides and vitamins. A general procedure for separation of the compounds by TLC technique.

UNIT V (15 Hours)

Organized natural products - wood and bark - Quassia and Cinchona. Leaves and Flowers -Adhathoda and Clove Seed and fruits- Fennel, Nutmeg. Unorganized products - *Acacia* gum and Castor oil*.

*Self study

TEXT BOOKS

1. G.E. Trease and W. C. Evans, (1983) Pharmacognosy, ELBS, Britain
2. Biren Shah and Avinash Seth (2013). Textbook of Pharmacognosy and Phytochemistry. Elsevier India
3. Suresh Narayana P, Varalakshmi D and Pullaiah T (2016). A Textbook of Pharmacognosy, CBS Publishers & Distributors Pvt Ltd, India.
4. Biren Shah and AK Seth. (2016). Textbook of Pharmacognosy and Phytochemistry, CBS Publishers & Distributors

REFERENCE BOOKS

1. G.M. Hocking, (1955). A dictionary of terms used in Pharmacognosy, Spring Field.
2. R.N. Chopra, R.L. Badhwa, and S. Ghosh, (1965). Poisonous plants of India Govt. of India Press.
3. M.H. Ballow, (1969). Marine Pharmacology, Williams and Wilkins.
4. C.K. Kokate, A.P. Purohit and S.B. Gokhale, (2008). Pharmacognosy, Nirali.
5. S.S. Handa and V.K.Kapoor. (2014). Pharmacognosy, Vallabh Prakashan
6. W.C. Evans, (2019), Trease and Evans of Pharmacognosy
7. Kuntal Das, (2019). Pharmacognosy and Phytochemistry – I, Nirali Prakashan
8. Neeraj Kumar Sharma, Mona Kejariwal and Md. Rageeb Md. Usman. 2021. PV Publication, Jalandhar

WEB RESOURCES

1. https://vipwr.ac.in/images/naac/criteria-2/232_History_of_pharmacognosy.pdf
2. <https://cdn.noteskarts.com/dpharma/firstyear/pharmacognosy/Chapter-7-Pharmacognosy-Complete-Notes-by-noteskarts-Acc-to-ER20.pdf>
3. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SCH1612.pdf
4. <https://vipw.in/images/5ef7d7d410092bf8f4799b6b8ab0ec68.pdf>
5. <https://pmc.ncbi.nlm.nih.gov/articles/PMC5456217/pdf/medicines-02-00251.pdf>
6. <https://auctoresonline.org/article/the-effect-of-drugs-on-central-nervous-system>
7. https://siesascs.edu.in/docs/notes/Secondary%20metabolites_93974.pdf
8. <https://microbenotes.com/thin-layer-chromatography/>
9. https://pharmacy.kkwagh.edu.in/uploads/study_material/sy/SY%20-%20Pcog%20I%20-%20Classification%20of%20crude%20drug.pdf
10. <https://www.sciencedirect.com/science/article/abs/pii/S2949824424000399?via%3Dihub>

UBO64

MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	H	M
CO2	S	H	M	S	H
CO3	H	S	H	M	S
CO4	H	M	H	H	M
CO5	S	H	M	M	H

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs) Dr. K. Sowndhararajan Signature of the Course in-charge	Signature of the HOD
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UBO65

Programme Code: 05	B.Sc., BOTANY			
	Major Elective 6 - HORTICULTURE			
Batch 2026-2027	Hours / Week 5	Total Hours 75	Credits 5	Entrepreneurship

COURSE OBJECTIVES

- ❖ To learn about the propagation methods of horticultural crops.
- ❖ To study the various types of gardening, landscaping and their management.
- ❖ To know about commercial floriculture and their significance.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ K5 ↓	CO1	Gain inherent knowledge on various horticultural practices
	CO2	Understand in depth knowledge on gardening techniques and their organization.
	CO3	Provide comprehensive account on cultivation practices and techniques of horticultural crops.
	CO4	Analyze various designs and patterns of arrangement of cut flowers.
	CO5	Evaluate various post-harvest handling strategies for various fruits and vegetables

SYLLABUS

UNIT I (15 HOURS)

Introduction to Horticulture - History, scope and divisions of Horticulture - Methods of vegetative propagation - cutting, layering, grafting and budding. Manures*: organic- Panchakavya, and inorganic. Irrigation.

UNIT II (15 HOURS)

Gardening - Types of gardens - Japanese. Styles of garden - Formal and Informal. Garden components - shrubbery, fernery, arches and pergolas, edges and hedges, climbers and creepers, cacti and succulents. Special types of garden - rock garden and sacred groves. Lawn making, Terrarium and Bonsai techniques.

UNIT III (15 HOURS)

Olericulture - Cultivation of vegetables - Bhendi and Tomato. **Pomology** - Cultivation of fruits - Banana and Grapes. Growth regulators in horticulture. Plant protection measures for horticultural crops. Bioinsecticides and Biopesticides.

UNIT IV (15 HOURS)

Floriculture - Cultivation of flowers - Jasmine and Rose. Cut flowers and Flower arrangements. Cultivation of plantation crops - Tea and Cardamom. Basics of greenhouse design, different types of structures - glasshouse, shade net, poly tunnels - Design and development of low-cost greenhouse structures.

UNIT V (15 HOURS)

Extraction of Jasmine concrete and papain. Postharvest handling of fruits and vegetables. Preservation of fruits and vegetables. Cultivation of medicinal plants - *Gloriosa superba* and *Aloe vera*.

***Self- study**

UBO66

TEXT BOOKS

1. George Aquach (2002). Horticulture - Principles and Practices. Parson Education Ltd. Delhi
2. N. Kumar (1999). An introduction to horticulture. Rajalakshmi Publication, Nagarcoil.
3. S.K. Bhattacharjee, (2006). Advances in Ornamental Horticulture. Pointer Publications, Jaipur.
4. N. Kumar, (2006). Horticulture: Principles and practices. New India Publishing agency, New Delhi 88.

REFERENCE BOOKS

1. K.L. Chaha, (2001). Handbook of horticulture. ICAR, New Delhi.
2. Edwin Biles. (2003). The complete book of gardening. Biotech book, New Delhi.
3. S.P. Singh, (1999). Advances in Horticulture and Forestry. Scientific Publishers, Jodhpur.
4. V.K. Sharma, (2004). Advances in Horticulture: Strategies, Production, Plant Protection and Value Addition - Deep and Deep Publications, New Delhi.
5. Desh Beer Singh and Poonam Wazir. (2002). Bonsai-An Art. Scientific Publishers, Jodhpur.

WEB RESOURCES

1. https://www.kngac.ac.in/elearning-portal/ec/admin/contents/2_18KP3B10_2020101608323615.pdf
2. <https://www.hillagric.ac.in/edu/coa/horticulture/lecture/Hort-351-Lectures/Hort-351-Lecture-1&2.pdf>
3. https://agritech.tnau.ac.in/horticulture/horti_Landscaping_garden%20features.html
4. <https://share.google/ykcSJNwkRnnu8dant>
5. <http://hasancelik.web.tr/derssunumlari/PLANT%20GROWTH%20REGULATORS%20IN%20HORTICULTURE.pdf>
6. <https://ncert.nic.in/vocational/pdf/kegr101.pdf>
7. https://agritech.tnau.ac.in/horticulture/horti_Greenhouse%20cultivation.html
8. <http://www.agritech.tnau.ac.in/pdf/HORTICULTURE.pdf>

MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	S	H	M
CO2	S	H	M	H	H
CO3	H	S	H	M	S
CO4	S	H	M	H	M
CO5	S	H	M	H	H
S - Strong		H - High		M - Medium	L – Low

Content Prepared by (Based on Inputs)	
Dr. H. Abdul Kaffoor Signature of the Course in-charge	Signature of the HOD

UBO67

Programme Code: 05	B.Sc., BOTANY			
	Major Elective 7 - MUSHROOM CULTIVATION TECHNOLOGY			
Batch 2026-2027	Hours / Week 5	Total Hours 75	Credits 5	Entrepreneurship

COURSE OBJECTIVES

- ❖ To learn about the morphology and nutritional value of some edible mushrooms
- ❖ To acquire a critical knowledge on cultivation of some edible mushrooms
- ❖ To know the disease management in mushroom cultivation
- ❖ To gain Knowledge of harvesting, packaging, grading, storage, and value-added processing of mushroom

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO1	Recognize the nutritive, medicinal and food values of mushrooms.
	CO2	Determine suitable climate and cultivation techniques for mushrooms.
	CO3	Relate knowledge on designing of farming house for mushrooms.
	CO4	Apply knowledge on processing and storage of mushrooms for marketing.
	CO5	Assess the various developments in modern technologies to enhance productivity of mushrooms.

SYLLABUS

UNIT I

(15 HOURS)

Introduction to Mushroom - History, importance and scope of mushroom, Identification and classification of mushroom. Habitat morphology and life cycle of mushroom*. Key to differentiate edible and poisonous mushroom. Medicinal value of mushroom.

UNIT II

(15 HOURS)

Edible Mushrooms - Systematic position, morphology and life cycle of Edible Mushrooms -White button mushroom (*Agaricus bisporus*). Oyster mushroom (*Pleurotus sajor- caju*). Paddy straw mushroom (*Volvariella* Sp.).

UNIT III

(15 HOURS)

Principles of Mushroom cultivation -Structure and construction of mushroom house. Sterilization of substrates. Spawn production - culture media preparation- production of pure culture, mother spawn, and multiplication of spawn. Composting technology, mushroom bed preparation. Spawning, spawn running and harvesting.

UNIT IV

(15 HOURS)

Common fungal and bacterial diseases of button, Oyster and paddy straw mushrooms and their control Measure. Problems in cultivation of mushrooms- diseases, pests, nematodes and weed moulds- management strategies during cultivation of mushrooms.

UNIT V

(15 HOURS)

Post harvesting techniques- Preservation of mushrooms - packaging, transport, short term and long term storage of mushrooms (canning, drying, freeze drying, sun drying and pickling), Commercial value of Mushrooms – Different Food recipes (Mushroom soup, Mushroom candy, Mushroom Pickle and Mushroom Preserve (Murabba)) and Novel Value Added Products of Mushrooms

***Self study**

TEXT BOOKS

1. Reeti Singh and U.C. Singh (2005). Modern mushroom cultivation, Agrobios India, Jodhpur.
2. V. Kumaresan, (2001). Biotechnology, Saras-publication, Nagarcoil.
3. P.K. Gupta, (2004). Elements of biotechnology, Rastogi publication, Meerut.
4. D.P. Tripathi, (2005). Mushroom Cultivation. Oxford and IBH publishing Co.Pvt.Ltd.,
5. V.N. Pathak and Yadavand Maneesha Gour (2000). Mushroom production and processing Technology, Vedams E books Pvt. Ltd, New Delhi
6. Textbook of Mushroom Cultivation (2023) by Rajni Gupta and Ajay Singh. A comprehensive text covering the biology,
7. Hand Book on Mushroom Cultivation Techniques & Marketing (2023) by Dr. Roopshikha Agrawal.

REFERENCE BOOKS

1. B.D. Singh, (2002). Biotechnology. Kalyani Publishers, New Delhi.
2. T.N. Kaul, (2001). Biology and conservation of Mushrooms. Oxford & IBH Publishing Company Pvt. Ltd. New Delhi.
3. Giovanni Pacioni, (1985). Mushrooms and Toadstools. Mac Donald & Co. Ltd., London.
4. B.P. Pandey, (1996). A text book of fungi. Chand & Co., New Delhi.
5. Pathak and Yadav Gour (2010). Mushroom Production and Processing Technology. Agrobios
6. Kannaiyan and K. Ramasamy (1980). A Hand Book of edible Mushroom, Today and Tomorrow Printers and Publishers, New Delhi
7. N. Bahl, (1998). Hand book on Mushroom Oxford and IBH, Publication. Co.
8. T.N. Kaul, (1999). Introduction to Mushroom Science Oxford and IBH, Co, Pvt. Limited.

WEB RESOURCES

1. <https://www.slideshare.net/slideshow/mushroommorphologypptx/257357364>
2. <https://www.slideshare.net/slideshow/scope-and-importance-of-mushroom-248711341/248711341>
3. <https://www.slideshare.net/slideshow/mushroom-diseases/238645773>
4. <https://gacbe.ac.in/pdf/ematerial/18BBO47S-U5.pdf>
5. https://dmrsolan.res.in/Bull_PHT.pdf
6. <https://celkau.in/Agrienterprises/enerprise/19.%20Mushroom%20Production/8.%20Mushroom%20processing%20and%20preservation.pdf>
7. <https://kvkwestkhasihills.nic.in/publication/2024/TrainingManual/TrainingManualOysterMushroom.pdf>

UBO69

MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	H	M	S
CO2	H	S	M	S	H
CO3	S	S	H	M	H
CO4	M	H	S	H	S
CO5	M	M	S	H	H

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs)	
Dr. M. Parveen Signature of the Course in-charge	Signature of the HOD

UBO70

Programme Code: 05	B.Sc., BOTANY			
	Major Elective 8: MEDICOBOTANY			
Batch 2026-2027	Hours / Week 5	Total Hours 75	Credits 5	Entrepreneurship

COURSE OBJECTIVES

- To learn about the traditional people and their knowledge in ethno-medicine.
- To understand the role of ethnic groups and government organizations in cultivation and conservation of plant genetic resources.
- To acquire basic knowledge on traditional systems of medicine in India.
- To study the potential natural products derived from medicinal plants.
- To know the conservation strategies for ET plants.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO1	Recognize about ethnobotany and its relevance in Life Sciences.
	CO2	Understand various ethnobotanical sources and its uses.
	CO3	Implement knowledge on herbal drugs and its validation.
	CO4	Apply ethnopharmacological knowledge for the development of novel drugs.
	CO5	Develop skill set as a source of employment ability in pharmaceutical/herbal industries

SYLLABUS

UNIT I (15 HOURS)

Ethnobotany: Introduction, concept, scope and objectives; Ethnobotany as an interdisciplinary Science. Relevance of ethnobotany in present context. Medico-ethnobotanical sources in India. Major Tribal groups in Tamil Nadu (Irulas, Todas, Malasars and Malayalis).

UNIT II (15 HOURS)

Plants used by the Irular Tribes: Food plants, Beverages, Resins and oils. Sharing of wealth concept with few examples from India. Role of ethnobotany in modern medicine with special reference to *Rawolfia serpentina*, *Trichopus zeylanicus*, *Artemisia annua* and *Withania somnifera*.

UNIT III (15 HOURS)

Introduction, Scope and Importance of Indigenous Medical systems. Ayurveda, Siddha, Unani and Homeopathy – History*, basic principles and drug preparations.

UNIT IV (15 HOURS)

Natural Products - Definition, importance, systematics, characterization of alkaloids, glycosides, flavonoids, terpenoids, phenolic acids and steroids. Approaches to drug discovery from ethnobotanical leads. Ethnopharmacological validation of traditional medicines.

UNIT V (15 HOURS)

Organizations involved in medicinal plants conservation, Conservation of endangered and endemic medicinal plants: RET plants - Definition, Red list Criteria. *In situ* conservation: Biosphere reserves, sacred groves, National Parks. *Ex sit* conservation: Botanical Gardens

*Self study

TEXT BOOKS

1. Purohit and Vyas. (2005). Medicinal plant cultivation- A scientific approach, Agrobios, Jodhpur
2. A.K. Rath and S.R. Mishra, (2017). Ethnobotany, Kalyani Publishers, New Delhi
3. Biren Shah and A.K. Seth. (2019). Textbook of Pharmacognosy and Phytochemistry. CBS Publishers & Distributors Pvt. Ltd.,
4. Mohammed Ali. (2019). Textbook of Pharmacognosy. CBS Publishers & Distributors Pvt. Ltd.,
5. P. Arora and V. Arora (2019). A Textbook of Herbal Drug Technology. S.Vikas and Company

REFERENCE BOOKS

1. S.K. Jain, Manual of Ethnobotany, Scientific Publishers, Jodhpur, 1995.
2. C.M. Colton, (1997). Ethnobotany – Principles and applications. John Wiley and sons – Chichester
3. Rajiv K. Sinha. (1996). Ethnobotany The Renaissance of Traditional Herbal Medicine. INA SHREE Publishers, Jaipur.
4. Gokhale et al. (2019). Pharmacognosy and Phytochemistry. Nirali Prakashan,
5. C.S. Mandal, (2011). Herbal Drugs. New Central Book Agency,
6. P.C. Trivedi, (2008). Medicinal Plants: Traditional Knowledge. I.K. International.
7. M.C. Joshi, (2007). Handbook of Indian Medicinal Plants. Scientific Publishers,
8. R. John *et al.* (1995). Phytochemistry of Medicinal Plants. Springer Sciences & Business Media.

WEB RESOURCES

1. <https://www.geeksforgeeks.org/biology/ethnobotany-scope-importance/>
2. https://www.researchgate.net/publication/377565714_Ethnomedicinal_plants_used_by_Irula_tribe_in_Tamil_Nadu_India_A_review
3. https://www.researchgate.net/publication/333017295_Role_of_ethnobotany_in_modern_medicines_with_special_reference_to_Rauvolfia_serpentina_Trichopus_zeylanicus_Artemisia_sp_and_Withania_somnifera
4. https://gcwgandhinagar.com/econtent/document/15878871451BOTSE0602_Role%20of%20Ethnobotany%20in%20modern%20medicine.pdf
5. <https://www.mdpi.com/2223-7747/13/24/3556>
6. <https://www.studocu.com/en-us/document/west-virginia-state-university/biology/lecture-notes-bioprospecting-and-natural-product-discovery/60133383>
7. https://ccrum.res.in/ViewData/PrintContent_multiple?mid=1640

UBO72

MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	H	M	S
CO2	H	S	M	S	H
CO3	S	S	H	M	H
CO4	M	H	S	H	S
CO5	M	M	S	H	H

S - Strong H - High M - Medium L - Low

Content prepared by (Based on Inputs)	
Dr. V. Aravindhana Signature of the Course in-charge	Signature of the HOD

UBO73

Programme Code: 05	B.Sc., BOTANY			
	MAJOR ELECTIVE 9: INTRODUCTION TO INDUSTRY 4.0			
Batch 2026-2027	Hours / Week 5	Total Hours 75	Credits 5	Skill Development

COURSE OBJECTIVES

- ❖ To understand the concepts, goals, and technologies of Industry 4.0.
- ❖ To introduce the fundamentals and applications of Artificial Intelligence.
- ❖ To familiarize with Big Data concepts, tools, and applications.
- ❖ To provide knowledge on IoT architecture, development, and sectoral applications.
- ❖ To understand the impact of Industry 4.0 and develop skills for Education 4.0 and future careers.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ K5 ↓	CO1	Exhibit skills in artificial intelligence, big data and internet of things in solving biological problems.
	CO2	Demonstrate the use of artificial intelligence in different fields of plant biology
	CO3	Analyze critically various biological processes using technology based tools and resources
	CO4	Apply more efficiently the virtual reality and augmented reality into real life
	CO5	Formulate methods to collect, analyze and store biological data (data bases).

SYLLABUS

UNIT I (15 HOURS)

Industry 4.0: Need and Reasons for Adopting; Definition, Goals and Design Principles, Technologies including Big Data, Artificial Intelligence (AI), Industrial Internet of Things (IIoT), Cyber Security, Cloud Computing, and Augmented Reality.

UNIT II (15 HOURS)

Artificial Intelligence (AI): What and Why; History and Foundations; AI environment; Societal Influences of AI; Application Domains and Tools; Associated Technologies, Future Prospects and Challenges of AI.

UNIT III (15 HOURS)

Big Data: Evolution, Definitions and Essentials of Big Data in Industry 4.0; Merits and Advantages, Components and Characteristics, Processing frameworks, Applications and Tools; Big Data Domain Stack, including its Role in Data Science, IoT, Machine Learning and Databases; Big Data use cases in social sectors and industry and Big Data Roles, Skills, and Learning Platforms

UNIT IV (15 HOURS)

Internet of Things (IoT): Introduction, architecture and development; Applications IoT in various sectors*, including manufacturing, healthcare, education, aerospace and defense, agriculture, and transportation and logistics. Impact of Industry 4.0 on Society: Impact on Business, Government, and People. Tools and technologies for Artificial Intelligence: Big Data and Data Analytics, Virtual Reality, Augmented Reality, IoT, and Robotics.

UNIT V

(15 HOURS)

Education and Industry 4.0: Industry 4.0; Education 4.0; Curriculum 4.0 and Faculty 4.0. Skills required for the future; Tools for education; Artificial Intelligence Jobs in 2030 and Framework for aligning Education with Industry 4.0.

Self - study*TEXTBOOKS**

1. P. Kaliraj, T. Devi, Artificial Intelligence Theory, models and Applications, 2022, ISBN 9781032008097, CRC Press, Taylor & Francis Group
2. P. Kaliraj, T. Devi, Innovating with Augmented Reality: Applications in Education and Industry, 2022, ISBN 9781032008127, CRC Press, Taylor & Francis Group
3. P. Kaliraj, T. Devi, Big Data Applications in Industry 4.0, 2022, ISBN 9781032008110, CRC Press, Taylor & Francis Group
4. Kaliraj, P., & Thirupathi, D. (Eds.). (2022). Innovating with augmented reality: applications in education and industry. CRC Press (chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://b-u.ac.in/sites/b-u.ac.in/files/latest-attachments/2.pdf) DOI: 10.1201/9781003175896.
5. Kaliraj, P., & Devi, T. (Eds.). (2022). Big data applications in industry 4.0. CRC Press (chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://b-u.ac.in/sites/b-u.ac.in/files/latest-attachments/3.pdf). DOI: 10.1201/9781003175889.

REFERENCE BOOKS

1. Bahga, A., Mediseti, V. 2014. Internet of Things: A Hands-On Approach. Universities Press, Hyderabad, India.
2. Bhuvaneswari, V., Devi, T. 2018. Big Data Analytics: Scitech Publisher, Chennai, India.
3. Soraya, S. 2018. Data Analytics and Big Data. John Wiley & Sons, Inc., Hoboken, USA.
4. Demirbaga, Ü., Aujla, G. S., Jindal, A., & Kalyon, O. (2024). Big Data Analytics. In Big Data Analytics: Theory, Techniques, Platforms, and Applications (pp. 31-42). Cham: Springer Nature Switzerland (https://link.springer.com/book/10.1007/978-3-031-55639-5?utm_source=chatgpt.com)
5. Chavan, P., Pampattiwar, K., & Mangrulkar, R. (2026). Essentials of Big Data Analytics: Applications in R and Python. Morgan Kaufmann (https://shop.elsevier.com/books/essentials-of-big-data-analytics/chavan/978-0-443-45206-2?utm_source=chatgpt.com)
6. Mohanta, B., Nanda, P., Patnaik, S., & Patnaik, S. (2020). New Paradigm of Industry 4.0: Internet of Things, Big Data & Cyber Physical Systems. Switzerland: Springer.
7. Dilip Kumar Sharma, Rohit Sharma (2026) New Trends and Applications in Internet of Things (IoT) and Big Data Analytics, Volume 2. Springer Cham (https://link.springer.com/book/9783032217523?utm_source=chatgpt.com)
8. Hassanien, A. E., Chatterjee, J. M., & Jain, V. (Eds.). (2022). Artificial Intelligence and industry 4.0. Academic Press.
9. Mahalle, P. N., Shinde, G. R., & Joshi, P. M. (Eds.). (2023). Industry 4.0 Convergence with AI, IoT, Big Data and Cloud Computing: Fundamentals, Challenges and Applications.
10. Thirunavukkarasan, M., Mary, S. S. A., Ghantasala, G. P., & Khan, M. (Eds.). (2025). Artificial Intelligence and Machine Learning for Industry 4.0. John Wiley & Sons.

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11. Khang, A., Abdullayev, V., Hahanov, V., & Shah, V. (Eds.). (2024). Advanced IoT technologies and applications in the industry 4.0 digital economy. CRC Press.

WEB RESOURCES

1. <chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://sitams.ac.in/wp-content/uploads/2025/02/course-material.pdf>
2. <https://blog.rgbsi.com/big-data-analytics-in-industry-4.0>
3. <chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://b-u.ac.in/sites/b-u.ac.in/files/latest-attachments/3.pdf>
4. <https://www.mahindrauniversity.edu.in/blog/how-artificial-intelligence-is-shaping-the-next-generation-of-engineers-for-industry-4-0/>
5. <https://www.sciencedirect.com/science/article/abs/pii/S0360835223006861>
6. <https://explitia.com/blog/artificial-intelligence-and-industry-4-0/>
7. <https://www.epicor.com/en/blog/technology-and-data/what-is-industry-4-0/>
8. https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cs38
9. <https://www.machinemetrics.com/blog/industry-4-0-internet-of-things-what-s-the-difference>
10. <https://safe.security/resources/insights/cybersecurity-in-the-age-of-industry-4-0/#Industry-4-0-cybersecurity-challenges>
11. <https://www.sciencedirect.com/science/article/pii/S277291842400033X>
12. <https://www.nist.gov/blogs/manufacturing-innovation-blog/industry-40-and-cybersecurity-how-protect-your-investment>
13. <https://blog.rgbsi.com/cloud-computing-foundation-of-industry-4.0>
14. <https://www.automation.com/article/role-cloud-computing-industry-4-0-beyond>
15. <https://www.microland.com/blogs/microlands-enterprises-of-tomorrow-eot>
16. <https://www.onirix.com/learn-about-ar/augmented-reality-for-industry-4-0/>
17. <https://www.mdpi.com/2079-9292/13/6/1147>
18. <https://www.sciencedirect.com/science/article/abs/pii/S0736584518304101>
19. <https://www.geeksforgeeks.org/artificial-intelligence/evolution-of-ai/>
20. <chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://sitams.ac.in/wp-content/uploads/2026/03/Industry-4.0-22AUD241.pdf>
21. <https://b-u.ac.in/sites/b-u.ac.in/files/iE4/Curriculum%204.0.docx>
22. <https://www.frontiersin.org/journals/education/articles/10.3389/feduc.2024.1412018/full>

MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	H	M	S
CO2	H	S	M	S	H
CO3	S	S	H	M	H
CO4	M	H	S	H	S
CO5	M	M	S	H	H

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs) Dr. G. Dhandapani Signature of the Course in-charge	Signature of the HOD
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UBO76

Programme Code: 05	B.Sc., BOTANY			
MAJOR ELECTIVE 10: INDUSTRIAL BOTANY				
Batch 2026-2027	Hours / Week 5	Total Hours 75	Credits 5	Entrepreneurship

COURSE OBJECTIVES

- To familiarize students with the economic importance of diverse plant species.
- To train students for specific industrial needs—such as pharmaceutical, agricultural, or medical applications.
- To foster entrepreneurship skills for starting small biotech or botanical ventures.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO1	Explain the scope, classification, and economic importance of Industrial Botany.
	CO2	Understand scientific principles and modern technological interventions to transform raw plant materials into finished commercial goods.
	CO3	Analyze the importance, cultivation, and processing of medicinal and aromatic plants and their bioactive compounds.
	CO4	Apply knowledge of plant biotechnology techniques for industrial applications.
	CO5	Evaluate food processing, fermentation technologies, and biofuel production in plant-based industries.

SYLLABUS

UNIT I

(15 HOURS)

Introduction to Industrial Botany: Scope and importance of industrial botany; role of plants in industries and economic development; classification of plant-based industries; overview of plant resources and their industrial applications; sustainable utilization and conservation of plant resources.

UNIT II

(15 HOURS)

Industrial Uses of Plant Products: Fibers: cotton, jute, coir – extraction and processing; **Timber and wood products:** types, properties, and uses; **Gums and resins:** sources, collection, and industrial applications; **Tannins and dyes:** natural dyes, tanning industry; **Latex and rubber:** extraction, processing, and uses.

UNIT III

(15 HOURS)

Medicinal and Aromatic Plants: Importance of medicinal plants in pharmaceuticals; Active principles: alkaloids, glycosides, essential oils; Cultivation and processing of major medicinal plants; Aromatic plants and essential oil extraction methods; Role of herbal industries and quality control.

UNIT IV

(15 HOURS)

Plant Biotechnology in Industry: Plant tissue culture techniques; Micropropagation and its industrial applications; Production of secondary metabolites; Genetic engineering in crop improvement; Bioreactors and large-scale plant cell culture.

UNIT V**(15 HOURS)**

Food and Fermentation Industries: Plant-based food industries: cereals, pulses, fruits, and vegetables; **Beverage industries:** tea, coffee, cocoa; **Fermentation technology:** alcohol, vinegar, and organic acids; Biofuels and single-cell protein*; Quality control and food safety standards.

***Self - study**

TEXT BOOKS

1. S.L. Kochhar (2016). Economic Botany: A Comprehensive Study. Cambridge University Press.
2. B.P. Skaria (2020). Aromatic Plants. New India Publishing Agency, New Delhi.
3. H.S. Chawla (2020). Introduction to Plant Biotechnology, 3rd edition, Oxford & IBH Publishing.
4. A. Chakraverty (2019). Post-Harvest Technology of Cereals, Pulses and Oilseeds, 3rd edition, CBS Publishers & Distributors.
5. P.J. Fellows (2015). Food Processing Technology: Principles and Practice. Elsevier.

REFERENCE BOOKS

1. G.E. Wickens (2001). Economic Botany: Principles and Practices. Springer.
2. Pulok K. Mukherjee (2019). Quality Control and Evaluation of Herbal Drugs. Elsevier.
3. A. Uma Sambamurty (2020). A Textbook of Modern Economic Botany. CBS Publishers & Distributors.
4. K.G. Ramawat & J.M. Merillon (2013). Biotechnology: Secondary Metabolites. Science Publishers.
5. M.J. Waite et al. (2001). Industrial Microbiology: An Introduction. Blackwell Science.

WEB REFERENCES

1. <https://www.eolss.net/sample-chapters/c03/E6-118-18.pdf>
2. https://www.researchgate.net/publication/367167701_Industrial_use_of_Plant_Product_and_their_conservation#fullTextFileContent
3. <https://pravara.in/wp-content/themes/twentyseventeen/essentials/pdf/elearn/Principles-of-Plant-Biotechnology.pdf>
4. <https://davuniversity.org/images/files/study-material/AGS126%20Fundamentals%20of%20Plant%20Biochemistry%20and%20Biotechnology.pdf>
5. <https://www.assochem.org/uploads/files/The%20Rising%20Plant%20Based%20Report%20final%20for%20approval.pdf>
6. <https://ncert.nic.in/textbook/pdf/lehe105.pdf>
7. https://gurukpo.com/Content/Bsc-biotech/Plant_Secondary_Metabolites.pdf

UBO78

MAPPING

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	H	M
CO2	S	H	M	S	H
CO3	H	S	H	M	S
CO4	H	M	H	H	M
CO5	S	H	M	M	H
S - Strong		H - High	M - Medium		L - Low

Content Prepared by (Based on Inputs) Dr. K. Sowndhararajan Signature of the Course in-charge	Signature of the HOD
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UBO79

SKILL BASED SUBJECT

Programme Code: 05		B.Sc., BOTANY			
SKILL BASED SUBJECT 1 –BASICS OF CYBER SECURITY					
Batch 2026-2027	Semester III	Hours/Week 2	Total Hours 30	Credits 3	Skill Development

COURSE OBJECTIVES

- To provide fundamental knowledge of cyber security concepts and the digital environment.
- To create awareness about cyber threats, cybercrimes, and common online frauds.
- To develop the ability to identify risks associated with internet, mobile, and online transactions.
- To familiarize students with safe practices in email, social media, and digital communication.
- To introduce basic cyber laws, ethics, and responsible digital behavior.

COURSE OUTCOME

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO1	Apply the fundamental concepts of cyber security and digital safety at appropriate place
	CO2	Identify various cyber threats, cybercrimes, and online frauds
	CO3	Enable safe practices while using internet, mobile, and e-commerce platforms
	CO4	Interpret security issues related to email and social media usage
	CO5	Comprehend cyber laws, ethics, and legal responses to cybercrime

SYLLABUS

UNIT I

(6 HOURS)

Foundations of Cyber Security: Cyberspace and Digital Environment -Evolution of Cyber Security- Basic Concepts and terminology in Cyber security –Cyber security Threat – Defense in Depth concept in Cyber Security- Information Literacy – Types of False Information — Digital footprint — Cyber Frauds- Basic Safety Practices and Password Awareness - Multi-Factor Authentication (MFA)- Zero Trust Security Model.

UNIT II

(6 HOURS)

Cyber Crimes & Threat Landscape: Introduction to AI in Cyber Security- Cyber Crimes- Important of Cybercrime- Types of Cyber Crime - CIA Triad – Tools for Confidentiality, Integrity, Availability -Cyber Crime & Digital Evidence Indian Perspective- Recent Cyber Crime Incidents-Social Engineering Frauds- Financial Frauds using Social Media Platforms- Ransomware Attacks -Deep fake based frauds - Cryptocurrency scams -Dark Web basics - Preventive Measures for individuals and Organizations – Awareness and Safe Online Behavior- Incident Response Process.

UNIT III**(6 HOURS)**

Internet, Mobile & Digital Transaction Security: Browser Security Tools – Mobile phone security and privacy settings – E-commerce concepts and risks – UPI Fraud Awareness -QR Code Scams - App permissions & Data Tracking – Malware Types and Cyber Attacks- Secure browsing and Data Theft & Public Wi-Fi Precautions – Symmetric vs Asymmetric Encryption.

UNIT IV**(6 HOURS)**

Communication & Social Media Security: Basics of email usage and Communication – Email threats: Spam, Phishing, Malicious links- Fake News – Fake profiles, Cyber Bullying and Data Misuse –Computer Viruses – Antivirus and Firewall concepts – Safe sharing practices and Digital responsibility. Ethical Hacking

UNIT V**(6 HOURS)**

Cyber Laws, Ethics & Digital Responsibility: Introduction to Cyber Law – IT Act 2000 and Amendments– Data Protection Laws (India DPDP Act 2023). Intellectual Property in Digital Space- Cybercrime and legal provisions – User rights and responsibilities in cyberspace – Digital footprint and online identity – Personal data protection and privacy – Cyber ethics and responsible usage – Cyber safety awareness programs and best practices.

CASE STUDY: Case studies of cyber law enforcement in India

WORK BOOK

1. *Basics of Cyber Security*, prepared by Kongunadu Arts and Science College, Coimbatore

REFERENCE BOOKS

1. Data Security Council of India (DSCI), in collaboration with Seqrite, presents the second edition of the India Cyber, Threat Report 2025.
2. Green, J., Smith, A., & Brown, T. (2024). Information security management principles. Routledge.
3. Armstrong-Smith, S. (2024). Understand the cyber attacker mindset: Build a strategic security program. Kogan Page.
4. Ismail, Y., Lacy, F., & Belu, R. (Eds.). (2024). Cybersecurity: Threats, technologies, and emerging solutions. IntechOpen.
5. Rais, R., Morillo, C., Gilman, E., & Barth, D. (2023). Zero trust networks: Building secure systems in untrusted networks (2nd ed.). O'Reilly Media.
6. Shapiro, S. J. (2023). Fancy bear goes phishing: The dark history of the information age. Farrar, Straus and Giroux.
7. Tamil Nadu Fact Check Unit, Training Handbook
8. James Graham (2011), Cyber Security Essentials, CRC Press, Auerbach Publications, Taylor & Francis Group.
9. Kathryn Knerler (2022), 11 Strategies of a World-Class Cybersecurity Operations Center, MITRE Corporation.
10. Dr. Jeetendra Pande (2017), Introduction to Cyber Security, Uttarakhand Open University.
11. Rohas Nagpal (2008), Real world cybercrime cases, Cyber Crime & Digital Evidence – Indian Perspective, Asian School of Cyber Laws

12. Prof. (Dr.) Nilesh K. Modi (2021), Cyber Security Techniques, Dr. Babasaheb Ambedkar Open University.
13. Cyber Security Awareness Handbook (2020), Ciso Jil information Technology Limited.
14. Jeff Kosseff (2020), Cybersecurity Law, John Wiley & Sons, Inc.
15. Cyber Crime Law and Practice, The Institute of Company Secretaries of India, 2016
16. Yuri Diogenes (2018), Cybersecurity Attack and Defense Strategies, Packt Publishing.
17. Cybersecurity Handbook, Ministry of Digital Governance, National Cybersecurity Authority, June 2021.
18. Justin Hutchens (2024), The Language of Deception: Weaponizing Next Generation AI– Explores AI in social manipulation, deep fakes, and malware.
19. D.R. Halston (2025), Cyber Security Mastery Covers AI-driven attacks, cloud security, and career preparation.

WEB REFERENCES

- <https://safety.google/>
- <https://safety.google/security/security-tips/>
- <https://www.simplilearn.com/tutorials/cyber-security-tutorial>
- <https://www.getcybersmart.org/for-students>
- <https://www.techbuddies.io/cyber-security-basics>
- <https://www.geeksforgeeks.org/ethical-hacking/what-is-cyber-security/>
- <https://www.drishtias.com/daily-updates/daily-news-editorials/india-s-cybersecurity-challenge-threats-and-strategies>
- <https://www.dsci.in/resource/content/india-cyber-threat-report-2025>
- <https://www.eimt.edu.eu/25-major-cyber-attacks-in-india-threats-and-strategies>
- <https://www.coursera.org/in/articles/types-of-cyber-attacks>
- <https://eventussecurity.com/cybersecurity/india/cyber-attacks/>
- www.heimdalsecurity.com

QUESTION PAPER PATTERN**Duration: 3 hrs****Max: 75 Marks****Section - A ($10 \times 1 = 10$)****Choose the correct answer****Section - B ($5 \times 5 = 25$)****Short answer questions, either or type, one question from each unit.****Section – C ($5 \times 8 = 40$)****Essay answer questions, either or type, one question from each unit.**

CIA EXAMINATION MARK BREAKUP

S. NO	DISTRIBUTION COMPONENT	MARKS
1.	CIA I – 75 Marks Converted to 30	30
2.	CIA II – 75 Marks Converted to 30	30
3.	Seminar / Objective Capacity Testing	10
4.	Seminar /Objective Capacity Testing	10
5.	Attendance	05
6.	Any Case Study related to Cyber Security (as a Group)	15
Total		100

Programme Code: 05		B.Sc., BOTANY			
SKILL BASED SUBJECT II: PLANT TISSUE CULTURE CONCEPTS AND APPLICATIONS					
Batch 2026-2027	Semester IV	Hours / Week 2	Total Hours 30	Credits 3	Skill Development

COURSE OBJECTIVES

- To gain the basic knowledge on plant tissue culture and organization of tissue culture laboratory
- To acquire fundamental knowledge on tissue culture media and preparation
- To reproduce the rare endemic & endangered plants from tissue culture techniques
- To gain the theoretical knowledge on transgenic plants and their applications

COURSE OUTCOMES (CO)

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO1	Know about plant tissue culture laboratory organization
	CO2	Gain knowledge on various tissue culture media composition and preparation
	CO3	Learn about the direct regeneration techniques
	CO4	Study various tissue culture techniques and their applications
	CO5	Understand <i>in vitro</i> regenerated variants

SYLLABUS**UNIT I (6 HOURS)**

Plant tissue culture - history, organization of tissue culture laboratory, glass goods and instruments, preparation of stock solution.

UNIT II (6 HOURS)

Medium preparation- MS, B5 and Nitsch medium. Collection of explants, surface sterilization, inoculation, incubation. Callus culture and sub culture

UNIT III (6 HOURS)

Micropropagation- nodal and shoot tip culture, anther and pollen culture, Cell culture: single cell and cell suspension culture

UNIT IV (6 HOURS)

Embryo and ovule culture, somatic embryogenesis and artificial seed production, Protoplast isolation, culture and fusion

UNIT V (6 HOURS)

Somaclonal variation: Definition, mechanism, isolation of somaclonal variation- phenotypic character, cytological study, DNA content, disease and herbicide resistance. Application of somaclonal variation*.

*Self study

TEXT BOOKS

1. P.K. Gupta (1996). Elements of Biotechnology. Rastogi Publications, Meerat.
2. V.K. Kumaresan (2003). Biotechnology. Saras Publications, Kanyakumari.
3. M.K. Razdon (2003). Plant Tissue Culture. Oxford and IBH Publishing Co. Private Ltd., New Delhi.
4. Kalyan Kumar De (2008). An introduction ot plant tissue culture. New Central Book Agency. Kolkata.

REFERENCE BOOKS

1. S.S. Bhojwani and M.K. Razdan (1996). Plant Tissue Culture: Theory and Practice. 1st Edition, Elsevier Publications.
2. H.S. Chawla (1998). Biotechnology in crop improvement. International Book Distributors, Dehradun.
3. H.S. Chawla (2002). Introduction to Plant Biotechnology. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
4. H.K. Choudhri (2005). Elementary principles of Plant Breeding. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
5. T.B. Jha and Biswajit Ghosh (2005). Plant Tissue Culture: Basic and Applied. Universities Press.
6. E.F. George, M.A. Hall, G.D. Klerk (2008). Plant Propagation by Tissue Culture. Springer Publications.
7. Robert Trigiano and Dennis Gray (2011). Plant Tissue Culture, Development, and Biotechnology. 1st Edition, CRC Press.
8. S.S. Bhojwani and P.K. Dantu (2013). Plant Tissue Culture: An Introductory Text. Springer Publications.

WEB RESOURCES

1. <https://nptel.ac.in/courses/102103016>
2. <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/micropropagation>
3. <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/callus-culture>
4. <https://labassociates.com/cell-suspension-culture-an-overview>
5. <https://pmc.ncbi.nlm.nih.gov/articles/PMC4752953/>

MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	S	S
CO2	S	M	S	H	M
CO3	H	S	H	S	H
CO4	S	S	S	S	M
CO5	S	H	H	S	H

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs) Dr. R. Thirugnanasampandan Signature of the Course in-charge	Signature of the HOD
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Programme Code: 05		B.Sc., BOTANY			
SKILL BASED SUBJECT III: BASICS OF INTELLECTUAL PROPERTY RIGHTS					
Batch 2026-2027	Semester VI	Hours / Week 2	Total Hours 30	Credits 3	Skill Development

COURSE OBJECTIVES

- To create awareness about recent trends in IPR and Innovation
- To explore the basic concepts IPR
- To focus upon trademarks, copyrights, patents, industrial designs and traditional knowledge.
- To learn more about managing IP rights and legal aspects.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO1	Know about basic concepts of IPR and patent
	CO2	Understand copyrights, industrial designs and geographical indication of goods.
	CO3	Differentiate between trademarks and trade secrets
	CO4	Acquire knowledge on protection of traditional knowledge and plant varieties.
	CO5	Manage and protect IP Rights

SYLLABUS

UNIT I

(6 HOURS)

Introduction -origin and development of Intellectual Property Rights (IPR), need for protecting IP, **Patents:** Foundation of patent law, patent searching process, basic criteria of patentability. Patentable and non - patentable subject matters in India. Patent prior art search, drafting the patent specification and filing procedure

UNIT II

(6 HOURS)

Copyrights: Fundamentals of copyright law, originality of material, right of reproduction, right to perform the work publicly, copyright ownership issues, notice of copyright. **Industrial Designs:** Kind of protection provided in Industrial design. **Geographical Indication of Goods:** Basic aspects and need for the registration.

UNIT III

(6 HOURS)

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, transfer of rights, selecting and evaluating trademark, registration of trademarks, claims. **Trade Secrets:** Trade secret law, determination of trade secret status, liability form is appropriation of trade secrets, trade secret litigation.

UNIT IV

(6 HOURS)

Protection of traditional knowledge - Objectives, concept of traditional knowledge, issues concerning, bioprospecting and biopiracy. **Protection of Plant Varieties** - Objectives, international position, plant varieties protection in India. Rights of farmers, breeders and researchers.

UNIT V**(6 HOURS)**

Managing IP Rights: Acquiring IP Rights: letters of instruction, joint collaboration agreement, protecting IP Rights: non-disclosure agreement, cease and desist letter, settlement memorandum. **Transferring IP Rights:** Assignment contract, license agreement, deed of assignment. Infringement and enforcement.

***Self study**

TEXT BOOKS

1. Ramakrishna Chintakunta and M. Geethavani (2022). A Textbook of Intellectual Property Rights. Blue Hills publications.
2. N. K Acharya (2021). Intellectual property rights(8thEdn). Asia Law House.
3. Craig Allen Nard, Michael J. Madison, and Mark P. McKenna. (2017). Law of Intellectual Property (5thEdn). New York Aspen publishers.
4. Barrett and Margreth (2009). Intellectual Property. New York Aspen publishers.
5. Deborah E.Bouchoux(2013). Intellectual property:The Law of Trademarks, Copyrights, Patents, and Trade Secrets. Publisher: Cengage India

REFERENCEBOOKS

1. B.Ramakrishna and H.S.Anil Kumar (2017). Fundamentals of Intellectual Property Rights: For Students, Industrialist and Patent Lawyers.Notion Press.
2. K. Ahuja (2013). Law relating to Intellectual Property rights (2nd Edn). LexisNexis.
3. R. Radhakrishnan and S. Balasubramanian (2008). Intellectual property rights: Text and Cases. Excel Books India.
4. D. Goeland S. Parashar (2013). IPR Biosafety and Bioethics. Pearson Education India.

WEB RESOURCES

1. <https://www.nitap.ac.in/storage/pdf/f63d0ea9127821f83a5a4ad9f1531be8-10-04-11of%20IPR.pdf>
2. <https://blog.ipleaders.in/patent-procedure-filing-application/>
3. <https://blog.ipleaders.in/an-overview-of-the-copyright-act-1957/>
4. https://www.icsi.edu/media/webmodules/Industrial_Design_An_Imperative_IP_Right.pdf
5. <https://cleartax.in/s/functions-trademarks-in-india>
6. <https://law.dypvp.edu.in/plr/Publication/Long-Articles/Poorvi-Bansal/Trade-Secrets-India's-Dimension.pdf>
7. <https://fitm.ris.org.in/sites/fitm.ris.org.in/files/Publication/Scooping%20Paper%20No%202%20%281%29.pdf>
8. https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000020LA/P000846/M010204/ET/151376063923_Q1e-text.pdf
9. https://mrcet.com/downloads/digital_notes/IT/IPR%20-%20Digital%20Notes.pdf
10. https://www.argus-p.com/uploads/blog_article/download/1593606674_Transfer_of_Intellectual_Property_-_A_Primer.pdf

CIA EXAMINATION MARK BREAKUP

The CIA examination mark break up for the course **Basics of IPR** is given below

S. No	DISTRIBUTION COMPONENT	MARKS
1.	CIA I – 75 Marks Converted to 30	30
2.	CIA II – 75 Marks Converted to 30	30
3.	Seminar / Objective Capacity Testing	10
4.	Seminar /Objective Capacity Testing	10
5.	Attendance	05
6.	Any Case Study related to IPR (as a Group)	15
Total		100

QUESTION PAPER PATTERN

The following Question Paper pattern will be followed

Duration: 3 hrs.

Max: 75 Marks

Section - A ($10 \times 1 = 10$)

Choose the Correct Answer

Section - B ($5 \times 5 = 25$)

Short answer questions, either or type, one question from each unit.

Section – C ($5 \times 8 = 40$)

Essay answer questions, either or type, one question from each unit.

Content Prepared by (Based on Inputs)	
Dr. K. Sowndhararajan Signature of the Course in-charge	Signature of the HOD

UBO89

**EXTRA DEPARTMENTAL
COURSE (EDC) PAPER**

Programme Code: 05		For UG STUDENTS			
Extra Departmental Course (EDC) - MEDICINAL BOTANY AND HUMAN WELFARE					
Batch 2026-2027	Semester V	Hours / Week 2	Total Hours 30	Credits 3	Entrepreneurship

COURSE OBJECTIVES

- To obtain inherent knowledge on the Indian system of traditional medicine
- To expertise pharmacognostical aspects of medicinal plants
- To familiarize cultivation technologies of medicinal plants

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO1	Recognize crude drugs used in traditional system of medicine
	CO2	Understand the therapeutic potential of crude drugs
	CO3	Apply knowledge for the cultivation practices of medicinal plants
	CO4	Implement knowledge in identifying novel drug leads against allopathic medicine
	CO5	Assess the methods of cultivation and processing of medicinal plants

SYLLABUS

UNIT-I (6 Hours)

Traditional medicinal Systems - Ayurveda, Unani, Siddha and Homeopathy. Classification and Evaluation of crude drugs. Drug adulterations.

UNIT-II (6 Hours)

Morphological and histological studies chemical constituents. Therapeutic and other pharmaceutical uses of bark - *Cinchona*, Leaves - *Adathoda* and Flower-clove.

UNIT-III (6 Hours)

Fruits and seeds – Noni and poppy seeds, Underground stem-ginger- Unorganized drugs. Gum - Gugul, Resin - *Ferula*, Fixed oil- Castor oil

UNIT-IV (6 Hours)

A brief account of the following: Drugs acting on the central nervous system (*Papaver somniferum*, *Atropa belladonna*, *Valeriana officinalis*) Drugs used in disorders of gastro-intestinal tract (*Zingiber officinale*, *Curcuma longa*, *Ulmus rubra*) and Cardio vascular drugs (*Panax ginseng*, *Taxus brevifolia*, *Digitalis purpurea*).

UNIT-V (6 Hours)

Botanical features, medicinal uses and cultivation of medicinal plants - *Embllica officinalis*, *Gloriosa superba* and *Rauwolfia serpentina**.

*Self study

TEXT BOOKS

1. Trease and Evans. (1978). Pharmacognosy, Baillere Tindall London.
2. T.E.Wallis. (2005). Text book of Pharmacognosy Fifth Edition. Publishers- CBS publishers and distributions Delhi.
3. J.K. Maheshwari, (2000). Ethnobotany and Medicinal Plants of India and Subcontinent Scientific Publishers, India
4. S.K. Jain, (1981). Glimpses of Ethnobotany. Oxford and IBH, New Delhi
5. P. Vasanthkumar, (2014). Economic Botany. Sonali Publications, New Delhi.

REFERENCE BOOKS

1. S.S Handa and V.K. Kapoor. (1989). Pharmacognosy, Second Edition. Publishers- CBS Publishers and Distributors, Delhi.
2. N.C. Kumar, (1993). An introduction to Medical Botany and Pharmacognosy, Emky Publications, New Delhi.
3. B. Supriya Kumar, (2005). Hand Book of Medicinal Plants, Pointers Publishers, Jaipur.
4. C.K. Kokate, A.Purohit and S.R. Gokhale. (2002). Pharmacognosy, 13th Edition Publishers Nirali Prakashan. Pune.
5. Rai et al. (2012). Medicinal plants: Biodiversity and Drugs. CRC Press, USA
6. Hao et al (2015). Medicinal Plants: chemistry, Biology and omics. Woodhead publishers, Cambridge
7. P.C. Trivedi, (2016). Medicinal plants and Raw drugs of tribals. Pointer Publishers, India.
8. Bikarma Singh, (2019). Plants for Human survival and Medicine., New India Publishing Agency, New Delhi

WEB RESOURCES

1. <https://www.vbspu.ac.in/e-content/Dharmendra-Singh/Traditional%20System%20of%20Medicine.pdf>
2. <https://pmc.ncbi.nlm.nih.gov/articles/PMC2816487/>
3. <https://ijpsr.com/bft-article/histological-and-phytochemical-analysis-of-four-ethnomedicinal-plants-used-to-cure-skin-diseases/>
4. <https://www.slideshare.net/slideshow/studies-on-phytochemical-constituents-of-medicinal-plants/52665816>
5. <https://pubmed.ncbi.nlm.nih.gov/16909441/>
6. <https://onlinelibrary.wiley.com/doi/abs/10.1002/9781119794127.ch15>
7. <https://pmc.ncbi.nlm.nih.gov/articles/PMC9581220/>
8. <https://pmc.ncbi.nlm.nih.gov/articles/PMC7155419/>

Content Prepared by (Based on Inputs)	
Dr. V. Aravindhan Signature of the Course in-charge	Signature of the HOD

Question Paper Pattern**Duration: 3 hrs****Max: 75 marks****Section - A ($10 \times 1 = 10$)****Choose the Correct Answer****Section - B ($5 \times 5 = 25$)****Short answer questions, either or type, one question from each unit.****Section - C ($5 \times 8 = 40$)****Essay answer questions, either or type, one question from each unit.**

CIA EXAMINATION MARK BREAKUP

S. NO	DISTRIBUTION COMPONENT	MARKS
1.	CIA I – 75 Marks Converted to 40	40
2.	CIA II – 75 Marks Converted to 40	40
3.	Seminar / Objective Capacity Testing	05
4.	Seminar /Objective Capacity Testing	05
5.	Attendance	05
6.	Others (Group Discussion, Flipped Class room, etc.,)	05
Total		100

Content prepared by (Based on Inputs) Dr. V. Aravindhana Signature of the Course in-charge	Signature of the HOD
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UBO93

GENERAL PAPERS

For B.A., BBA, B. Com, BCA and B.Sc., Degree Students				
PART IV – ENVIRONMENTAL STUDIES				
Batch 2026-2027	Semester I	Hours / Week 2	Total Hours 30	Credits 2

COURSE OBJECTIVES

- To provide a fundamental understanding of natural resources, environmental ethics, and the impact of modern practical conservation and sustainability.
- To inculcate knowledge and create awareness about concepts, components and function of ecosystems
- To appraise on the importance of biodiversity, its values, threats, indigenous and Traditional knowledge systems, conservation strategies, and modern identification tools, and cultivate conscious responsibility and awareness for biodiversity conservation and sustainability.
- To understand the environment threats and pollution, its impacts and mitigation strategies
- To develop an understanding of disasters (natural and man-made) and its preparedness

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO 1	Formulate genetic resource conservation strategies and assess India's SDG performance through AI/ML tools.
	CO2	Evaluate and predict the impact of humans on web of life, global economy and quality
	CO3	Think critically and develop strategies for biodiversity conservation, sustenance and environmental equity through eco conscious approach
	CO4	Demonstrate values and have compassion towards complex environmental issues and take part in mitigating current environment challenges through sustainable solutions
	CO5	Apply basic safety and preparedness measures in disaster situations in society, household and workplace

SYLLABUS

UNIT I MULTIDISCIPLINARY NATURE OF ENVIRONMENT AND ITS SOCIAL ETHICS AND VALUES (6 HOURS)

- Introduction to environment; Historical Development of Human – environment interaction; Industrial revolution, Economic development and its impact on the environment; **Overview of resources:** Definition, Classification of natural resources – biotic and abiotic, renewable and non-renewable. **Renewable Resources:** Water

Resources- Rainwater Harvesting, Reservoirs managements, AI & ML tools for water resource management. Sustainable Development goals - Agriculture and Environment. Revisiting traditional agricultural practices- Biodynamic Farming, Physical and Biological soil factors. **Non-renewable Resources-** fossil fuel, nuclear fuel, Energy Resources: Conventional and non-conventional Resources- solar, wind, clean energy- hydrogen, Biomass energy-coir pith, charcoal; Use of exotic/invasive weed biomass for alternative energy/economy. Eg: *Lantana camara*, *Eichhornia Sp*, Genetic Resources and conservation, strategies.

***Activity:** (i) Analyze your department and its practices towards compliance to SDG's. List out the compliances towards SDG's with justification.

(ii) Examine your campus' current resource conservation strategies and provide recommendations to improve its sustainability and resource efficiency.

* Students can take up any one of the above.

UNIT II ECOSYSTEMS

(6 HOURS)

Ecosystem- Definition, Components (producers, consumers and decomposers) and functions- Energy flow, Food chains and its types, food web, Disturbances to food chain and food web due to anthropogenic intrusions Eg: Diclofenac Case, Ecological pyramids: types and importance of ecological pyramids, **Types of Ecosystems:** Natural ecosystem- Aquatic Ecosystem (Pond, River, Marine and Estuarine), Terrestrial Ecosystem (Forest, Grassland and Desert). Artificial Ecosystem (Crop land).

Activity: Develop a working model for an ecosystem through building a Terrarium or Suseum.

UNIT III BIODIVERSITY

(6 HOURS)

Concept of Biodiversity: Definition, Types-Genetic, Species and Ecosystem diversity. Indigenous Knowledge Systems on Biodiversity – Traditional knowledge and legal framework for bioprospecting and Biomimicry. Biodiversity- Values, uses and threats, sustainable use of bioresources for value additions, Conservation strategies of Biodiversity- *In-situ* - National Parks, Wildlife Sanctuaries, Community Reserve and Conservation Reserves, *Ex-situ* – Zoological Park, Aquarium, Botanical garden. ***Case Study-** Nilgiri Tahr Conservation Project.

Activity: (i) Applications for plant and animal identification by software -*iNaturalist* and Merlin Bird ID

(ii) Field observation and documentation of the campus biodiversity.

UNIT IV ENVIRONMENTAL THREATS AND POLLUTION (6 HOURS)

Introduction and Classification of Pollution- physical, chemical and biological; major types of pollution- air, water, soil/land, noise, thermal, radioactive, solid waste, electronic waste (e-waste), plastic, biomedical waste. **Assessment and Monitoring:** Pollution impact assessment/health risk assessment & monitoring techniques, Biological indicators of pollution – Dissolved Oxygen (DO), Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD). Impact of pollution and incidence of Life style disorders like Diabetes, Cardio Vascular Disease, Cancer, PCOS etc. **Waste Management** – concept of 3R (Reduce, Recycle and Reuse) and sustainability. ***Case studies:** Dye Industrial pollution from tanneries, paper and pulp industrial effluents in Noyyal and Cauvery rivers.

Activity: Prepare an Audit report for:

- (i) Water usage in your department/house
- (ii) Magnitude of solid waste generation and its management at your department/house.

UNIT V: DISASTER MANAGEMENT AND PREPAREDNESS (6 HOURS)

Definition and Classification of Disaster (Natural and Man-made disasters). **Natural Disaster:** Earthquakes, Landslides, Tsunami, Floods, Volcanic eruptions, Cyclones. Wayand- landslides, Joshimath- The sinking Village, Forest fires: causes, spread, control measures. **Man-made Disasters:** Industrial and chemical accidents (Bhopal disaster, oil spills), Nuclear hazards (Chernobyl and Fukushima). Kasargod- Impact of Endosulfan spraying on cashew farms. **Preparedness and safety measures:** Early warning system, response, recovery, mitigation, vulnerability, risk, resilience and capacity building. **Forecasting methods:** Conventional – cloud formation & wind, wave patterns, behaviours of animals & plants, Modern methods – remote sensing, drone and AI tools for impact assessment. ***Case studies:** Chennai flood 2015, causes and control measures.

Activity: Prepare (i) Personal/Class emergency plan; (ii) Risk identification checklist like loose heavy furniture, poor wiring, blocked exits; (iii) A document using Mobile technology to map local resources or identify safer locations.

Field Study: Visit to eco parks'/conservation sites and report.

*Case studies are not for examination purposes.

TEXT BOOK

Workbook on Environmental Science (2026), published by Kongunadu Arts and Science College, Coimbatore-641029.

REFERENCE BOOKS:

1. Fundamentals of Ecology, Odum E.P, Odum H.T & Andrews- Saunders publications
2. Ecology, Environmental science and Conservation. Singh J.S & Gupta SR, S Chand Publishing (2017).
3. This Fissured Land: An Ecological History of India; Gadgil M & Guha R (1993), University of California Press, 1st Edition.
4. Environment (8th Ed.) by Raven PH, Gift, Bary LR, Hassenzahl DM, 2015, Wiley publishing house.
5. R. S. Ambasht, A Text Book of Plant Ecology, Students Friends & Company, 1990 - Plant ecology - 373 pages
6. A. Ravikrishnan (2019), Environmental Science and Engineering (Forth Edition) by Sri Krishna Hitech Publishing Company Pvt.Ltd, Velappanchavadi, Chennai.
7. Yadav, P. (2021). Applied and Economic Zoology. Kedar Nath Ram Nath
8. Krishnamurthy, K. V. (2023). An advanced textbook on biodiversity: Principles and practice. Oxford and IBH Publishing.
9. Anonymous (2003) Professional's The Wildlife (Protection) Act, 1972. Professional Book Publications.
10. National Disaster Management Guidelines - National Disaster Management Information and Communication System (NDMICS) (2011). A publication of the National Disaster Management Authority, Government of India. ISBN: 978-93-80440-12-5, February 2012, New Delhi.
11. Disaster Risk Management Systems Analysis: A Guide Book, Food and Agriculture Organization of the United Nations, Rome (2008). ISBN 978-92-5106056-8.

WEB REFERENCE SOURCES

1. <https://egyankosh.ac.in/bitstream/123456789/77368/1/Unit-4.pdf>
2. <https://agritech.tnau.ac.in/pdf/sustainableagriculture.pdf>
3. https://www.dev-practitioners.eu/media/key_documents/SDGs_Booklet_Web_En.pdf
4. <https://www.pmfias.com/environment-ecosystem-components-ecosystem/>
5. <https://www.ugc.gov.in/oldpdf/modelcurriculum/Chapter3.pdf>
6. https://mjcollege.kces.in/pdf/download_documents/study_material_env_studies/ch3.pdf
7. [https://www.deshbandhucollege.ac.in/pdf/resources/1587401626_BA\(H\)-Psc-Eco-Eng-BA\(P\)-II-Ecosystem.pdf](https://www.deshbandhucollege.ac.in/pdf/resources/1587401626_BA(H)-Psc-Eco-Eng-BA(P)-II-Ecosystem.pdf)
8. <http://www.tezu.ernet.in/denvsc/IDC/biodiversity.pdf>
9. <https://egyankosh.ac.in/bitstream/123456789/86424/1/Unit-11.pdf>

10. <https://utkaluniversity.ac.in/wp-content/uploads/2022/05/Environmental-Pollution.pdf>
11. https://cdn.visionias.in/value_added_material/d6c24-disaster_management.pdf
12. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SCIA4001.pdf
13. https://mrcet.com/downloads/MBA/Disaster%20and%20Crisis%20Management_Digital%20Notes.pdf

QUESTION PAPER PATTERN

Maximum Marks: 50

Duration: 3 Hours

Answer all Questions (5×10 = 50 Marks)

Essay type, Either or type questions from each unit.

For B.A., BBA, B. Com, BCA and B.Sc., Degree Students				
VALUE EDUCATION - MORAL AND ETHICS				
Batch 2026-2027	Semester II	Hours / Week 2	Total Hours 30	Credits 2

COURSE OBJECTIVES

- To impart Value Education in every walk of life
- To help the students to reach excellence and reap success
- To impart the right attitude by practicing self introspection
- To portray the life and messages of Great Leaders
- To insist the need for universal brotherhood, patience and tolerance
- To help the students to keep them fit
- To educate the importance of Yoga and Meditation

COURSE OUTCOMES

After completing the course, the students:

K1 ↑ ↓ K5	CO1	will be able to recognize Moral values, Ethics, contribution of leaders, Yoga and its practice
	CO2	will be able to differentiate and relate the day to day applications of Yoga and Ethics in real life situations
	CO3	can emulate the principled life of great warriors and take it forward as a message to self and the society
	CO4	will be able to analyze the Practical outcome of practicing Moral values in real life situation
	CO5	could Evaluate and Rank the outcome of the pragmatic approach to further develop the skills

SYLLABUS

UNIT I (4 HOURS)

Moral and Ethics: Introduction – Meaning of Moral and Ethics – Social Ethics – Ethics and Culture – Aim of Education.

UNIT II (6 HOURS)

Life and Teachings of Swami Vivekananda: Birth and Childhood days of Swami Vivekananda – At the Parliament of Religions – Teachings of Swami Vivekananda

UNIT III (4 HOURS)

Warriors of our Nation: Subhas Chandra Bose – Sardhar Vallabhbhai Patel – Udham Singh – V. O. Chidambaram Pillai – Bhagat Singh – Tiruppur Kumaran – Dheeran Chinnamalai – Thillaiaadi Valliammai – Velu Nachiyar – Vanchinathan

UNIT IV: (8 HOURS)

Fundamentals of Yoga: Introduction to Yoga – Benefits of Yoga - Principles of Yoga Practice– Yoga for Health and Well Being – Yoga for Peace – Yoga for Success – Brain Yoga Benefits – The Science of Yoga - Importance of Yoga in Modern Life

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UNIT V

(8 HOURS)

Yoga Practices: Warm Up Exercises in Yoga: Neck, Shoulder, Wrist, Hip, Knee and Ankle Rotations - Basic Yoga Asanas: Tadasana, Vrikshasana, Bhujangasana, Vajrasana, Shavasana and Ardhasiddhasana – Surya Namaskar - Pranayama - Meditation and Relaxation

TEXT BOOKS:

Value Based Education – Moral and Ethics – compiled by Kongunadu Arts and Science College (Autonomous), 3rd Edition (2024).

REFERENCE BOOKS:

1. Swami Vivekananda - A Biography, Swami Nikhilananda, Advaita Ashrama, India, 24th Reprint Edition (2010).
2. Gandhi, Nehru, Tagore and other eminent personalities of Modern India, Kalpana Rajaram, Spectrum Books Pvt. Ltd., revised and enlarged edition (2004).
3. Freedom Fighters of India, Lion M.G. Agrawal, Isha Books Publisher, First Edition (2008).
4. Easy steps to Yoga by Swami Vivekananda, A Divine Life Society Publication (2000).

WEB REFERENCES:

1. https://youtu.be/4UXFb7Cs3PU?si=6c50D1IfFvxTXdX_
2. <https://youtu.be/zCag6hbDIQw?si=kNWsrIxQXvOKfacp>
3. https://youtu.be/_2GgRQJ9IbU?si=Xp_YEcCSR8mvMEG-
4. <https://youtu.be/ZkyN4Dy4kO0?si=BkctTS1W3jDS886v>
5. https://youtu.be/TWbiDzi-rQc?si=92crHrzoNq_0jrU-

Question paper pattern

(External only)

Duration: 3 hrs

Total Marks: 50

Answer all Questions (5 × 10 = 50 Marks)

Essay type, either or type questions from each unit.

UBO101

NON- MAJOR ELECTIVE PAPERS

For B.A., BBA, B. Com, BCA and B.Sc., Degree Students				
PART IV - Non- Major Elective 1 – HUMAN RIGHTS				
Batch 2026-2027	Semester III	Hours/Week 2	Total Hours 30	Credits 2

COURSE OBJECTIVES

- To prepare for responsible citizenship with awareness of the relationship between Human Rights, democracy and development.
- To impart education on national and international regime on Human Rights.
- To sensitive students to human suffering and promotion of human life with dignity.
- To develop skills on human rights advocacy
- To appreciate the relationship between rights and duties
- To foster respect for tolerance and compassion for all living creature.

COURSE OUTCOMES

K1 ↑ ↓	CO1	To understand the hidden truth of Human Rights by studying various provisions in the Constitution of India.
	CO2	To acquire overall knowledge regarding the Feminist perspectives in the Liberative Empowerment of Women.
	CO3	To gain knowledge about various gender roles and stereotypes involved in the comprehension of gender equality and women's rights.
	CO4	To comprehend the legal provisions and policies that foreground the safety of children in the society and to promote awareness.
	CO5	To gain enhanced knowledge about sexual and gender minorities to recognize, celebrate and acknowledge the diversified forms of gender expressions and rights.

SYLLABUS

UNIT I (6 Hours)

HUMAN RIGHTS HUMANS RIGHTS CONSTITUTION OF INDIA:

Humans Rights - Constitution of India

UNIT II (6 Hours)

WOMEN EMPOWERMENT IN INDIA: Feminism and Sexual Violence -

Women And Liberation

UNIT III (6 Hours)

GENDER EQUALITY AND WOMEN'S RIGHTS: Stereotype Gender Roles -

Women's Education, Power and Science

UNIT IV (6 Hours)

RIGHTS OF THE CHILD IN INDIA: Status of child in contemporary Indian society - Special Laws and Policies for protection of children.

UNIT V (6 Hours)

SOGIESC RIGHTS: Understanding SOGIESC- basic Definitions- inclusivity of SOGIESC-importance of studying SOGIESC- presence of SOGIESC in Indian Traditions- temples and cultural practices that exemplify SOGIESC in India- Genetics of Sex determination- Genetics of Intersex community- Successful SOGIESC

Personalities and achievers – Alan Turing- Sally Ride- Leonardo da vinci- Alan Hart- Virginia -Woolf- Bayard Rustin- Padmini Prakash- Akkai Padmashali- K Prithika Yashini- Laxmi Narayan Tripathi- Madhu Bai Kinnar-Manabi Bandhopadhyay- SOGIESC Rights and laws

BOOKS FOR STUDY:

Human Rights (2024) Compiled by Kongunadu Arts and Science College, Coimbatore –29.

REFERENCES:

1. Human Rights, (2018) by Jaganathan, MA., MBA., MMM., ML., ML., (Humanitarian Law) and J.P. Arjun Proprietor: Usha Jaganathan, Refugee Law Law series, 1st floor, Narmatha Nanthi Street, Magathma Gandhi Nagar, Madurai – 625014.
 2. Country Report on SOGIESC Rights In India: An Unfinished Agenda. Weblink: <https://www.ilgaasia.org/publications/india-country-report-an-unfinished-agenda>
 3. Intersex. Weblink: <https://my.clevelandclinic.org/health/articles/16324-intersex>
 4. SOGIESC Personalities:
<https://www.bbc.com/news/world-asia-india-29357630>
https://en.wikipedia.org/wiki/Laxmi_Narayan_Tripathi
https://en.wikipedia.org/wiki/Akkai_Padmashali
<https://www.indiatoday.in/india/story/prithika-yashini-india-first-transgender-police-officer-tamil-nadu-969389-2017-04-04>
<https://yourstory.com/2018/03/first-transgendre-college-principal-west-bengal>
 5. SOGIESC Rights and laws
<https://www.openglobalrights.org/lgbtqia-to-sogiesc-reframing-sexuality-gender-human-rights/>
<https://static1.squarespace.com/static/5a84777f64b05fa9644483fe/t/625ead0484f9005d75b92dd0/1650371887436/ILGA+Asia+India+Report+2021.pdf>
-

QUESTION PAPER PATTERN

Duration: 3 Hours

Max. Marks: 75

SECTION A

(5 × 5 = 25 marks)

Short answers, either or type, one question from each unit.

SECTION B

(5 × 10 = 50 marks)

Essay type questions, either or type, one question from each unit.

For B.A., BBA, B. Com, BCA and B.Sc., Degree Students				
PART IV - NON- MAJOR ELECTIVE – II - WOMEN’S RIGHTS				
Batch 2026-2027	Semester IV	Hours/Week 2	Total Hours 30	Credits 2

COURSE OBJECTIVES

- To know about the laws enacted to protect Women against violence.
- To impart awareness about the hurdles faced by Women.
- To develop a knowledge about the status of all forms of Women to access to justice.
- To create awareness about Women’s rights.
- To know about laws and norms pertaining to protection of Women.
- To understand the articles which enables the Women’s rights.
- To understand the Special Women Welfare laws.
- To realize how the violence against Women puts an undue burden on healthcare services.

COURSE OUTCOMES (CO)

After completion of the Course the student will be able to

K1 ↑ ↓ K5	CO1	Appraise the importance of Women’s Studies and incorporate Women’s Studies with other fields
	CO2	Analyze the realities of Women Empowerment, Portrayal of Women in Media, Development and Communication
	CO3	Interpret the laws pertaining to violence against Women and legal consequences
	CO4	Contribute to the study of the important elements in the Indian Constitution, Indian Laws for Protection of Women
	CO5	Spell out and implement Government Developmental schemes for women and create awareness on modernization and impact of technology on Women

SYLLABUS

UNIT I

(6 Hours)

Women’s Studies: Basic concepts of Women’s studies in Higher education, Women’s studies perspectives- Socialization- Patriarchy- Women’s studies as an academic discipline- Growth and development of Women’s studies as a discipline internationally and in India.

UNIT II

(6 Hours)

Socio-Economic Development of Women: Family welfare measures, role of Women in economic development, representation of Women in media, status of Women land rights, Women Entrepreneurs, National policy for the empowerment of women.

UNIT III**(6 Hours)**

Women's Rights – Access to Justice: Crime against Women, domestic violence – physical abuse- verbal abuse – emotional abuse - economic abuse – minorities, dowry- harassment and death, code of conduct for work place, abetment of suicide.

UNIT IV**(6 Hours)**

Women Protective acts: Protective legislation for Women in the Indian constitution- Anti-dowry, SITA, PNDT, and Prevention Sexual Harassment at Workplace (Visaka case), Domestic violence (Prevention) Act.

UNIT V**(6 Hours)**

Women and Child welfare: Safety provisions - various forms of mass media, radio, visual, internet, cyber space, texting, SMS and smart phone usage. Healing measures for the affected Women and child society by private and public sector, NGO and society.

TEXT BOOK

Women's Rights (2021), Published by Kongunadu Arts & Science College, Coimbatore – 641 029.

REFERENCE BOOKS

1. **“Rights of Indian Women”** by Vipul Srivatsava. Publisher: Corporate Law Advisor, 2014.
 2. **“Women's security and Indian law”** by Harsharam Singh. Publisher: Aabha Publishers and Distributors, 2015.
 3. **“Women's Property Rights in India”** by Kalpaz publications, 2016.
-

QUESTION PAPER PATTERN**Duration: 3 Hours****Max. Marks: 75****SECTION A****(5 × 5 = 25 marks)**

Short answers, either or type, one question from each unit.

SECTION B**(5 × 10 = 50 marks)**

Essay type questions, either or type, one question from each unit.

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For B.A., BBA, B. Com, BCA and B.Sc., Degree Students			
PART IV - NON- MAJOR ELECTIVE III – CONSUMER AFFAIRS			
Batch 2026-2027	Hours/Week 2	Total Hours 30	Credits 2

COURSE OBJECTIVES

- To familiarize the students with their rights and responsibilities as a consumer.
- To understand the procedure of redress of consumer complaints.
- To know more about decisions on Leading Cases by Consumer Protection Act.
- To get more knowledge about Organizational set-up under the Consumer Protection Act
- To impart awareness about the Role of Industry Regulators in Consumer Protection
- To understand Contemporary Issues in Consumer Affairs

COURSE OUTCOMES

After completion of the Course the student will be able to

K1 ↑ ↓ K5	CO1	Know the rights and responsibility of consumers.
	CO2	Understand the importance and benefits of Consumer Protection Act.
	CO3	Apply the role of different agencies in establishing product and service standards.
	CO4	Analyse to handle the business firms' interface with consumers.
	CO5	Assess Quality and Standardization of consumer affairs

SYLLABUS

UNIT I

(6 Hours)

Conceptual Framework - Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labeling and packaging along with relevant laws, Legal Metrology. Experiencing and Voicing Dissatisfaction: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000suite

UNIT II

(6 Hours)

The Consumer Protection Law in India - Objectives and Basic Concepts: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, restrictive trade practice. Organizational set-up under the Consumer Protection Act: Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

UNIT III**(6 Hours)**

Grievance Redressal Mechanism under the Indian Consumer Protection Law - Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties. Leading Cases decided under Consumer Protection law by Supreme Court/National Commission: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

UNIT IV**(6 Hours)**

Role of Industry Regulators in Consumer Protection

- i. Banking: RBI and Banking Ombudsman
- ii. Insurance: IRDA and Insurance Ombudsman
- iii. Telecommunication: TRAI
- iv. Food Products: FSSAI
- v. Electricity Supply: Electricity Regulatory Commission
- vi. Real Estate Regulatory Authority

UNIT V**(6 Hours)**

Contemporary Issues in Consumer Affairs - Consumer Movement in India: Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings. Quality and Standardization: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview.

Note: Unit 2 and 3 refers to the Consumer Protection Act, 2086. Any change in law would be added appropriately after the new law is notified.

SUGGESTED READINGS:

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) Consumer Affairs, Universities Press.
2. Choudhary, Ram Naresh Prasad (2005). Consumer Protection Law Provisions and Procedure, Deep and Deep Publications Pvt. Ltd.
3. G. Ganesan and M. Sumathy. (2012). Globalisation and Consumerism: Issues and Challenges, Regal Publications
4. Suresh Misra and Sapna Chadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, New Delhi
5. Rajyalaxmi Rao (2012), Consumer is King, Universal Law Publishing Company
6. Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.
7. E-books: -www.consumereducation.in
8. Empowering Consumers e-book, www.consumeraffairs.nic.in
9. ebook, www.bis.org
10. The Consumer Protection Act, 1986 and its later versions.

QUESTION PAPER PATTERN**Duration: 3 Hours****Max. Marks: 75****SECTION A****(5 × 5 = 25 marks)**

Short answers, either or type, one question from each unit.

SECTION B**(5 × 10 = 50 marks)**

Essay type questions, either or type, one question from each unit.

ALL UG COURSES		
TITLE OF THE PAPER: HEALTH AND WELLNESS		
Batch 2026 – 2027	Semester IV	Credits 2

Skill Areas:

Physical Fitness, Nutrition, Mental Health, Awareness on Drug addiction and its effects

Purpose:

The Health & Wellness course focuses on teaching the elements of physical, mental, emotional, social, intellectual, environmental well-being which are essential for overall development of an individual. The course also addresses the dangers of substance abuse and online risks to promote emotional and mental health.

Learning Outcomes:

Upon completion of the Health & Wellness course, students will be able to:

1. Demonstrate proficiency in sports training and physical fitness practices.
2. Improve their mental and emotional well-being, fostering a positive outlook on health and life.
3. Develop competence and commitment as professionals in the field of health and wellness.
4. Awareness on drug addiction and its ill effects

Focus:

During the conduct of the Health & Wellness course, the students will benefit from the following focus areas:

1. Stress Management.
2. Breaking Bad Habits.
3. Improving Interpersonal Relationships.
4. Building Physical Strength & Inner Strength.

Role of the Facilitator:

The faculty plays a crucial role in effectively engaging with students and guiding them towards achieving learning outcomes. Faculty participation involves the following areas:

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1. **Mentorship & Motivation:** The Facilitator mentors students in wellness and self-discipline while inspiring a positive outlook on health. Faculty teach stress management, fitness, and daily well-being.
2. **Promoting a Safe and Inclusive Environment:** The facilitator ensures a safe, inclusive, and respectful learning environment for active student participation and benefit.
3. **Individualised Support and Monitoring Progress:** The facilitator plays a crucial role in providing personalized support, monitoring and guidance to students.

Guided Activities:

In this course, several general guided activities have been suggested to facilitate the achievement of desired learning outcomes. They are as follows:

1. Introduction to Holistic Well-being.
2. Holistic Wellness Program- Nurturing Body and Mind
3. Breaking Bad Habits Workshop.
4. Improving the elements of physical, emotional, social, intellectual, environmental and mental well-being.
5. Creating situational awareness, digital awareness.
6. Understanding substance abuse, consequences and the way out.

Period Distribution

The following are the guided activities suggested for this Audit course.

The Physical Director should plan the activities by the students.

Arrange the suitable Mentor / Guide for the wellness activities.

Additional activities and programs can be planned for Health and Wellness.

S.No	Guided Activities	Period
1	Introduction to Holistic Well-being 1. Introduce the core components of Health & Well-being namely Physical, mental and emotional well-being 2. Provide worksheets on all the four components individually and explain the interconnectedness to give an overall understanding.	
2	Wellness Wheel Exercise (Overall Analysis)	

	• Guide students to assess their well-being in various life dimensions through exercises on various aspects of well – being, and explain the benefits of applying wellness wheel. • Introduce Tech Tools: • Explore the use of technology to support well-being. • Introduce students to apps for meditation, sleep tracking, or healthy recipe inspiration.	
3	Breaking Bad Habits (Overall Analysis) • Open a discussion on bad habits and their harmful effects. • Provide a worksheet to the students to identify their personal bad habits. • Discuss the trigger, cause, consequence and solution with examples. • Guide them to replace the bad habits with good ones through worksheets.	
4	Physical Well-being 1. Fitness Introduce the different types of fitness activities such as basic exercises, cardiovascular exercises, strength training exercises, flexibility exercises, so on and so forth. (Include theoretical explanations and outdoor activity). 2. Nutrition Facilitate students to reflect on their eating habits, their body type, and to test their knowledge on nutrition, its sources and the benefits. 3. Yoga & Meditation Discuss the benefits of Yoga and Meditation for one's overall health. Demonstrate different yoga postures and their benefits on the body through visuals (pictures or videos)	

	4. Brain Health Discuss the importance of brain health for daily life. Habits that affect brain health (irregular sleep, eating, screen time). Habits that help for healthy brains (reading, proper sleep, exercises). Benefits of breathing exercises and meditation for healthy lungs. 5. Healthy Lungs Discuss the importance of lung health for daily life. Habits that affect lung health (smoking, lack of exercises). Benefits of breathing exercises for healthy lungs. 6. Hygiene and Grooming Discuss the importance of hygienic habits for good oral, vision, hearing and skin health. Discuss the positive effects of grooming on one's confidence level and professional growth. <u>Suggested Activities (sample):</u> Nutrition: Invite a nutritionist to talk among the students on the importance of nutrition to the body or show similar videos shared by experts on social media. Organize a 'Stove less/fireless cooking competition' for students where they are expected to prepare a nutritious dish and explain the nutritive values in parallel.	
5	Emotional Well-being 1. Stress Management Trigger a conversation or provide self-reflective worksheets to identify the stress factors in daily life and their impact on students' performance. Introduce different relaxation techniques like deep breathing, progressive muscle relaxation, or guided imagery. (use audio recordings or visuals to guide them through these techniques). After practicing the techniques, have them reflect on how these methods can help manage stress in daily life. 2. Importance of saying 'NO'.	

	Explain the students that saying 'NO' is important for their Physical and mental well-being, Academic Performance, Growth and Future, Confidence, Self-respect, Strong and Healthy Relationships, building reputation for self and their family (avoid earning a bad name). Factors that prevent them from saying 'NO'. How to practice saying 'NO'. 3. Body Positivity and self-acceptance Discuss the following with the students. • What is body positivity and self-acceptance? • Why is it important? • Be kind to yourself. • Understand that everyone's unique. <u>Suggested Activities(Sample):</u> (Importance of saying 'NO') Provide worksheets to self-reflect on... ...how they feel when others say 'no' to them ...the situations where they should say 'no' Challenge students to write a song or rap about the importance of saying no and how to do it effectively. Students can perform their creations for the class.	
6	Social Well-Being 1. Practicing Gratitude Discuss the importance of practicing gratitude for building relationships with family, friends, relatives, mentors and colleagues. Discuss how one can show gratitude through words and deeds. Explain how practicing gratitude can create 'ripple effect'. 2. Cultivating Kindness and Compassion Define and differentiate between kindness and compassion. Explore practices that cultivate these positive emotions. Self-Compassion as the Foundation.	

	The power of small gestures. Understanding another's perspective. The fruits of compassion. 3. Practising Forgiveness Discuss the concept of forgiveness and its benefits. Forgiveness: What is it? and What it isn't? Benefits of forgiveness. Finding forgiveness practices. 4. Celebrating Differences Appreciate the value of individual differences and foster inclusivity. The World: A Tapestry of Differences (cultures, backgrounds, beliefs, abilities, and appearances). Finding strength in differences (diverse perspectives and experiences lead to better problem-solving and innovation). Celebrating differences, not ignoring them (respecting and appreciating the unique qualities). Activities for celebrating differences (share culture, learn about others, embrace new experiences). 5. Digital Detox Introduce the students to: The concept of a digital detox and its benefits for social well-being. How to disconnect from devices more often to strengthen real-world connections. <u>Suggested Activities (sample):</u> (Practicing Gratitude) Provide worksheets to choose the right ways to express gratitude. Celebrate 'gratitude day' in the college and encourage the students to honour the house keeping staff in some way to express gratitude for their service.	
7.	Intellectual Well-being 1. Being a lifelong Learner Give students an understanding on: The relevance of intellectual well-being in this 21st century to meet	

	the expectations in personal and professional well-being The Importance of enhancing problem-solving skills Cultivating habits to enhance the intellectual well-being (using the library extensively, participating in extra-curricular activities, reading newspaper etc.) 2. Digital Literacy Discuss: The key aspects of digital literacy and its importance in today's world. It is more than just liking and sharing on social media. The four major components of digital literacy (critical thinking, communication, problem-solving, digital citizenship). Why is digital literacy important? Boosting one's digital skills. 3. Transfer of Learning Connections between different subjects – How knowledge gained in one area can be applied to others. <u>Suggested Activities(sample):</u> Intellectual Well-being. Provide worksheets to students for teaching them how to boost intellectual well-being. Ask the students to identify a long-standing problem in their locality, and come up with a solution and present it in the classroom. Also organize an event like 'Idea Expo' to display the designs, ideas, and suggestions, to motivate the students to improve their intellectual well-being.	
8	Environmental Well-being 1.The Importance of initiating a change in the environment. The session could be around: Defining Environmental well-being (physical, chemical, biological, social, and psychosocial factors) – People's behaviour, crime, pollution, political activities, infra-structure, family situation etc. Suggesting different ways of initiating changes in the environment (taking responsibility, creating awareness, volunteering,	

	approaching administration). <u>Suggested Activities (sample):</u> Providing worksheets to self-reflect on how the environment affects their life, and the ways to initiate a change. Dedicate a bulletin board or wall space (or chart work) in the classroom for students to share their ideas for improving environmental well-being. Creating a volunteers' club in the college and carrying out monthly activities like campus cleaning, awareness campaigns against noise pollution, (loud speakers in public places), addressing anti-social behaviour on the campus or in their locality.	
9	Mental Well-being 1. Importance of self-reflection Discuss: Steps involved in achieving mental well-being (self-reflection, self-awareness, applying actions, achieving mental well-being). Different ways to achieve mental well-being (finding purpose, coping with stress, moral compass, connecting for a common cause). The role of journaling in mental well-being. 2. Mindfulness and Meditation Practices Benefits of practicing mindful habits and meditation for overall well-being. 1. Connecting with nature Practising to be in the present moment – Nature walk, feeling the sun, listening to the natural sounds. Exploring with intention – Hiking, gardening to observe the nature. Reflecting on the emotions, and feeling kindled by nature. 2. Serving people Identifying the needs of others. Helping others. Volunteering your time, skills and listening ear. Finding joy in giving. 3. Creative Expressions	

	Indulging in writing poems, stories, music making/listening, creating visual arts to connect with inner selves. <u>Suggested Activities(Sample):</u> (Mindfulness and Meditation) – Conducting guided meditation every day for 10 minutes and directing the students to record the changes they observe.	
10	Situational Awareness (Developing Life skills) 1. Being street smart Discuss: Who are street smart? Why is it important to be street smart? Characteristics of a street smart person: Importance of acquiring life skills to become street smart – (General First-aid procedure, CPR Procedure, Handling emergency situations like fire, flood etc). 2. Digital Awareness Discuss: Cyber Security Information Literacy Digital Privacy Fraud Detection <u>Suggested Activities</u> (sample): (Street Smart) Inviting professionals to demonstrate the CPR Procedure Conducting a quiz on Emergency Numbers	
11	Understanding Addiction Plan this session around: Identifying the environmental cues, triggers that lead to picking up this habit. Knowing the impact of substance abuse – Adverse health conditions, social isolation, ruined future, hidden financial loss and damaging the family reputation. Seeking help to get out of this addiction. <u>Suggested Activities:</u>	

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	Provide Worksheets to check the students' level of understanding about substance addiction and their impacts. Share case studies with students from real-life. Play/share awareness videos on addiction/de-addiction, experts talk. *Conduct awareness programmes on Drugs and its ill effects. (Arrange Experts from the concerned government departments and NGOs working in drug addiction issues) and maintain the documents of the program.	
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Closure:

Each student should submit a Handwritten Summary of their Learnings & Action Plan for the future.

Assessments:

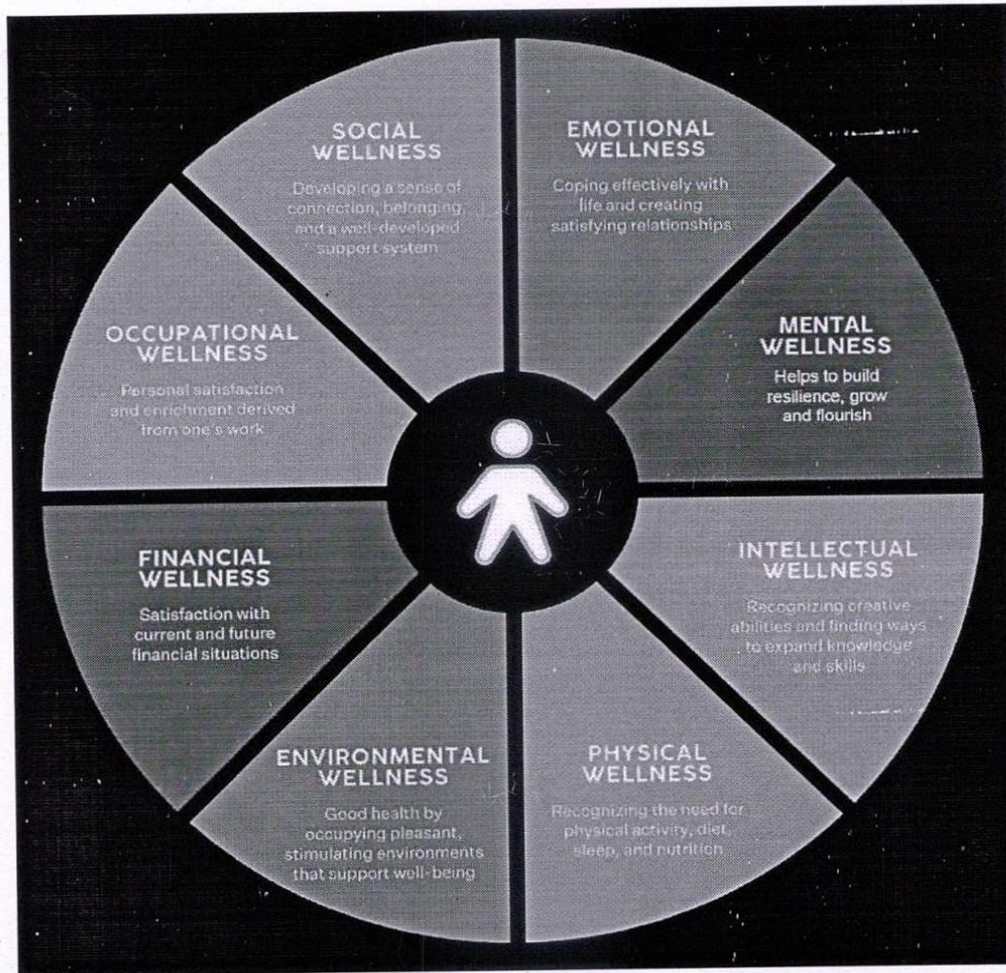
- Use Self-reflective worksheets to assess their understanding.
- Submit the worksheets to internal audit/external audit.
- Every student's activities report should be documented and the same have to be assessed by the Physical Director with the mentor. The evaluation should be for 100 marks. No examination is required.

Scheme of Evaluation

Part	Description	Marks
A	Report	40
B	Attendance	20
C	Activities (Observation During Practice)	40
Total		100

References/Resource Materials:

The course acknowledges that individual needs for references and resources may vary. However, here are some general reference materials and resources that may be helpful:

1. The Well-Being Wheel:

2. Facilities & Spaces: Some activities may require access to specific facilities, resources or spaces. Students may need to coordinate with the college administration to reserve these as required.

3. Online Resources:

1. United Nations Sustainable Development Goals - Goal 3 - Good Health & Well-Being: <https://www.un.org/sustainabledevelopment/health/>
2. Mindfulness and Meditation: Stanford Health Library offers mindfulness and meditation resources:
<https://healthlibrary.stanford.edu/books-resources/mindfulness-meditation.html>

3. Breaking Bad Habits: James Clear provides a guide on how to build good habits and break bad ones: <https://jamesclear.com/habits>
4. 6 Ways to Keep Your Brain Sharp
<https://www.lorman.com/blog/post/how-to-keep-your-brain-sharp>
5. What Is Social Wellbeing? 12+ Activities for Social Wellness
<https://positivepsychology.com/social-wellbeing/>
6. How Does Your Environment Affect Your Mental Health?
<https://www.verywellmind.com/how-your-environment-affects-your-mental-health-5093687>
7. How to say no to others (and why you shouldn't feel guilty)
<https://www.betterup.com/blog/how-to-say-no>

QUESTION PAPER PATTERN

Duration: 3 Hours

Max. Marks: 75

SECTION A

(5 × 5 = 25 marks)

Short answers, either or type, one question from each unit.

SECTION B

(5 × 10 = 50 marks)

Essay type questions, either or type, one question from each unit.

UBO121

ALLIED PAPER

Programme Code: 05			For B.Sc., ZOOLOGY		
ALLIED-1 BOTANY: 1					
Batch 2026-2027	Semester I	Hours / Week 5	Total Hours 75	Credits 4	Skill Development

COURSE OBJECTIVES

- ❖ To study the classification of Cryptogams & Gymnosperms.
- ❖ To learn the structure and life cycle patterns of primitive to advanced life forms.
- ❖ To impart knowledge on the economic values of plants.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO1	Gain knowledge on lower life form habits, habitats and their phylogeny
	CO2	Understand structural organization and reproduction of lower life forms
	CO3	Apply impart knowledge in the identification of plant diseases and their control measures
	CO4	Explore the economic aspects of lower life forms for the betterment of mankind
K5	CO5	Evaluate the life cycle patterns of Cryptogams and Gymnosperms

SYLLABUS

UNIT I

(15 HOURS)

Phycology: Introduction, General characters. Classification by Fritsch (1945) (outline only). Economic importance of algae (briefly). Structure, Reproduction and Life cycle of the following Genus: *Oscillatoria*, *Caulerpa*, and *Chara*.

UNIT II

(15 HOURS)

Mycology: Introduction, General characters. Classification by Alexopoulos and Mims (1979) (outline only). Economic importance of Fungi. Structure, Reproduction and Life cycle of the following Genus: *Albugo* and *Agaricus*. Plant Pathology: Tikka disease of Ground-nut and Citrus canker.

UNIT III

(15 HOURS)

Bryophytes: Introduction, General characters, Classification by Smith (1955) (outline only). Economic importance of Bryophytes. Structure, Reproduction and Life cycle of *Marchantia* and *Funaria*.

UNIT IV

(15 HOURS)

Pteridophytes: Introduction, General characters, Classification by Riemers (1954) (outline only), Economic importance of Pteridophytes. Structure, Reproduction and Life cycle of *Lycopodium* and *Adiantum*.

UNIT V

Gymnosperms: Introduction, General characters, Classification by K.R. Sporne (1962) (outline only), Economic importance of Gymnosperms*. Structure, Reproduction and Life cycle of *Cycas* and *Gnetum*.

Self study*TEXTBOOKS**

1. B.P. Pandey. (20004). College Botany Volume I&II.S. Chand and company Ltd, New Delhi
2. Gangulee, Das & Kar. (2001). College Botany Vol II. New central Book agency Pvt. Ltd. Calcutta.
3. R.M. Johri, S. Latha and S. Shrama, (2004). Text book of Bryophytes, Dominant publishers and distributors, New Delhi.
4. B.P. Pandey, (1994). A Text book of Botany - Pteridophyta. Chand & Co. New Delhi.
5. P.C. Vashishta, A.K. Sinha and A. Kumar, (2006). Gymnosperms. Revised Edition S. Chand and company Ltd, New Delhi.

REFERENCE BOOKS

1. B.R. Vashishta, (1998). The Algae. S. Chand & Co., New Delhi.
2. B.R. Vashishta, (1998). Fungi. S. Chand & Co., New Delhi.
3. P.C. Vashista, Sinha and Anil Kumar. (2008). Text book of Bryophytes. Chand & Co., New Delhi.
4. C. Pathak, (2003). Latest Protfolio of Theory and practice of Pteridophytes Dominant Publication, New Delhi
5. P.C. Vashista, (1992). Pteridophyta. Chand & Co., New Delhi.
6. K.R. Spore, (1976 Morphology of Pteridophytes, 4th edition. B.L.Publication.
7. B.P. Pandey, (1981). Gymnosperms. Chand & Co., New Delhi.
8. Gilbert M Smith (1951). Manual of Phycology.

WEB RESOURCES

1. <https://microbenotes.com/algae/>
2. https://www.lndcollege.co.in/syllabus/co_po/Algae%20General%20characteristics%20and%20Economic%20importance.pdf
3. <https://uou.ac.in/lecturenotes/science/MSCBOT-17/Unit%20%E2%80%9310%E2%80%93%20General%20Characters%20and%20Classification%20of%20Fungi%20by%20Dr.%20Kirtika%20Padalia-converted.pdf>
4. <https://microbenotes.com/characteristics-of-fungi/>
5. https://agri-bsc.kkwagh.edu.in/uploads/department_course/PATH-121_FUNDAMENTALS_OF_PLANT_PATHOLOGY.pdf
6. https://www.jsscacs.edu.in/sites/default/files/Department%20Files/AN-%20HC%201.2-%20PTERIDOPHYTES_compressed%20%282%29_compressed.pdf
7. <https://microbenotes.com/gymnosperms-characteristics-morphology-classification/>

MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	S	H	H
CO2	S	S	H	M	S
CO3	H	H	M	S	M
CO4	S	M	S	H	H
CO5	M	H	H	S	M

S - Strong

H - High

M - Medium

L – Low

Content Prepared by (Based on Inputs) Dr. V. Aravindhan Signature of the Course in-charge	Signature of the HOD
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Programme Code: 05		For B.Sc., ZOOLOGY			
ALLIED-2 BOTANY: 2					
Batch 2026-2027	Semester II	Hours / Week 5	Total Hours 75	Credits 4	Skill Development

COURSE OBJECTIVES

- To differentiate the anatomical and reproductive features of monocot and dicots
- To acquire knowledge on the classification and nomenclature of Angiosperms
- To understand physiological process and metabolism in plants

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 	CO1	Recognize anatomical features and morphological variations among Angiospermic taxa.
	CO2	Understand the structure and development of different types of embryos
	CO3	Apply keys and manuals for identifying any unknown plants at species level.
	CO4	Explore the nature of application of micronutrients and growth regulators for the development of plants.
K5	CO5	Determine the strategies for the conservation of natural resources

SYLLABUS

UNIT I (15 HOURS)

Anatomy: Scope and significance of plant anatomy. A brief account of meristems and tissues (simple and complex tissue). Primary structure of dicot and monocot stem, root and leaf.

UNIT II (15 HOURS)

Embryology: Introduction, Microsporogenesis, Development of Male gametophyte, Megasporeogenesis, Development of female gametophyte (Polygonum type). Structure of mature embryo sac. Type of embryo sac - Polygonum type (8 nucleus) and Oenothera type (4 nucleus). Endosperm and its types. Structure and Development of Dicot embryo (Capsella type)

UNIT III (15 HOURS)

Taxonomy of Angiosperms: Introduction. Bentham and Hooker's classification (outline only). Botanical Nomenclature - ICBN (briefly). Herbarium techniques. Detailed study of the following families with their economic importance - Annonaceae, Asteraceae, Apocynaceae, Lamiaceae, Amaranthaceae, Liliaceae and Poaceae.

UNIT IV (15 HOURS)

Physiology: Water relationships of plants. Osmosis, absorption of water, absorption of ions. **Photosynthesis:** Photosynthetic apparatus, primary photochemical reaction, path of carbon (Calvin cycle). **Respiration:** Glycolysis and Krebs' cycle. **Phytohormones:** auxins and cytokinins.

UNIT V**(15 HOURS)**

Environmental Biology: Scope and significance of environmental studies. Soil conservation methods. Structure and functions of ecosystems. Vegetational types of southern India. Pollution – Air, water and noise*.

Self study*TEXTBOOKS**

1. H.C. Gangulee, K.S. Das and C.T.Dutta (1986). College Botany Vol. - I. AIU publications. New Delhi
2. Gangulee and A.K. Kar, (1986). College Botany Vol. - II. AIU Publications. New Delhi
3. O.P. Sharma (2013), Plant Taxonomy, Mc,Graw Hill Education. Pvt. Ltd. New Delhi
4. S.S. Bhojwani and S.P. Bhatnagar, S.P. (2008). The Embryology of Angiosperms
5. P.D.Sharma, (2017), Ecology and Environment – Rastogi Publication.

REFERENCE BOOKS

1. T. Pullaiah, (2007). Taxonomy of Angiosperms 3rd edition. Regency Publication. New Delhi.
2. B.P. Pandey, (1997). Taxonomy of Angiosperms. Chand & Co., New Delhi.
3. V.K. Jain, (1993). Fundamentals of plant physiology. S. Chand & Co. New Delhi
4. P.D. Sharma, (2013). Environmental Biology and Toxicology – Rastogi Publication Meerut.
5. Shukla. R.S. and P. S. Chandal. (2000). Plant Ecology and soil science. Chand & Co. Ltd., New Delhi.
6. Bhojwani & Bhatnager. (1977). The embryology of angiosperms. Vikas Publishing House, New Delhi
7. B.P. Pandey, (1978). Plant Anatomy. Chand and Co, New Delhi.
8. P. Maheswari, (1950). An introduction to the embryology of Angiosperms. McGraw Hill.

WEB RESOURCES

1. <https://uou.ac.in/sites/default/files/slm/BSCBO-202.pdf>
2. https://scsco.org.in/Download/lms/science/Botany/VDD-Botany/BScII_SemIII_Unit%20I.pdf
3. <https://microbenotes.com/angiosperms-characteristics-morphology-classification-uses/>
4. <https://www.esalq.usp.br/lepse/imgs/conteudo/Plant-Physiology-by-Vince-Ordog.pdf>
5. https://www.ksmv.ac.in/Studymaterial/203915Ecosystem_Concepts.pdf

MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
C01	H	S	M	H	H
C02	S	H	H	M	S
C03	H	M	S	H	M
C04	S	H	M	S	H
C05	H	S	H	M	S

S - Strong

H - High

M - Medium

L - Low

Content prepared by (Based on Inputs) Dr. V. Aravindhan Signature of the Course in-charge	Signature of the HOD
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Programme Code: 05		For B.Sc., ZOOLOGY			
ALLIED PRACTICAL BOTANY- I & II					
Batch 2026-2027	Semester I & II	Hours/Week 2	Total Hours 60	Credits 2	Skill Development

COURSE OBJECTIVES

- To acquire knowledge on the morphological and anatomical features of vascular plants.
- To create basic skills on biosystematics and herbarium preparation techniques.
- To learn the basic concepts and principles of ecosystem

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K3 ↑ ↓ K5	CO1	Apply knowledge on the identification of lower life forms.
	CO2	Analyze various diseases and their impact on crop plants.
	CO3	Dissect and determine the structural organization of lower life forms.
	CO4	Assign and identify plants to their families based on their morphological characters.
	CO5	Examine the physiological process that occur in plant life.

SYLLABUS**LIST OF PRACTICALS****ALLIED PRACTICAL BOTANY - I**

1. **Phycology:** Structure and the reproduction of the following:
 - i. *Oscillatoria*
 - ii. *Caulerpa*
 - iii. *Chara*
2. **Mycology**
 - i. *Albugo*
 - ii. *Agaricus*
3. **Plant pathology:** Symptoms, causative organisms and control measures of
 - i. Tikka disease of Groundnut
 - ii. Citrus canker
4. **Bryophytes**
 - i. *Marchantia*
 - ii. *Funaria*
5. **Pteridophytes**
 - i. *Lycopodium*
 - ii. *Adiantum*
6. **Gymnosperms**
 - i. *Cycas*
 - ii. *Gnetum*

ALLIED PRACTICAL BOTANY - II**1. Anatomy**

1. Primary and secondary structure of dicot stem and root
2. Primary structure of monocot stem, root and leaf.

2. Embryology

1. T.S. of mature anther
2. Types of the endosperm

3. Taxonomy of Angiosperms:

1. Study of morphology and systematic position of plant families mentioned in theory

4. Physiology

1. Osmosis
2. Evolution of oxygen during photosynthesis

5. Environmental Botany

1. Aquatic and terrestrial ecosystem.

MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	M	H	H
CO2	S	H	H	M	S
CO3	H	M	S	H	M
CO4	S	M	H	S	M
CO5	S	H	M	S	H

S - Strong

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KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)**COIMBATORE - 641 029****UG MODEL QUESTION PAPER (PRACTICALS)****End of Semester Examination Question Paper Pattern**(For the candidates admitted from the academic year 2026-2027 onwards)

Time: 3 Hours**Max. Marks: 30 Marks****BREAK UP OF MARKS****ALLIED PRACTICAL BOTANY - I & II**

I. Algae and Bryophytes	06 Marks
II. Pteridophytes/Gymnosperms	04 Marks
III. Anatomy section	04 Marks
IV. Taxonomy	04 Marks
IV. Physiology setup	03 Marks
V. Spotters	04 Marks
RECORD	05 Marks

TOTAL	30 Marks
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Content Prepared by (Based on Inputs)	
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