

# **ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN PALANI**



**(AUTONOMOUS)**

**RE-ACCREDITED WITH B<sup>++</sup> GRADE BY NAAC**

**(Affiliated to Mother Teresa Women's University, Kodaikanal)**

## **DEPARTMENT OF BOTANY**

**SYLLABUS**

**FOR**

**B.Sc., BOTANY**

**&**

**EXTRA-CREDIT COURSES**

**UNDER CHOICE BASED CREDIT SYSTEM**

**2022 - 2025**

**ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN  
PALANI**

**DEPARTMENT OF BOTANY**

**BOARD OF STUDIES MEETING**

**HELD ON 09 – 05 - 2022**

**UNIVERSITY NOMINEE:**

**Dr. C. Thamaraiselvi**

Assistant Professor

Department of Biotechnology

Mother Teresa Women's University, Kodaikanal

**MEMBERS:**

**Dr. R. Kannan**

Associate Professor & Head

PG Department of Botany

NGM College

Pollachi

**Dr. M. Anandi**

Associate Professor & Head

PG and Research Department of Botany

Arulmigu Palaniandavar College of Arts and Culture

Palani

**Dr. C. Jayachitra (Alumini)**

Associate Professor & Head

PG and Research Department of Botany

Arulmigu Palaniandavar College of Arts and Culture

Palani

**ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN  
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**UNDER CHOICE BASED CREDIT SYSTEM**

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**Preamble:**

The Department of Botany came into existence in the year 1971. The Department stands for its academic excellence and well-equipped laboratories. The highlight of the Department is the active participation of the faculty members in skill development programmes like Mushroom cultivation, Azolla cultivation, Herbal plant cultivation etc. Many seminars, workshops and outreach programmes are conducted to encourage the creative skills of the students. The faculty members publish many research papers in reputed journals. The faculty renders dedicative service to empower women and also raise the status of women by promoting them as entrepreneurs through skill based training and introducing relevant courses in the curriculum.

**COLLEGE VISION**

- ❖ Enlightenment and Empowerment of Rural Women

**COLLEGE MISSION**

- ❖ Providing high quality teaching learning environment with practical exposure
- ❖ Imbibing research culture and collaborate programs with local communities
- ❖ Imparting strong and supportive education to promote employability
- ❖ Encouraging questioning spirit and self-reliance

## **DEPARTMENT OF BOTANY**

### **VISION**

- ❖ To upgrade the department into PG and Research Centre.
- ❖ To start PG Diploma courses
- ❖ To motivate the students in the research field
- ❖ To mould the students into a good citizen

### **MISSION**

- ❖ To focus the areas where Entrepreneurial scope for Botanists
- ❖ To create awareness about the Environment, Bioethics and Biodiversity Conservation
- ❖ To update the students with latest technologies in the field of science

## **Bloom's Taxonomy in fixing the Learning Objectives:**

Since the Academic year 2019 – 2020, the curriculum for B.Sc Botany has been designed and the learning objectives and outcomes of the programmes are set, following the Bloom's Taxonomy Cognitive Domain. Accordingly, it is broken into six levels of learning objectives of each course. They are -

K1 / Knowledge = Remember

K2 / Comprehension = Understand

K3 / Application = Apply

K4 / Analysis = Analyze

K5 / Evaluation = Evaluate

K6 / Synthesis = Create

## **Bloom's Taxonomy Action Verbs:**

**K1 / Knowledge:** Arrange, Define, Describe, Duplicate, Identify, Label, List, Match, Memorize, Name, Order, Outline, Recognize, Relate, Recall, Repeat, Reproduce, Select, State

**K2 / Comprehension:** Classify, Convert, Defend, Describe, Discuss, Distinguish, Estimate, Explain, Express, Extend, Generalize, Give example(s), Identify, Indicate, Infer, Locate, Paraphrase, Predict, Recognize, Rewrite, Review, Select, Summarize, Translate

**K3 / Application:** Apply, Change, Choose, Compute, Demonstrate, Discover, Dramatize, Employ, Illustrate, Interpret, Manipulate, Modify, Operate, Practice, Predict, Prepare, Produce, Relate, Schedule, Show, Sketch, Solve, Use, Write

**K4 / Analysis:** Analyze, Appraise, Breakdown, Calculate, Categorize, Compare, Contrast, Criticize, Diagram, Differentiate, Discriminate, Distinguish, Examine, Experiment, Identify, Illustrate, Infer, Model, Outline, Point out, Question, Relate, Select, Separate, Subdivide, Test

**K5 / Evaluation:** Appraise, Argue, Assess, Attach, Choose, Compare, Conclude, Contrast, Defend, Describe, Discriminate, Estimate, Evaluate, Explain, Judge, Justify, Interpret, Relate, Predict, Rate, Select, Summarize, Support, Value

**K6 / Synthesis:** Arrange, Assemble, Categorize, Collect, Combine, Comply, Compose,

Construct, Create, Design, Develop, Devise, Explain, Formulate, Generate,  
Plan, Prepare, Rearrange, Reconstruct, Relate, Reorganize, Revise,  
Rewrite, Set up, Summarize, Synthesize, Tell, Write

### **Mapping COs with POs:**

For each programme, the Educational objectives and the Specific objectives are specified. The programme outcomes are designed according to the curriculum, teaching, learning and evaluation process. For each course, the definite outcomes are set, giving challenge to the cognitive domain. The course outcomes are mapped with the programme outcomes. The performance of the stakeholders is assessed and the attainment rate is fixed, by using the measurements 'high', 'medium' and 'low'. The restructuring of the curriculum is done based on the rate of attainment.

### **Institutional Objectives:**

- Women Education
- Women Empowerment
- Self-reliance and
- Making Model Citizens

### **Programme Educational Objectives:**

**PEO 1** Graduates of the program will develop a strong and competent knowledge in basic biological science required for critical learning and research.

**PEO 2** Graduates will develop diversified basic professional skills through various laboratory technical training, communicational and presentation skills.

**PEO 3** They will possess an ability to identify, formulate, and solve biological problems to contribute to service efforts to communicate in both the professional and private realm.

**PEO 4** Graduates will integrate related topics from separate parts of the course such as levels of organization, cell biology, ecology, evolution, biochemistry, genetics, embryology, basic biotechnology, physiology, molecular biology for successful career.

## Programme Outcomes:

Upon completion of B.Sc., Botany Degree Programme, the graduates will be able to

<b>PO 1</b>	Develop a broad fundamental knowledge of the plant diversity especially habit, habitat, morphology, adaptations and classification of plant kingdom.
<b>PO 2</b>	Analyze the relationship between plants, animals, microbes and deal with the local national global environment issues by realizing the right of the individuals and also need to conserve our biosphere.
<b>PO 3</b>	Understand how organisms function at the level of gene, genome, cell tissue, thallus, plant body drawing upon this knowledge, they are able to give specific examples of the physiological adaptations developed, reproduction and behavior of different forms of life.
<b>PO 4</b>	Gain knowledge about the application of biological sciences in mushroom cultivation, azolla cultivation, nursery management, herbal garden management, pest management, there by impart skill as well a source of income and self employment.
<b>PO 5</b>	Generate innovative ideas for performing experiments in the areas of biochemistry, physiology, genetics, microbiology, Developmental biology, anatomy, taxonomy, economic botany, and ecology.
<b>PO 6</b>	Explain the recent developments in genetic engineering, biotechnology, microbiology, for research activities in the department or in collaboration with other research institutions.
<b>PO 7</b>	Organize and deliver relevant applications of knowledge through effective written verbal, graphical/virtual communications and interact with people from diverse back ground.

## Mapping PEOs with IOs:

Programme Educational Objectives	Institutional Objectives			
B.Sc., (Botany)	1	2	3	4
Graduates of the program will develop a strong and competent knowledge in basic biological science required for critical learning and research.	*			
Graduates will develop diversified basic professional skills through various laboratory technical training, communicational and presentation skills.		*		
They will possess an ability to identify, formulate, and solve biological problems to contribute to service efforts to communicate in both the professional and private realm.			*	
Graduates will integrate related topics from separate parts of the course such as levels of organization, cell biology, ecology, evolution, biochemistry, genetics, embryology, basic biotechnology, physiology, molecular biology for successful career.				*

**Measuring: H – High; M – Medium; L – Low**



## COMMON ACADEMIC STRUCTURE

**B.Sc., (Botany) / 2022 – 2025**

Sem	Title of the Paper	Hrs	Credits	Marks			Course Code
				CIA	CE	Total	
<b>I</b>	<b>Part I</b> Tamil	6	3	25	75	100	
	<b>Part II</b> English	6	3	25	75	100	
	<b>Part III</b> <b>Core – I:</b> Algae and Bryophytes	4	4	25	75	100	
	<b>Core - II:</b> Fungi Lichenology and Plant Pathology	4	4	25	75	100	
	<b>Core Practical Paper I</b>	2	-	-	-	-	
	<b>Allied – I:</b> Ancillary Zoology theory Paper I	3	3	25	75	100	
	<b>Allied – I:</b> Ancillary Zoology Practical Paper I	2	-	-	-	-	
	<b>Part IV/ SBC – I:</b> Biofertilizers and Biopesticides	2	2	25	75	100	
	<b>Part – V:</b> Value Education	1	2	25	75	100	
	<b>Total</b>	<b>30</b>	<b>21</b>			<b>700</b>	

Sem	Title of the Paper	Hrs	Credits	Marks			Course Code
				CIA	CE	Total	
<b>II</b>	<b>Part I</b> Tamil	6	3	25	75	100	
	<b>Part II</b> English	6	3	25	75	100	
	<b>Part III</b> <b>Core – III:</b> Pteridophytes, Gymnosperms & Paleobotany	8	4	25	75	100	
	<b>Core – Practical Paper 1</b>	3	4	40	60	100	
	<b>Allied – II:</b> Ancillary Zoology- Theory Paper II	3	3	25	75	100	
	<b>Allied – II:</b> Ancillary Zoology- Practical Paper I	2	4	40	60	100	
	<b>Part IV SBC – II:</b> Botany for Entrepreneurship Development	2	2	25	75	100	
	<b>Total</b>	<b>30</b>	<b>23</b>			<b>700</b>	

Sem	Title of the Paper	Hrs	Credits	Marks			Course Code
				CIA	CE	Total	
III	<b>Part I</b> Tamil	6	3	25	75	100	
	<b>Part II</b> English	6	3	25	75	100	
	<b>Part III</b> <b>Core – IV:</b> Biochemistry, Biophysics and Biotechniques	6	4	25	75	100	
	<b>Core Practical Paper II:</b>	3	-	-	-	-	
	<b>Allied:</b> Chemistry Theory Paper I	3	3	25	75	100	
	<b>Allied:</b> Chemistry Practical Paper I	2	-	-	-	-	
	<b>Part IV SBC-III:</b> Computer applications and Basic Bioinformatics	2	2	25	75	100	
	<b>Part IV NME – I:</b> Floriculture and Landscaping	2		25	75	100	
	<b>Total</b>	<b>30</b>	<b>17</b>			<b>600</b>	

Sem	Title of the Paper	Hrs	Credits	Marks			Course Code
				CIA	CE	Total	
IV	<b>Part I</b> Tamil	6	3	25	75	100	
	<b>Part II</b> English	6	3	25	75	100	
	<b>Part III: Core – V:</b> Plant Anatomy and Plant Ecology	4	5	25	75	100	
	<b>Core – VI:</b> Cell biology and Embryology	4	4	25	75	100	
	<b>Core:</b> Practical Paper II	3	4	40	60	100	
	<b>Allied:</b> Chemistry Theory Paper II	3	3	25	75	100	
	<b>Allied:</b> Chemistry Practical Paper I	2	4	40	60	100	
	<b>Part IV SBC – IV:</b> Forest Botany	2	2	25	75	100	
	<b>Part V:</b> Extension activities	-	1	-	-	100	
	<b>Total</b>	<b>30</b>	<b>29</b>			<b>900</b>	

Sem	Title of the Paper	Hrs	Credits	Marks			Course Code
				CIA	CE	Total	
V	<b>Part III: Core – VII:</b> Taxonomy of Angiosperms and Economic Botany	6	5	25	75	100	
	<b>Core – VIII:</b> General Microbiology	6	4	25	75	100	
	<b>Core – Practical Paper III</b>	6	-	-	-	-	
	<b>Major Elective – I:</b> <b>Option – I:</b> Plant Biotechnology <b>Option - II:</b> Habitat Ecology <b>Option- III:</b> Any <b>MOOC courses</b> related to Botany	5	5	25	75	100	
	<b>Major Elective – II:</b> <b>Option – I:</b> Horticulture and Landscaping <b>Option - II:</b> Plant Tissue Culture <b>Option – III:</b> Any <b>MOOC courses</b> related to Biotechnology	5	5	25	75	100	
	<b>Part IV SBC – V:</b> Value Added Crop Products	2	2	25	75	100	
	<b>Total</b>	<b>30</b>	<b>21</b>			<b>500</b>	

Sem	Title of the Paper	Hrs	Credits	Marks			Course Code
				CIA	CE	Total	
VI	<b>Part III:</b> <b>Core – IX:</b> Plant Physiology	6	5	25	75	100	
	<b>Core-X:</b> Classical Genetics and Molecular Biology	7	5	25	75	100	
	<b>Core – Practical Paper III</b>	-	4	40	60	100	
	<b>Core – Practical Paper IV</b>	6	4	40	60	100	
	<b>Major Elective – III:</b> <b>Option – I:</b> Herbal Medicine and Human Welfare <b>Option – II:</b> Plant Breeding, Evolution, Seed Technology and Biostatistics <b>Option – III:</b> Any <b>MOOC</b> courses related to Environmental studies	5	5	25	75	100	
	<b>Part IV SBC – VI:</b> Group Project	2	2	75	25	100	
	<b>NME–II:</b> Mushroom Cultivation	2	2	25	75	100	
	<b>Part V:</b> Environmental Studies	2	2	25	75	100	
	<b>Total</b>	<b>30</b>	<b>29</b>			<b>800</b>	
	<b>Grand Total</b>		<b>140</b>			<b>4200</b>	

Part No	Course Code	Course Title	Lecture/ Practical (Hours /Week)	Duration of Exam (Hours)	Max Marks			Credit Points
					Internal	External	Total	
SEMESTER I, III & V								
VI		Extra Credit Paper I Dietary and Nutritional Value of Fruits and Vegetables	-	3	-	-	100	2
		Extra Credit Paper II Commercial Plant Products	-	3	-	-	100	2
		Extra Credit Paper III Biodiversity Conservation and Management	-	3	-	-	100	2

Part No	Course Code	Course Title	Lecture/ Practical (Hours /Week)	Duration of Exam (Hours)	Max Marks			Credit Points
					Internal	External	Total	
SEMESTER II, IV & VI								
IV		Value Added Course I Organic Farming	-	3	-	-	100	
		Value Added Course II Landscape Gardening	-	3	-	-	100	
		Value Added Course III Terrace Gardening	-	3	-	-	100	



### Internal Question Pattern Part III

Section	Pattern	Marks	Total
A	1-6 MCQ (Answer all)	6x1	6
B	7-8 (Either or Choices)	2x4	8
C	9-12 (Any Two out of Four)	1x8	16
		<b>TOTAL</b>	<b>30</b>
<b>Assignment</b>			<b>5</b>
<b>Seminar</b>			<b>5</b>
<b>Total Internal Marks</b>			<b>25</b>

### External Question Pattern Part III

Section	Pattern	Marks	Total
A	1-10 MCQ (Answer All)	10x1	10
B	11-15 (Either or Choices)	5x7	35
C	16-20 (Any Three out of Five)	3x10	30
		<b>TOTAL</b>	<b>75</b>

### Internal Question Pattern Part IV

Section	Pattern	Marks	Total
A	1-3 (Any Two Out of Three)	2x2	4
B	4-5 (Any One Out of Two)	1x4	4
C	6-7 (Any One Out of Two)	1x7	7
		<b>TOTAL</b>	<b>15</b>
<b>Assignment</b>			<b>5</b>
<b>Seminar</b>			<b>5</b>
<b>Total Internal marks</b>			<b>25</b>

### External Question Pattern Part IV

Section	Pattern	Marks	Total
A	1-8 (Any Five Out of Eight)	5x3	15
B	9-16 (Any Five Out of Eight)	5x6	30
C	17-21 (Any Three Out of Five)	3x10	30
		<b>TOTAL</b>	<b>75</b>

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** I

**Course:** Algae and Bryophytes

**Course Type:** Core Paper - I

**Course Code:**

**Contact Hours:** 5 Hours/Week

**Credits:** 4

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To make the students understand the classification of algae.
- To make the students study the structure, reproduction and lifecycle of algae and bryophytes.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Understands about general characters, classification and economic importance of algae.
<b>K2</b>	CO 2	Students are taught the detailed structure of some algal forms
<b>K2</b>	CO 3	Imparts knowledge about various algal species
<b>K2</b>	CO 4	Understands about morphology, structure, reproduction and life cycle of bryophytes.
<b>K5</b>	CO 5	Students gain fundamental knowledge about evolution and economic importance of bryophytes.

### **COURSE CONTENT**

#### **Unit: I Algae**

**15 Hours**

Introduction, general characters, classification of algae, general outline proposed by Fritsch-1935-1945. Economic importance of algae – algae as food, role in industry and agriculture. Ecology of algae (brief account).

#### **Unit: II**

**20 Hours**

Detailed study of structure and life cycle of the following: *Chlorella*, *Nostoc*, *Oedogonium*, and *Chara*.

**Unit: III****20 Hours**

Detailed study of structure and lifecycle of the following: *Caulerpa*, *Diatom*, *Sargassum*, and *Gracilaria*.

**Unit: IV Bryophytes****20 Hours**

Introduction, general characters, classification of bryophytes (Smith), morphology, structure, reproduction and lifecycle of the following: *Marchantia* and *Polytrichum*.

**Unit: V****15 Hours**

Evolution of sporophyte and gametophyte, ecological aspects and economic importance of bryophytes, fossil bryophytes.

**Practicals:**

Study of Morphology and Anatomy of genera as given in the syllabus.

Field trip arranged to visit sea shore and collect algae.

**Prescribed Texts**

- Kumar, H.D. Introductory Phycology. Affiliated East –West Press Ltd., 1988.
- Gangulee and Kar. College Botany, Vol II. New Central Book Agency Pvt. Ltd, 2007.
- Johri, R.M., Lata, S and Sharma, S., A Text Book of Bryophyta, Dominant Publishers and Distributors, New Delhi, 2004.
- Barsanti, L and Gualtieri, P. Algae – Anatomy, Biochemistry and Biotechnology, 2<sup>nd</sup> Edition, CRC Press, New York, 2014.
- Pandey, B.P., College Botany, 5<sup>th</sup> Edition S. Chand Co., Pvt. Ltd, 2013.
- Pandey, B.P., College Botany Vol. I, S. Chand and Co., New Delhi, 8<sup>th</sup> Edition, 2011.
- Singh Pandey and Jain. A Text Book of Botany, 4<sup>th</sup> Edition Rastogi Publications, 2010.

**Reference Books:**

- F.E.Fritsch. The Structure and Reproduction of the Algae. Vol I&II, Vikas Publishing House Pvt. Ltd, 1975.
- Puri, P. Bryophytes. Atma Ram & Sons. Delhi, 1980.

- Round, F .E. The Biology of Algae. Cambridge University Press, 1986.
- O.P. Sharma. Text Book of Algae. Tata McGrow Hill Publication, 1986.
- Morris, I. An Introduction to the algae .Cambridge University Press, UK, 1986.
- Parihar, N .S. Bryophyta .Central Book Depot, Allahabad, 1991.
- Thakur, A.K., and Basi, S.K., A Text Book of Botany, Diversity of Microbes and Cryptogams, S. Chand and Co., New Delhi., 2007,
- Vashishta, B.R., Sinha, A.K. and Singh, V.P., Algae, 9<sup>th</sup> Edition, S. Chand and Co., New Delhi, 2010.

**Bloom's Mapping**

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	<b>M</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>
CO2	<b>H</b>	<b>M</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>
CO3	<b>M</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
CO4	<b>M</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>L</b>
CO5	<b>S</b>	<b>H</b>	<b>H</b>	<b>L</b>	<b>M</b>	<b>H</b>	<b>H</b>
<b>S – Strong      H – High      M- Medium      L - Low</b>							

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** I

**Course:** Fungi, Lichenology and Plant Pathology

**Course Type:** Core Paper - II

**Course Code:**

**Contact Hours:** 5 Hours/Week

**Credits:** 4

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVES**

- To know the general characters and lifecycle of Fungi and Lichens.
- To enable the students to understand the economic importance of Fungi and various plant diseases.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	To study, classify Fungi and also understand the economic importance of Fungi
<b>K2</b>	CO 2	Understands the characteristic features of different groups of Fungi
<b>K2</b>	CO 3	Imparts knowledge about the life cycle of various groups of Fungi
<b>K2</b>	CO 4	Understands the types, lifecycle and benefits of Lichens
<b>K5</b>	CO 5	Gain knowledge about the Causes, Symptoms and Control measures of Plant diseases.

### **COURSE CONTENT**

#### **Unit: I Fungi**

**15 Hours**

Fungi – General characteristics of fungi; Classification of fungi (Alexopoulos); Economic importance of fungi- beneficial and harmful activities.

#### **Unit: II**

**20 Hours**

Occurrence, Structure, Reproduction and Life cycle of the following: *Albugo* sp., *Rhizopus* sp., *Aspergillus* sp.,

#### **Unit: III**

**20 Hours**

Occurrence, Structure, Reproduction and Life cycle of the following: *Saccharomyces* sp., *Puccinia* sp., sp., and *Cercospora* sp.,

#### **Unit: IV Lichenology**

**20 Hours**

Introduction, Classification and Types of lichens, Economic importance of lichens, Ecology of Lichens – Occurrence, Structure and Reproduction of *Usnea*

#### **Unit: V Plant Pathology**

**15 Hours**

A study of the following plant diseases with special reference to the Symptoms, Causal Organisms, Disease Cycle and Control Measures.

Fungal Disease	- Red rot of Sugarcane
Bacterial Disease	- Citrus Canker
Viral Disease	- Bunchy top of Banana

#### **Practicals:**

Study of morphology and anatomy of the genera as given in the syllabus.

#### **Prescribed Texts:**

- Vashishta B.R., Botany for Degree students part – II – Fungi, S. Chand -& Co.,
- A.V.S.S Sambamurthy. A text book of Plant Pathology –I.K. International Publishing House Pvt. Ltd, New Delhi.
- Chopra, G.L. A text book of Fungi. S. Nagin & Co ., New Delhi.

#### **Reference Books:**

- Alexopoulos. C.J and N.C. Bold. Algae and Fungi, The Macmillan Co, London.
- Gilbert M. Smith. Cryptogamic Botany, Vol –I, Algae and Fungi, New Delhi.
- Alexopoulos, C.J. Introductory Mycology, John Wiley & Sons, New York.
- Munkur. B.B. Fungi and plant diseases.
- Singh. R.S.Principles of plant pathology, Oxford , IBH Publishing Co., New Delhi.
- Ranga swami. G. Diseases of crop plants in India.
- M.E. Hake. The Biology of Lichens.
- Ahamed Geon. Lichens.

- Ranga swamy, G and Mahadevan, A. Diseases of Crop plants in India (4th edition).  
Prentice Hall of India Pvt. Ltd., New Delhi. 1999.
- B. P. Pandey. Plant Pathology.

### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	S	M	S	H	H	H	M
<b>CO2</b>	S	M	S	S	S	M	M
<b>CO3</b>	S	S	S	S	M	M	H
<b>CO4</b>	M	S	S	S	L	M	S
<b>CO5</b>	S	S	M	L	M	S	S

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** I

**Course:** Bio-fertilizers and Biopesticides

**Course Type:** SBC

**Course Code:**

**Contact Hours:** 2 Hours/Week

**Credits:** 2

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To acquire an in-depth knowledge about various types of Bio-fertilizers.
- To develop clear understanding about their field applications.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Enable the students to understand the scope, importance and applications of symbiotic bacteria.
<b>K2</b>	CO 2	Gains knowledge about Non- symbiotic bacteria.
<b>K2</b>	CO 3	Understands the mass cultivation and field applications of Blue green algae.
<b>K2</b>	CO 4	Study the mass cultivation and field applications of VAM fungi.
<b>K3</b>	CO 5	Develop an interest to study the role of Mycorrhizae in agriculture and also study the mechanism and uses of bacterial and viral biopesticides.

### **COURSE CONTENT**

#### **Unit: I**

**6 Hours**

Biofertilizers – scope, importance and need, symbiotic bacterial inoculants- Rhizobium - isolation, packing and storage, field applications of inoculants, crop response and marketing.

#### **Unit: II**

**6 Hours**

Non-Symbiotic bacterial inoculants – Azotobacter– isolation, mass cultivation, field application of inoculants, crop response

#### **Unit: III**

**6 Hours**

Blue green algae inoculants –isolation, storage –field applications and crop response, Azolla – A green manure cum bio fertilizer – Mass cultivation, field applications and uses

#### **Unit: IV**

**6 Hours**



Mycorrhizae – Mass multiplication – Role of Mycorrhizae in Agriculture as Organic manures and Green manures. Vesicular and Arbuscular Mycorrhizae – importance and field applications.

**Unit: V**

**6 Hours**

Biopesticides – Bacterial and viral biopesticides – Mechanism of action and uses – Advantages of Biopesticides.

**Prescribed Text:**

- Dubey .R.C. A Text book of Biotechnology S. Chand and Co, New Delhi. 2002.

**Reference Books:**

- Subba Rao N.S. Bio fertilizers in agriculture , second edition, Oxford & IBH Publishing Co ,Pvt Ltd , New Delhi. 1988.
- Subba Rao .N.S. Advanced agricultural Microbiology, Oxford & IBH Publishing Co, New Delhi. 1982.
- Dubey .R.C. 2002. A Text book of Biotechnology S. Chand and Co, New Delhi.
- Sathyanarayana, U. 2008. Biotechnology, Books and Allied Pvt. Ltd. Kolkata.

**Bloom's Mapping**

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>S</b>
<b>CO2</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>S</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>L</b>	<b>M</b>	<b>S</b>	<b>S</b>

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

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** I

**Course:** Ancillary Botany Theory Paper - I

**Course Type:** Ancillary Botany Theory Paper

**Course Code:**

**Contact Hours:** 5 Hours/Week

**Credits:** 3

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To study the classification, structures, lifecycle and economic importance of plant diversities.
- To study the anatomical structures.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Impart knowledge about classification, structures and lifecycle of different forms of algae
<b>K2</b>	CO 2	Students gain fundamental knowledge of fungi and its various forms.
<b>K2</b>	CO 3	Understands the classification and lifecycle of Bryophytes and Pteridophytes.
<b>K2</b>	CO 4	Develop interest in understanding the classification of Gymnosperms.
<b>K3</b>	CO5	Study the anatomical structures of dicot and monocot plants.

### **COURSE CONTENT**

#### **Unit: I Phycology**

**9 Hours**

Outline of Fritsz's (1935- 1945) classification of Algae. Structure and Life cycle of the following *Oscillatoria*, *Oedogonium*. Economic importance of algae – algae in food and agriculture.

#### **Unit: II Mycology**

**9 Hours**

Outline of Alexopolous's ( 1952 ) classification of fungi. Structure, Reproduction and life cycle of the following. *Albugo*, *Puccinia*. Economic importance of fungi – fungi in food and pharmaceuticals.

**Plant pathology**-Symptoms, Causative organisms and control measures of Tikka Disease of Groundnut

#### **Unit: III**

**9 Hours**

**Bryology** - Outline classification (Smith – 1965). Structure, Reproduction and life cycle of *Anthoceros*.

**Pteridology** - Outline of (Sporne's 1965) classification. Structure, Reproduction and life cycle of *Lycopodium* (excluding development).

**Unit: IV Gymnospermae**

**9 Hours**

Outline classification (K.R. Sporne's 1965). Structure, Reproduction and Life cycle of *Cupressus* . (excluding secondary growth & development)

**Unit: V Anatomy**

**9 Hours**

Tissues – Types, Definition and Function. A brief account of Meristems – Types, Histogen theory, Tunica corpus theory –Primary structure of Dicot stem and Monocot root.

**Practical**

A detailed study of the forms mentioned above – Specimens and Slides

**Anatomy**

Slides of Tissues – Parenchyma, Collenchyma, Sclerenchyma, Xylem, Phloem, Primary structure of Dicot stems and Monocot root.

**Embryology:**

Orthotropous ovule, Structure of 8 nucleate embryosac, Structure of Dicot embryo.

**Prescribed Texts:**

- Gangulee H. C. Das, K.S. Dutta CT. College Botany. Vol.1. 1986.
- Gangulee and Kar A K. College Botany Vol. I and II. 1986.

**Reference Books:**

- Narayanasamy, R.V and Krishnamoorthy, K.V. Outlines of Botany.
- Smith G.M. Cryptogamic Botany. Vol. I and II. 1955.
- Ramasamy S.N. and Venkateswaralu. Taxonomy.

### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>L</b>
<b>CO2</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>L</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** II

**Course:** Pteridophytes, Gymnosperms and Paleobotany

**Course Type:** Core Paper - III

**Course Code:**

**Contact Hours:** 8 Hours/Week

**Credits:** 4

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To study the classification, structures, lifecycle and economic importance of Pteridophytes, Gymnosperms and Paleobotany.
- To study the types of fossils and fossilization.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Impart knowledge about classification, structures and lifecycle of different forms of fossil Pteridophytes.
<b>K2</b>	CO 2	Students gain fundamental knowledge of structure, reproduction and lifecycle of Pteridophytes.
<b>K2</b>	CO 3	Understand the morphology and reproduction of <i>Equisetum</i> and <i>Marsilea</i>
<b>K2</b>	CO 4	Classify the Gymnosperm, morphology and reproduction of <i>Williamsonia</i> , <i>Pinus</i> , <i>Cupressus</i> and <i>Gnetum</i>
<b>K3</b>	CO5	Comprehend the geological time scale, kinds of fossils and Radio carbon dating

### **COURSE CONTENT**

#### **Unit-I Pteridophytes**

**22 Hours**

General characters and classification of Pteridophytes (Sporne, 1965). Stelar evolution in Pteridophytes; Homospory, Heterospory, Apospory, Apogamy, Leptosporangiate and Eusporangiate- Definitions only with examples. Economic importance of Pteridophytes.

#### **Unit- II**

**22 Hours**

A detailed study of the morphology, structure, reproduction and life cycle of *Psilotum*, *Lycopodium* and *Gleichenia*.

#### **Unit- III**

**21 Hours**

A detailed study of morphology, structure, reproduction and life cycle of *Equisetum* and *Marsilea*.

#### Unit-IV

20 Hours

**Gymnosperms:** General characters of Gymnosperms. Classification of Gymnosperms (Sporne, 1965). A detailed study of morphology, structure, reproduction and life cycle of *Pinus*, *Cupressus* and *Gnetum*.

#### Unit- V

20 Hours

**Paleobotany:** Geological time scale. Introduction to fossils and fossilization- kinds of fossils- petrification, casts, impressions and compressions. Study of the following fossils – *Rhynia* and *Lepidodendron*. Radiocarbon dating. Contribution of Prof, Birbal Sahni (brief outline).

#### Practicals:

Study of morphology and anatomy of the genera *Psilotum*, *Lycopodium*, *Gleichenia*, *Equisetum*, *Marsilea*, *Pinus*, *Cupressus* and *Gnetum*.

Study of the fossil specimens *Rhynia*, *Lepidodendron* and *Williamsonia*

#### Prescribed Texts:

- Vashista, P. C. - Pteridophyta
- Vashista P. C.- Gymnosperms
- Pandey .B.P. – A text book of Botany (Bryophyta, Pteridophyta & Gymnosperms ) S. Chand & Co. New Delhi

#### Reference Books:

- Bhatnagar, S. P. and Moira, A. Gymnosperms. New age international Pvt. Ltd., New Delhi. 1996.
- Sporne, K. R. - Morphology of Pteridophytes.
- Sharma, O. P. - Text book of Pteridophyta.
- Smith, G. M. - Cryptogamic Botany (Vol. II).
- Sporne, K. R. - Morphology of gymnosperms, 1965. Hutchinson univ. Asia Publishing House.
- Arnold, C. A. - An Introduction to Paleobotany.
- Ganguly Dass and Dutta - College Botany.

- Narayanaswamy, K. N., Rao and Raman, A. Outline of Botany Pteridophyta (Vascular Cryptogams). 2000.
- P. C. Vashista, A. K. Shina, Anil Kumar. S.Chand & Company New Delhi - 110055. 2010.

**Bloom's Mapping**

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>
<b>CO2</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>S</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>L</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** II

**Course:** Core Practical Paper – I

**Course Type:** Core Practical Paper

**Course Code:**

**Contact Hours:** 3 Hours/Week

**Credits:** 4

**CIA:** 40

**CE:** 60

### **COURSE OBJECTIVE**

- To develop the skills to identify the structures of different species through sectioning .
- To understand the practical techniques.

### **COURSE OUTCOME**

<b>K4</b>	CO 1	Impart knowledge about structures and different forms of Plant diversities through microscope.
<b>K4</b>	CO 2	Students gain knowledge about the spotters and identify the specimens.
<b>K4</b>	CO 3	Understand the morphology and taking sections.
<b>K4</b>	CO 4	Develop skills to identify the different species.
<b>K5</b>	CO5	Develop drawing sketches of the structures of the specimens.

### **COURSE CONTENT**

#### **Practical Paper I**

1. To make suitable micro preparations of the types prescribed in Algae, Fungi, Pteridophytes and Gymnosperms.

**Algae:** *Sargassum* – T.S of stipe

**Fungi:** *Puccinia* – Uredial and Telial stages

**Pteridophyte:** *Lycopodium* – T.S of stem; *Marsilea* – T.S of petiole

**Gymnosperm:** *Pinus* – T.S of needle; *Cupressus* – T.S of Stem

2. To observe and identify Macroscopic and Microscopic specimens at sight and write illustrated and explanatory notes on them.

*Nostoc* – Habit

*Chlorella* – Habit



*Oedogonium* – Nannandrium

*Chara* – Habit, Sex organs

*Puccinia* – Habit

*Albugo* – Conidia

*Rhizopus* – Thallus, Chlamydospore

*Usnea* – Habit, Apothecium

*Polytrichum* – Habit, L.S. of Sporophyte

*Marchantia* – Habit, Gemma cup

*Psilotum* – Habit, Synangium

*Equisetum* – Habit, Strobilus

*Gleichenia* – T.S. of Petiole

*Gnetum* – Habit, L.S. of Ovule

*Pinus* – Habit, L.S. of Female cone

*Cupressus* – Habit

*Rhynia* – T.S. of Stem

*Lepidodendron* – T.S. of Stem

3. To observe and identify at sight and make detailed study of the type of the diseases and prescribed in the syllabus.

Bunchy Top of Banana

Red Rot of Sugarcane

Citrus canker

4. To maintain an observation note and to submit it for external valuation.

**Question Pattern**  
**Practical Paper I**

1. Prepare suitable Micropreparations of A, B and C stain and mount in Glycerine. Draw labeled sketches. Identify giving reasons. Submit the slides for valuation. (7X3=21)
2. Spot at Sight (Genus and Group Only) D, E, F and G. (4X2=8)
3. Comment on the Plant pathology specimen of H. (5X1=5)
4. Identify Microscopic slides I, J and K. Draw labeled sketches and giving reasons. (3X4=12)
5. Comment on 'L'. (4X1=4)
6. Record Note Book. (10)

**KEY AND SCHEME FOR VALUATION**

1. Algae, Bryophytes, Pteridophytes, Gymnosperm, materials to be given in **A B & C**  
  
**A.** Algae / Fungi, **B.** Pteridophytes, **C.** Gymnosperms  
Slide Submission – 2 Marks      Identification - 1 Mark  
  
Diagram - 2 Marks      Reasons - 2 Marks (7X3=21)
2. Macroscopic specimens prescribed in the syllabus **D, E, F and G** (Algae, Fungi or Lichen, Bryophytes, Pteridophytes and Gymnosperm)  
  
Genus - 1 Mark      Group – 1 Mark (4X2=8)
3. **H.** Plant Pathology Specimen prescribed in the Syllabus  
  
Identification – 1 Mark      Causal Organism – 1 Mark  
  
Diagram – 1 Mark      Two symptoms - 2 Mark (1X5=5)
4. Write Critical notes **I, J,** and **K** – Microscopic slides

**I** – Algae/ Fungi, **J**- Bryophytes / Pteridophytes, **K**- Gymnosperm

Identification – 1 Mark    Diagram – 1 Mark    Notes - 2 Mark    (3X4=12)

5. **L**. Fossil slide

Identification – 1 Mark    Diagram – 1 Mark    Notes - 2 Marks    (1X4=4)

6. Record Note Book    10 Marks

### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>S</b>	<b>H</b>	<b>H</b>	<b>L</b>
<b>CO2</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>S</b>	<b>S</b>

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

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** II

**Course:** Ancillary Botany Theory Paper - II

**Course Type:** Ancillary Botany Theory Paper

**Course Code:**

**Contact Hours:** 3 Hours/Week

**Credits:** 3

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To develop the skills to identify the structures of different species of taxonomy .
- To understand the water potential, photosynthesis, respiration and anatomical adaptations..

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Impart knowledge about structures and different forms of Plant diversities through microscope.
<b>K2</b>	CO 2	Students gain knowledge about the spotters and identify the specimens.
<b>K2</b>	CO 3	Understand the morphology and taking sections.
<b>K2</b>	CO 4	Develop skills to identify the different species.
<b>K3</b>	CO5	Develop drawing sketches of the structures of the specimens.

### **COURSE CONTENT**

#### **Unit: I Taxonomy of Angiosperms**

**9 Hours**

Outline of Classification Bentham& Hooker's System (1862-83). Study of the following families with their economic importance, Annonaceae, Rutaceae, Rubiaceae, Amaranthaceae, Poaceae.

#### **Unit: II Embryology**

**9 Hours**

Structure of Microsporangium and Male gametophyte, structure of megasporangium and female gametophyte, - Monosporic and 8 nucleate embryo sac (Polygonum type). A brief account of types of Endosperm (excluding development) structure of Dicot embryo.

#### **Unit: III Plant Physiology**

**9 Hours**

Water relationship of plants- Imbibitions, Diffusion and Osmosis. Photosynthesis – Photosynthetic apparatus, Primary photochemical reaction and Calvin cycle

#### **Unit: IV Respiration**

**9 Hours**

Respiration – Structure of Mitochondria, Glycolysis, Krebs cycle and Electron Transport System.  
Phytohormones – Auxins

### Unit: V Plant Ecology

**9 Hours**

Anatomical adaptations and physiological adaptations of - Hydrophytes, Xerophytes, and Halophytes

### Practicals

**Taxonomy of Angiosperms** – A study of the families with their economic importance that is included in the theory.

**Plant Physiology** – Experiments to demonstrate: 1. Osmosis, 2. Evolution of O<sub>2</sub> during photosynthesis, 3. CO<sub>2</sub> is essential for photosynthesis, 4. Evolution of CO<sub>2</sub> during respiration, 5. Fermentation vessel. 6. Effect of Auxins in plant growth

**Plant Ecology** – Morphological and Anatomical adaptations of Hydrophytes, Xerophytes, and Halophytes. Macroscopic specimens and slides.

### Reference Books:

- Narayanasamy, R.V. and Krishnamoorthy, K. V- Outlines of Botany.
- Smith G.M. Cryptogamic Botany Vol. I and II. 1955.
- Ramasamy S.N. and Venkateswaralu- Taxonomy.
- Gangulee H. C. Das, K.S. Dutta CT. College Botany Vol.1. 1986.
- Gangulee and Kar A K. College Botany Vol. I and II. 1986.

### Bloom's Mapping

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	M	H	H	H	H
CO2	H	S	S	S	M	M	M
CO3	S	S	S	H	M	M	H
CO4	H	S	M	M	H	H	L
CO5	M	H	H	M	M	S	S

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** II

**Course:** Ancillary Botany Practical Paper

**Course Type:** Ancillary Botany Practical Paper

**Course Code:**

**Contact Hours:** 2 Hours/Week

**Credits:** 4

**CIA:** 40

**CE:** 60

### **COURSE OBJECTIVE**

- To develop the skills to identify the structures of different species through sectioning .
- To understand the practical techniques.

### **COURSE OUTCOME**

<b>K4</b>	CO 1	Impart knowledge about structures and different forms of Plant diversities through microscope.
<b>K4</b>	CO 2	Students gain knowledge about the spotters and identify the specimens.
<b>K4</b>	CO 3	Understand the morphology and taking sections.
<b>K4</b>	CO 4	Develop skills to identify the different species.
<b>K5</b>	CO5	Develop drawing sketches of the structures of the specimens.

### **COURSE CONTENT**

#### **Unit – I**

**6 Hours**

External Morphology and Transverse Section of Cryptogamic Materials – Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.

#### **Unit – II**

**6 Hours**

Micro suitable Anatomical Preparations of Plant Materials – Monocot Stem and Dicot Stem.

#### **Unit – III**

**6 Hours**

Family Identification and giving reasons (Families prescribed in the syllabus).

#### **Unit – IV**

**6 Hours**

Family Technical Term Description, Etiology and Plant Physiology Set Up.

**Unit – V****6 Hours**

Spotters – Macroscopic Specimen and Microscopic Slides – Cryptogamic Materials – Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms, Embryology and Ecological Specimens.

Maintenance of Record Note Book.

**Question Pattern****Ancillary Botany Practical Paper**

**Algae, Fungi, Plant Pathology, Bryophytes Pteridophytes Gymnosperms, Anatomy, Taxonomy of Angiosperms, Embryology, Plant Physiology and Plant Ecology**

**Sub Code: MUBAP****Max. Marks: 60 Marks****Time: 3 Hours**

1. Make suitable Micropreparation of **A** stain and mount in Glycerine. Draw labelled sketches and identify the giving reasons. Submit the slide for valuation. **(6 Marks)**
2. Prepare Transverse Sections of **B** stain and mount in Glycerine. Draw labelled sketches and identify the giving reasons. Submit the slide for valuation. **(6 Marks)**
3. Refer **C** to respective family giving reasons. **(5 Marks)**
4. Describe **D** in technical terms, draw labelled sketches including L.S of the flower. **(5 Marks)**
5. Comment on the Etiology of **E**. **(4 Marks)**
6. Comment on the Plant Physiology set up **F**. **(5 Marks)**
7. Identify, draw sketches and Write Notes on **G, H, I** and **J**. **(4×4= 16 Marks)**
8. Comment on Ecological Adaptations of **K**. **(3 Marks)**
9. Observation Note Book. **(10 Marks)**

## ANCILLARY BOTANY PRACTICAL PAPER

### Key and Scheme of Valuation

1. **A – Angiosperm Materials. (Root or Stem)** (6 Marks)
  - Slide Submission - 2 Marks
  - Identification - 1 Mark
  - Diagram - 1 Mark
  - Reasons - 2 Marks
2. **B – Pteridophytes or Gymnosperms.** (6 Marks)
  - Slide Submission - 2 Marks
  - Identification - 1 Mark
  - Diagram - 1 Mark
  - Reasons - 2 Marks
3. **C – Family Identification – Plants Prescribed in the Syllabus.** (5 Marks)
  - Identification - 1 Mark
  - Taxonomic position - 1 Mark
  - Description - 3 Mark
4. **D – Technical Term Description.** (5 Marks)
  - Identification - 1 Mark
  - Floral Diagram, Formulae - 2 Marks
  - Description - 2 Marks
5. **E – Etiology Specimen** (4 Marks)
  - Identification - 1 Mark
  - Diagram - 1 Mark
  - Reasons - 2 Marks
6. **F – Physiology set up** (5 Marks)
  - Identification - 1 Mark
  - Diagram - 1 Mark
  - Reasons - 3 Marks
7. **G, H, I and J Spotters - Algae or Fungi, Bryophytes or Pteridophytes, Gymnosperms and Embryology specimens or slides.** (4×4=16 Marks)
  - Identification - 1 Mark
  - Diagram - 1 Mark
  - Reasons - 2 Marks
8. **K - Specimen of Morphological and Ecological Interest.** (3 Marks)
  - Identification - 1 Mark
  - Diagram - 1 Mark
  - Reasons - 1 Mark
9. **Observation Note Book** (10 Marks)



### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>
<b>CO2</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>L</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** II

**Course:** Botany For Entrepreneurship Development

**Course Type:** SBC

**Course Code:**

**Contact Hours:** 2 Hours/Week

**Credits:** 2

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To acquire an in-depth knowledge about various Entrepreneurship programmes .
- To develop clear understanding about their preparations.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Enable the students to understand the role of microorganism in Biogas production.
<b>K2</b>	CO 2	Gains knowledge to prepare vermicompost and also assess the role of vermicompost in crop production.
<b>K2</b>	CO 3	Understands the cultivation methods, spawn production techniques and harvesting of mushrooms.
<b>K2</b>	CO 4	Analyse mulberry cultivation methods, the causes and symptoms of diseases in mulberry plants
<b>K3</b>	CO 5	Demonstrate the feeding frequency of silkworm and to evaluate the optimum environmental conditions for rearing and spinning

### **COURSE CONTENT**

#### **Unit: I**

**6 Hours**

**Biogas Technology:** Introduction and History – Anaerobic Digestion – Microbes Involved. Stages of Methane Generation – Wastes Used in Methanogenesis – Various Bioreactors Used for Methane Generation – Advantages and Disadvantages.

#### **Unit: II**

**6 Hours**

**Vermicompost preparation:** Vermiculture Preparation: History – *Eisenia foetida* used for Vermicompost preparation – Sources of Vermicomposting - Methods. Utilization of vermicompost for crop production, packaging and marketing.

**Unit: III****6 Hours**

**Mushroom Cultivation:** Cultivation methods – compost preparation – spawn production techniques – spawn running, cropping and harvesting.

**Unit: IV****6 Hours**

**Mulberry Cultivation:** Irrigation, manuring and pruning. Nutrient value of leaves, harvesting and storage of leaves, causes and symptoms in mulberry leaves.

**Unit: V****6 Hours**

**Silkworm Rearing:** Frequency of feeding silk worm, optimum environmental conditions for rearing and spinning. Harvesting: Time of harvesting of silk, sorting, storage, preservation, reeling and marketing. Budgeting. World silk production, Central silk board.

**Reference Books:**

- Faroqi A.A. Sree ramu.B.S. Cultivation of medicinal and crops. 2005.
- Asha Ram. Herbal Indian Perfumes and cosmetics SriSatguru Publications, New Delhi. 2002.
- Babu .S.S., Herbal cosmetics. Pushkal Publishers.
- SS. Handa and V.K. Kapoor, Pharmacognosy – Second Edition, publishers Vattubh Prakasan, Delhi.
- C.K.Kokate, A.Purohit and S.R.Gokhaletwelth – Pharmacognosy, edition – publishers Nirali prakasan, Pune.
- T.E. Wallis- Text Book of Pharmacognoc. 5th edition Publishers.CBS publishers and Distributors , Delhi.

### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>
<b>CO2</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>L</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** I

**Course:** Dietary and Nutritional

Value of Fruits and Vegetables

**Course Type:** Extra Credit Paper

**Course Code:**

**Contact Hours:** Self Study

**Credits:** 2

**CIA:** --

**CE:** 100

### **COURSE OBJECTIVE**

- To make the students to have a wide knowledge about nutritional value of fruits and vegetables.
- To understand the balanced diet.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Impart knowledge about balanced diet.
<b>K2</b>	CO 2	Students understand the functions of food.
<b>K2</b>	CO 3	Understand the nutritional classification of foods.
<b>K2</b>	CO 4	Develop knowledge in understanding the diet for various deficiencies.
<b>K3</b>	CO5	Understand the allergic and non allergic foods.

### **COURSE CONTENT**

#### **Unit – I**

Importance of balanced diet food groups and nutritive value of foods.

#### **Unit – II**

Function of foods – Physiological, Psychological and Social Functions.

#### **Unit – III**

Nutritional classification of foods – Energy Yielding Crops, Body Building Crops and Protective foods – Nutraceuticals – Definition and Importance.

#### **Unit – IV**

Fruits and Vegetables issued as the diet for Diabetes, Fever, Hyper tension, Hormonal Imbalance – Arthritis and Obesity Immunity Enhancements.

## Unit – V

Allergic foods – Remedial Crops for Deficiency Disease and Allergic Symptoms.

### Reference books

- Swaminathan, M. Advanced Text Book on Food and Nutrition (Vol. II), 2<sup>nd</sup> Edition. The Bangalore printing and publishing CO., Ltd., Bangalore. 1978.
- Wilson, E.D., Fischer, K.H., and Fuqua, M.E. Principles of nutrition 2<sup>nd</sup> Edition, Wiley Eastern Pvt, Ltd. 1971.
- Sri Lakshmi, B. Dietetics. New Age International Pvt, Ltd., Publishers New Delhi. 2006.

### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>S</b>
<b>CO2</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>L</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>S</b>	<b>S</b>

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

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** III

**Course:** Biochemistry, Biophysics and Biotechniques

**Course Type:** Core Paper IV

**Course Code:**

**Contact Hours:** 6 Hours/Week

**Credits:** 4

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To study the basic concepts of biochemistry, structures of biomolecules and enzymes.
- To study the concepts of biophysics and biotechniques.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Impart knowledge about atoms, bonds, pH, buffer and properties of water
<b>K2</b>	CO 2	Students gain fundamental knowledge of structure, classification and properties of biomolecules.
<b>K2</b>	CO 3	Understand the mechanism of enzyme action, and also study the structure, properties, nomenclature and classification of enzymes.
<b>K2</b>	CO 4	Develop knowledge in concepts of biophysics.
<b>K3</b>	CO5	Develop skills in studying and using instruments of biotechniques.

### **COURSE CONTENT**

#### **Unit: I Biochemistry**

**15 Hours**

Basic concepts of Biochemistry – Brief account of atoms, bonds - ionic, hydrogen, co-valent and co- ordinate, pH and buffer mechanism - structure and properties of water. Biomolecules – structure, classification and properties.

#### **Unit: II**

**20 Hours**

Carbohydrates - structure & properties of monosaccharides - glucose, disaccharides - sucrose, polysaccharides – starch. Proteins – primary, secondary and tertiary structure and properties.

#### **Unit: III**

**20 Hours**

Lipids – classification and properties, structure of fatty acid. Enzymes – structure, properties, nomenclature and classification, mechanism of enzyme action, factors affecting enzyme action.

**Unit: IV Biophysics****20 hours**

Laws of thermodynamics, concept of free energy, redox potential, ATP as high energy compound, photobiology - nature of light, solar radiation, absorption and emission spectrum, fluorescence, phosphorescence and bioluminescence.

**Unit: V Biotechniques****15 Hours**

Colorimetry and its use; Centrifugation – basic principles and types; pH meter and its use; Chromatography – basic principles, types (Paper); Spectrophotometer and its use.

**Practicals:**

1. Determination of pH of any three soil samples
2. Qualitative test for carbohydrates, proteins and lipids.
3. Separation of amino acids by paper chromatography
4. Estimation of starch by gravimetric method.
5. Estimation of total free amino acids by ninhydrin reagent method
6. Estimation of total protein by using green grams and cicer seeds.
7. Colorimeter – Complementary colours.

**Prescribed Texts:**

- Power C.B. and G.R Chatwal – Fundamentals of Biochemistry, S. Chand & Co, New Delhi.
- Jain J.L. - Fundamentals of Biochemistry, S. Chand & Co, New Delhi.

**Reference Books:**

- Conn E.E and Stumpf – Outlines of Biochemistry, Wiley Eastern Ltd. Chennai.
- Lehinger A.L. Bio chemistry, Kalyani's, New Delhi.
- Ambika Shanmugam – Fundamentals of Biochemistry for medical students – Chennai.
- Carey E.J. – Biophysics – affiliated East –west press P.Ltd. New Delhi.
- Albert .I Lechninger Bioenergetics – W.A Benjamin New York.
- Fuller et al., – Biophysics. Concepts and Mechanics.
- Dr. Salil Bose – Elementary Biophysics.



- Jeyaraman, Kunthala , M. Lakshmanan M. Gnananam and J.Jeyaraman - Experiments in Microbiology.
- Higginbothams, Chennai.
- Jeyaraman Techniques in Biology – A College level study.
- Plummer D.T – An introduction to practical Biochemistry, Tata Mc.Graw Hill Publishing Co, Bombay.
- Asokan .V. Melvisharam – Biochemistry and Biotechniques

#### Bloom's Mapping

<b>CO \ PO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>
<b>CO2</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>L</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>

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

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** III

**Course:** Computer applications and Basic Bioinformatics

**Course Type:** SBC

**Course Code:**

**Contact Hours:** 2 Hours/Week

**Credits:** 2

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To introduce classical bioinformatics theory to the students.
- To focus the applications of computers in biological studies..

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Enable the students to understand the components of computers
<b>K2</b>	CO 2	Gains knowledge about computer languages, internet and email.
<b>K2</b>	CO 3	Understands the windows, ms office, excel and powerpoint.
<b>K2</b>	CO 4	Study the basics of bioinformatics and phylogenetic analysis.
<b>K3</b>	CO 5	Develop an interest to study the biomolecular visualization and computer aided drug designing.

### **COURSE CONTENT**

#### **Unit – I**

**6 Hours**

Introduction to computers – components of computers – input devices – output devices – storage devices – operating system – DOS/WINDOWS/LINUX.

#### **Unit – II**

**6 Hours**

Computer languages low level (machine) language – high level languages – Introduction to Internet – data communication concept – LAN/WAN/WWW – net browsers (Internet explorer and Google chrome) – search engines (Google and Yahoo) – E-mail and FTP – Smileys and acronyms.

#### **Unit – III**

**6 Hours**

Windows OS – features – skills and options – MS office: Word (creation, editing and formatting of document) – Excel (Spreadsheet, Formula bar charts) - Powerpoint (Production, Editing, Animation and Presentation of Slides).

#### **Unit – IV**

**6 Hours**

Bioinformatics – definition – biological database (generalized and specialized) – public domain bioinformatics servers (NCBI, EBI and Genome NET) – bibliographic and sequence searching (ENTREZ and BLAST).

#### **Unit – V**

**6 Hours**

Algorithm and tools for gene finding: protein prediction, biomolecular visualization (RASMOL) – Computer Aided Drug Designing (CAD) – Target and lead discovery.

#### **Prescribed Texts:**

- Alexis Leon and Mathews Leon. Introduction to Computers, Leon Tech World, Chennai. 2008.
- Alexis Leon and Mathews Leon. Internet in a Nutsheel. Leon Tech World, Chennai. 1998.
- Lesk, A.M. Introduction to Bioinformatics, Oxford University Press, Oxford. 2002.

#### **References books:**

- Chakraborty, C. Bioinformatics Approaches, Chawla offset printers – Delhi, 2004.
- D.R. Westhead. J. Parish and R.M. Twyman. Bioinformatics (Instant Notes) Viva Books Private Limited – New Delhi, 2003.

### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>L</b>
<b>CO2</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** III

**Course:** Floriculture and Landscaping

**Course Type:** NME - I

**Course Code:**

**Contact Hours:** 2 Hours/Week

**Credits:** 2

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To study the global floriculture, flower arrangement and green house cultivation of cut flowers
- To understand the landscape gardening, Arboriculture, Bonsai, etc.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Enable the students to understand the cultivation of economic flowers
<b>K2</b>	CO 2	Gains knowledge about the techniques involved in flower arrangement and decoration
<b>K2</b>	CO 3	Understands the methods of green house cultivation of cut flowers.
<b>K2</b>	CO 4	Study the knowledge on landscape gardening.
<b>K3</b>	CO 5	Develop an interest to study the cultivation of various types of gardens.

### **COURSE CONTENT**

#### **Unit: I**

**6 Hours**

Floriculture - Global floriculture - Floriculture in India - Economic flowers - Rose, Jasmine, Crossandra, Chrysanthemum - Cultivation and uses.

#### **Unit: II**

**6 Hours**

Cut flowers - Significance of Cut flower industry in India\* - Export - Flower arrangement and decoration - dehydrated flowers, foliage and floral craft.

#### **Unit: III**

**6 Hours**

Green house cultivation of cut flowers -Green house technology - advantages - Green house cultivation of Orchids - Anthurium - *Gerbera* - Dahlia - Tuberose - *Gladioli*.

#### **Unit: IV**

**6 Hours**

Landscape gardening - important principles in layout a garden - Arboriculture - Shrubs

and climbers - annual, biennial herbaceous perennials - Ornamental palms - Succulents and Cacti.

**Unit: V**

**6 Hours**

Water garden, Rock garden, Roof garden, Vertical garden, Hydroponics, Lawn, Bonsai - Horticultural shows.

**Text Books:**

- Kumar, N. (1999). An Introduction to Horticulture. Rajalakshmi Publication, Nagarkoel.
- T. K. Bose, R.G. Maity, R.S. Dhua and P.Das, (1999). Floriculture and Landscaping, Naya Prokash, Calcutta.
- S. Prasad and U.Kumar. (2013). A handbook of Floriculture Agrobios(India),

**Reference Books:**

- Roy Edwin Biles, (2003). The complete Book of Gardening. Biotech Books, Delhi- 35.
- Bhattacharjee, S.K. (2006). Advances in Ornamental Horticulture. Pointer Publication, Jaipur.
- Doesh Beer Singh and Poonam Wazir, (2002). Bonsai - An art. Scientific Publishers, Jodhpur

**Bloom's Mapping**

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>S</b>	<b>H</b>	<b>H</b>	<b>M</b>
<b>CO2</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>L</b>	<b>M</b>	<b>S</b>	<b>S</b>
<b>S – Strong      H – High      M- Medium      L - Low</b>							

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** IV

**Course:** Plant Anatomy and Plant Ecology

**Course Type:** Core Paper - V

**Course Code:**

**Contact Hours:** 4 Hours/Week

**Credits:** 5

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To study the basic concepts of meristems, various theories of root and shoot.
- To study the structures of simple and complex tissues, nodal anatomy and adaptations of plants.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Impart knowledge about meristems and its various theories.
<b>K2</b>	CO 2	Students gain fundamental knowledge of structure and classification of simple and complex tissues.
<b>K2</b>	CO 3	Understand the primary and secondary structure of Dicot and Monocot plants.
<b>K2</b>	CO 4	Develop knowledge in studying nodal anatomy.
<b>K3</b>	CO5	Develop skills in identifying morphological, physiological and anatomical adaptations of plants.

### **COURSE CONTENT**

#### **Unit - I Anatomy**

**10 Hours**

Cell wall: Ultra structure; pits and their types; Meristems: Classification; characteristics; shoot and root meristems- various theories (Apical cell theory, Histogen theory, Tunica corpus theory and Korper - Kappe theory); Cambium.

#### **Unit - II**

**10 Hours**

Tissues: Simple tissues – parenchyma, collenchyma, sclerenchyma; Complex tissues - xylem, phloem. Structure of monocot and dicot leaves;

#### **Unit - III**

**15 Hours**

Primary structure of dicot stem and dicot root; monocot stem and monocot root. – Normal secondary growth of dicot stem and dicot root

**Unit - IV****15 Hours**

Anomalous secondary growth of *Boerhaavia* and *Dracaena*. Nodal anatomy – A brief account – Unilacunar node – *Justicia*, Trilacunar node – *Azadirachta*, Multilacunar node – *Aralia* .

**Unit - V Plant Ecology****10 Hours**

Study of the plant groups with special reference to their morphological, anatomical and physiological adaptations: Hydrophytes, Xerophytes, Halophytes - Plant succession Hydrosere, Xerosere.

**Practicals:**

1. Observation and identification of different types of tissues (slides).
2. Observation and study of internal structure of monocot (stem and root) and dicot (stem and root).
3. Observation and study of internal structure of monocot and dicot leaf (slides).
4. Observation and study of anomalous secondary growth in *Boerhaavia*
5. Observation and study of internal structure of Hydrophytes and Xerophytes

**Prescribed Texts:**

- Vashishta P.C. Plant Anatomy, S. Nagin & Co New Delhi.
- Venkateswarlu .V. Internal Morphology of Angiosperms
- Sharma .P.D. Elements of Ecology, Rastogi Publication, Meerut.
- Shukla R.S. and P.S. Chandel – Plant Ecology and Soil Science, S. Chand and Co., New Delhi.

**Reference Books:**

- Katherine Esau. Anatomy of seed plants –2<sup>nd</sup> Edition Wiley, New York, 1965.
- R. F Suan E. Eichhorn. Esau's Plant Anatomy: Meristems, Cells, and Tissue of the Plant Body, 3<sup>rd</sup> Edition, 2006.
- Fahn. A Plant Anatomy. 3<sup>rd</sup> Edition. Pergamon Press New York. 1985.
- S. Carlquest. Comparative Wood Anatomy, Springer Science Publication. 2001



- V. Singh P.C. Pande and D.K. Jain Rastogi. Anatomy of Seed Plant, 1998.
- B.P Pandey S. Chand. College Botany Vol II. New Delhi 2011.
- B.P. Pandey S. Chand. Plant Anatomy, New Delhi 2009
- Ambasht .R.S. A Text book of plant Ecology.
- R.S. Shukla and P.S. Chandel. A text book of Plant Ecology, 11<sup>th</sup> Edition. C. Chand and Company Ltd. New Delhi. 2007.
- H. D. Kumar. Modern concepts of Ecology 8<sup>th</sup> Edition, UBS Publisher's & Distributors Pvt. Ltd. New Delhi. 2007.

#### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>L</b>
<b>CO2</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>H</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>L</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** IV

**Course:** Cell Biology and Embryology

**Course Type:** Core Paper - VI

**Course Code:**

**Contact Hours:** 4 Hours/Week

**Credits:** 4

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To study the ultra structure of plant cell, prokaryotic and eukaryotic cell and microscopes.
- To study the structure and functions of cell organelles and embryo.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Gain knowledge about prokaryotic and eukaryotic cell, different microscopes.
<b>K2</b>	CO 2	Students understand the structure and functions of cell organelles like mitochondria, nucleus and chromosomes.
<b>K2</b>	CO 3	Understand the structure and functions of golgi complex and cell division.
<b>K2</b>	CO 4	Develop knowledge in studying the development of male and female gametophyte and types of ovule.
<b>K3</b>	CO5	Understand the types of endosperm, double fertilization and triple fusion.

### **COURSE CONTENT**

#### **Unit-I Cell Biology**

**10 Hours**

Microscopy - Compound microscope and Electron microscope. Ultra structure of plant cell; comparative account of prokaryotic and eukaryotic cell; Plasma membrane – Structure and functions; Types of plastids, Chloroplast – Structure, functions and its significances.

#### **Unit-II**

**10 Hours**

Mitochondria – Structure and functions; Peroxisome and Glyoxysomes, Nucleus – Structure and functions; Chromosomes-shapes and functions- special type of chromosomes – Giant and lamp brush chromosomes. Ribosomes – Origin, Structure and functions

#### **Unit-III**

**10 Hours**

Golgi apparatus- Structure and functions; Cell cycle, Cell division – Mitosis and meiosis – significance; various stages of cell division progression; cytokinesis;

#### **Unit-IV Embryology**

**15 Hours**

Structure and development of microsporangium; microsporogenesis, development of male gametophyte; megasporangium - types of ovule, nucellus, integument, obturator.

#### **Unit-V**

**15 Hours**

Megasporogenesis and development of female gametophyte – monosporic (*Polygonum*), Fertilization: Double fertilization and triple fusion; Endosperm – types – Cellular, Nuclear and Helobial, Ruminant (Haustoria not included) Dicot embryo – eg. *Capsella*, Monocot embryo – *Luzula* -.Polyembryony, Apomixis, Parthenocarpy- (only definitions with examples.)

#### **Practicals:**

1. Observation and study of T.S of young anther.
2. Observation of ovule types (slides).
3. Observation of embryo sac structure (chart).
4. Dissection of dicot embryo (any one stage).
5. Study of endosperm types (slide)
6. Observation and study of ultra structure of cell organelles (chart, slides, models& micrographs).
7. Observation of different stages of mitosis in onion root tip squash preparation

#### **Prescribed Texts:**

- S.S. Bhojwani and Bhatnagar. Embryology of Angiosperms- S, P.Vikas Publishing House Pvt Ltd., 2009.
- P. Maheswari. McCraw-Hill. An Introduction to Embryology of Angiosperm- New York. 1963.
- Gupta, P. K. A Text – book of Cell and Molecular Biology. Rastogi Publications, Meerut, India. 1999.
- Verma P.S. & V.K. Agarwal – Cytology, S,Chand & Co , New Delhi.

**Reference Books:**

- Freifelder, D. Essentials of Molecular Biology, Jones & Bartlett, Boston. 1993.
- De Robertis & De Robertis. Cell and Molecular Biology, Saunders College, Philadelphia, USA. 1990.
- Elliott WH & Elliott, DC. Biochemistry and Molecular Biology, 3rd Ed. Oxford University, Oxford. 2005.
- Watson, J.D. Molecular Biology of Gene. The Benjamin. Gummings publishing co. inc. California. 1987.
- Hopkins, W. Molecular biology of the gene. Benjamin publishing Company. California. 1988.
- Geoffrey, M. Cooper, Robert, E. Hansman. The cell- A Molecular approach, Sinauer Associates. USA. 2007.
- Lee, P. J. Plant Biochemistry and Molecular Biology, 2nd edition. John Wiley and Sons, New York. 1999.

**Bloom's Mapping**

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>
<b>CO2</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>L</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>L</b>	<b>M</b>	<b>S</b>	<b>S</b>

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

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** IV

**Course:** Core Practical Paper II

**Course Type:** Core Practical Paper

**Course Code:**

**Contact Hours:** 3 Hours/Week

**Credits:** 4

**CIA:** 40

**CE:** 60

### **COURSE OBJECTIVE**

- To develop the skills to do biochemistry experiments, take sections of anatomical specimens.
- To understand the practical techniques.

### **COURSE OUTCOME**

<b>K4</b>	CO 1	Impart knowledge in doing biochemistry experiments
<b>K4</b>	CO 2	Students gain knowledge about the spotters and identify the specimens.
<b>K4</b>	CO 3	Understand the morphology and taking sections.
<b>K4</b>	CO 4	Develop skills to identify the different species.
<b>K5</b>	CO5	Develop drawing sketches of the structures of the specimens.

### **COURSE CONTENT**

#### **Plant Anatomy**

1. To make suitable micropreparations of the angiospermic materials – Dicot and Monocot stem, root & leaves.
2. To draw labelled sketches of different types of microscope (Compound & Electron).

#### **Cell Biology**

3. To smear root tip and identify different stages of mitosis.
4. To smear young anther and identify different stages in meiosis.
5. To identify cell inclusions.

#### **Embryology**

6. To mount embryo (Tridax, Brassica).

7. To study and write critical notes on permanent preparation showing development of anther, Embryosac and embryo.

### **Biochemistry**

8. Qualitative test for carbohydrates, proteins and fats.

9. Measurement of PH of soil solutions.

10. Preparation of Buffer.

11. Estimation of starch in plant tissue – Gravimetric.

### **Bio Techniques**

12. Determination of Complementary colours and verification of Beer's law.

13. Estimation of Sugars in plant tissues – Colorimetry.

14. Paper chromatography for separation of sugar, Aminoacids, Pigments, Dyes, Circular, Ascending, Column chromatography, separation of pigments.

### **Plant Ecology**

15. Identification of section stems and leaves of Hydrophytic, xerophytic groups.

16. Identification of morphological, ecological and biological interests of ecologically important plants.

17. To maintain a record notebook and to submit it for external valuation

## **PRACTICAL PAPER- II-QUESTION PATTERN**

**Plant Anatomy, & Plant Ecology, Microscopy, Cellbiology, Embryology,  
Biochemistry, & Bio- Techniques**

**Time : 3 hours**

**Marks : 60**

1. Taking lots from the set of experiments. Write the procedure and submit the procedure. Proceed with the experiment, tabulate and interpret the results.

(10 Marks)

2. Prepare transverse sections of 'A' and B Stain and mount in Glycerine Draw labelled sketches. Identify giving reasons. Submit the slide for valuation

(2X5=10)

3. Make suitable micropreparations of 'C' Identify atleast any one stage and show it to the examiner for valuation

(5 Marks)

4. Dissect and takeout the embryo from the material 'D' mount and submit it for valuation

(5 Marks)

5. Write critical notes on E, F, G and H

(4X5=20)

6. Record Note Book

(10 Marks)

### KEY AND SCHEME FOR VALUATION:

1. Experiments prescribed in the syllabus alone should be given

Experiment setup – 3, Procedure – 4, Tabulation and Interpretation- 3 (10 marks)

2. A. Anatomy materials to be given, B. Specimens of ecological interest

Slide submission-2

Identification – 1, Diagram- 1, Reasons- 1 (2x5=10)

3. Onion Root tip may be given or Rheo flower buds may be given in C identification and submission of slides (notes need not be written) (5 marks)

4. Any suitable materials such as Tridax, or Brassica to be given in D. Notes need not be written, submission of slides (5 marks)

5. Critical Notes on (4x5= 20)

**E** – Any cell inclusion

**F** – Electron Photomicrograph of cell organelles.

**G** – Embryology Slide

**H** – Photograph of any one microscope

Identification – 1 mark, Sketch- 2 marks, Notes – 2 marks

6. Record Note Book (10 marks)

### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>
<b>CO2</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>L</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>L</b>	<b>M</b>	<b>S</b>	<b>S</b>

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



**Programme:** B.Sc.,

**Semester:** IV

**Course Type:** SBC

**Contact Hours:** 2 Hours/Week

**CIA:** 25

**Subject:** Botany

**Course:** Forest Botany

**Course Code:**

**Credits:** 2

**CE:** 75

### **COURSE OBJECTIVE**

- To understand the forestry, silviculture and forest conservation.
- To study the recent scenario in forest biodiversity, wildlife wealth of India, silviculture practice and forest act of India.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Gain knowledge about the types of forest & their importance and silvicultural practices.
<b>K2</b>	CO 2	Students understand the forestry, silviculture and forest conservation.
<b>K2</b>	CO 3	Understand the types of Indian forest, utilization and conservation of forest biodiversity by using silvicultural practice and forest policies
<b>K2</b>	CO 4	Develop knowledge about the forest climate, impact of deforestation, silviculture management and forest resource.
<b>K3</b>	CO5	Inspect the recent scenario in forest biodiversity, wildlife wealth of India, silviculture practice and forest act of India

### **COURSE CONTENT**

#### **Unit-I**

**6 Hours**

**Forest:** Introduction – Definition. Classification of World Forest and Indian Forests. Agroforestry: scope and necessity. Forest Climate – Forest Research Organizations – Importance of Forest Research on Conservation.

#### **Unit-II**

**6 Hours**

**Forest Resources and Utilization:** Direct and indirect beneficial of Forest – Major and Minor Timber Products – Non-Timber Forest Products (NTFPs) – Forestry for Social and National Development.

### Unit-III

6 Hours

**Forest and Biodiversity:** Forest Ecosystem –Importance of Biodiversity conservation. Causes of deforestation - Forest fires, Urbanization, Mining, Commercial Plantation, Over grazing.

### Unit- IV

6 Hours

**Silviculture:** Concept and scope –Natural and Artificial regeneration of forests saplings. Methods of propagation: Management of silviculture systems of temperate and tropical forests. Silvicultural practice of economically important species in India (*Dalbergia*, *Dipterocarpus* and *Pterocarpus*).

### Unit-V

6 Hours

**Indian forest Policy and Wildlife Act:** Indian Forest Policy – Indian Forest and Wildlife Act –Wildlife Protection Act and their amendments. People Biodiversity register – Vanakuzhu - Chipko movement – Role of Tribes in Forest Conservation.

### Text Books:

- Parthiban, K.T. *Introduction to Forestry and Agroforestry*. Scientific Publishers, 2018.
- Lal, J.B. *Forest Ecology*. Natraj Publishers 2012.
- Reddy, S.R. and Nagamani C. *Introduction to Forestry*. Kalyani book publication, 2017.
- Negi, S.S. *Textbook of Forestry and Wildlife Management*. International Book Distributors, 2009.

### References Books:

- Jurgen, P., Dietrich, D. and Holm, U. *Forestry and Rural Development*. Springer, 2016.
- Marcus, B.A. *Tropical Forests*. Jones and Bartlett Publishers Inc, 2010.
- Honnay, O. *Forest Biodiversity*. Illustrated Edition. CABI Publishing, 2004.
- Bachmann, P. *Assessment of Biodiversity for Improved Forest Planning*. Springer, 1998.

### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>S</b>
<b>CO2</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>L</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** III

**Course:** Commercial Plant Products

**Course Type:** Extra Credit Paper

**Course Code:**

**Contact Hours:** Self Study

**Credits:** 2

**CIA:** --

**CE:** 100

### **COURSE OBJECTIVE**

- To make the students to have a wide knowledge about economically important plant products
- To understand the extraction processes of plant products.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Impart knowledge about balanced diet.
<b>K2</b>	CO 2	Students understand the functions of food.
<b>K2</b>	CO 3	Understand the nutritional classification of foods.
<b>K2</b>	CO 4	Develop knowledge in understanding the diet for various deficiencies.
<b>K3</b>	CO5	Understand the allergic and non allergic foods.

### **COURSE CONTENT**

#### **Unit - I**

Importance of economically important plant products – a brief Introduction about any two - Food Grains, Pulses, Spices and Wood.

#### **Unit – II**

Economically important plant products – Rubber, Coir Industry – Agave and Banana, Oil Industry – Sunflower oil.

#### **Unit – III**

Processing of Coffee – Types of Coffee – Grading of Coffee.

#### **Unit - IV**

Sugar Industry – Extraction of sugar from Sugarcane.

## Unit – V

Paper Making Industry – Preparation of Pulp – Types of Paper Making.

### Reference Books:

- B.P. Pandey, S. Chand. Economic Botany. 1999.
- Sampat Nehra. Economic Botany. 2007.
- Dr. S. Sundararajan. Morphology and Economic Botany of Angiosperms – Anmol publications P. Ltd. 1997.
- Robert Hill. Economic Botany.
- K.C. Casida. Industrial biotechnology

### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>S</b>
<b>CO2</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>L</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** V

**Course:** Taxonomy of Angiosperms and Economic Botany

**Course Type:** Core Paper VII

**Course Code:**

**Contact Hours:** 9 Hours/Week

**Credits:** 5

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To enrich the students to have a broad knowledge about various families, local flora and classification of plants
- To equip the learners to identify angiosperms and economical uses of plants

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Impart knowledge about the morphological structures of angiosperms
<b>K2</b>	CO 2	Students understand the binomial nomenclature, herbarium technique and classification of angiosperms.
<b>K2</b>	CO 3	Understand the morphology and economic importance of families.
<b>K2</b>	CO 4	Develop knowledge in identifying different families.
<b>K3</b>	CO5	Understand the extraction, chemical constituents and uses of rubber and coffee..

### **COURSE CONTENT**

#### **Unit: I**

**20 Hours**

Plant morphology – modification of tap root system – modification of stem – aerial and underground stem- morphology of leaf – structure of a leaf, phyllotaxy, stipules and its modification and modification of leaves: inflorescence types- racemose, cymose, mixed and special types, flowers and fruits – simple, aggregate and multiple fruits.

#### **Unit: II**

**15 Hours**

Binomial Nomenclature – Herbarium technique – classification – Bentham & Hooker; ICN and its role. Botanical Survey of India (BSI) – Modern approaches - Chemo Taxonomy and Digital Taxonomy

#### **Unit: III**

**20 Hours**

Study of following families with special reference to morphology of the modified plant parts and plants of economic importance

\* Annonaceae \* Rutaceae \* Caesalpinaceae \* Cucurbitaceae \* Apiaceae

#### **Unit: IV**

**20 Hours**

Study of following families with special reference to morphology of the modified plant parts and plants of economic importance

\* Rubiaceae \* Asclepiadaceae \* Lamiaceae \* Amaranthaceae \* Euphorbiaceae

#### **Unit: V**

**15 Hours**

Study of following families with special reference to morphology of the modified plant parts and plants of economic importance

\* Orchidaceae \* Arecaceae \* Poaceae

**Economic Botany:** Study of economically important plants of the above mentioned families with a special reference to the morphology of their uses. Study of the extraction, chemical constituents, and uses of the following - Coffee, - Rubber.

#### **Practicals:**

- \* Diversity of Angiosperms: Morphology of Angiospermic plants.
- \* Taxonomy: Taxonomic study of plants belonging to the families as per the syllabus (only dicot families given for identification in practical examinations).
- \* Field visits: Botanical study tour for 3 or 4 days to be undertaken for covering various natural habitats and one or two single day collection trips.
- \* Submission herbarium: Submission of 15 herbarium sheets along with tour/trip report and field note book.
- \* Economic Botany: Study of the morphology and structure of useful parts of the plants mentioned in and herbarium sheets and collection of samples of plants.
- \* Ethnobotany: Listing of the medicinal practices of one or two tribes.

**Prescribed Texts:**

- O.P. Sharma. Plant Taxonomy. Data McGraw-Hill Publishing Company New Delhi. 2007.
- B.K. Verma. Introduction to Taxonomy of Angiosperms. PHI Learning Pvt. Ltd New Delhi. 2011.
- V. Singh, Dr. V. Singh & Dr. D.K. Jain. Taxonomy of Angiosperms, Second Edition. Rastogi Publications Meerut, India. 2010.

**Reference Books:**

Singh. Plant Systematics. Oxford & IBH Publishing Co., Pvt., Ltd. New Delhi. 2004.

A.K. Mondal. Advanced Plant Taxonomy. New Central Agency Pvt. Ltd. New Delhi. 2009.

B.P. Pandey. College Botany S. Chand and Co., Ltd. Vol. I. New Delhi. 2011.

Bharathi Bhattacharyya. Systematic Botany. Narosa Publishing House. India. 2009.

Dr.N.S. SubrahmanyamVikas. Modern Plant Taxonomy Publishing House Pvt. Ltd New Delhi.

Pandey, B.P. and Anita. Economic Botany, S. Chand and Co., Ltd. New Delhi. 2009.

Kochar, S.L. Economic Botany of the Tropics – Macmillan India Pvt. Ltd. 2000.

The useful Plant's of India – CSIR Publications and Information Directorate, New Delhi. 1986.

Sharma. Economic Botany , Tata McGraw Hill Co., Ltd. 1996.



### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>
<b>CO2</b>	<b>M</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>M</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>L</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** V

**Course:** General Microbiology

**Course Type:** Core Paper VIII

**Course Code:**

**Contact Hours:** 9 Hours/Week

**Credits:** 4

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To enrich the students to have a broad knowledge about microbiology
- To equip the learners to learn about antibiotics, microbial degradation, sewage treatment and immunology.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Acquire knowledge about the characteristics, multiplication and control of viruses.
<b>K2</b>	CO 2	Students understand the food poisoning, industrial manufacture of ethanol, penicillin, etc.
<b>K2</b>	CO 3	Understand the decomposition, functions of humus and microbial degradation of cellulose.
<b>K2</b>	CO 4	Develop knowledge in sewage treatment and control of microorganisms.
<b>K3</b>	CO5	Understand the structure of antigen and antibody, their reaction and types of immune systems.

### **COURSE CONTENT**

#### **Unit: I**

**20 Hours**

Introduction to microbiology - definition and scope of microbiology, General characteristics of Bacteria. Classification of bacteria based on Morphological characteristics, viruses – general characteristics, structure and multiplication of TMV and bacteriophage, transmission of viruses, symptoms and control of rabies, AIDS and Covid 19 virus.

#### **Unit: II**

**15 Hours**

Food microbiology – microbial flora of food – food poisoning and food infection; industrial manufacture of ethanol; antibiotics – penicillin, vitamin B12; aminoacids- glutamic acid; production of SCP. Staining techniques – simple and differential staining.

#### **Unit: III**

**15 Hours**

Soil microbiology – soil microorganism the rhizosphere microorganisms – organic matter decomposition, humus, functions of humus; microbial degradation of cellulose

**Unit: IV**

**20 Hours**

Microbiology of domestic water – microbiology of drinking water, municipal water and sewage water – brief account of sewage treatment process; determination of sanitary quality; chemotherapy and control of micro organisms through antibiotics

**Unit: V**

**20 Hours**

Immunology – basic principle of immunology, structure of antigen and antibody and their reaction; types of immunology –antigen, antibody - definition, types Ag- Ab reaction – types of immunosystem, human immune system, immunization schedule (WHO)

**Practicals:**

**Microbiology:**

1. Calibration of Microscope.
2. Sterilization techniques & Types.
3. Preparation of Basal medium – solid agar and broth
4. Preparation of agar plates, agar slants and agar deep tubes.
5. Isolation and culturing techniques of microbes – streak plate and pour plate methods.
6. Simple staining of bacteria.
7. Gram's staining of bacteria.

**Prescribed Texts:**

- Ananthanarayayan and Panikaer's. Text book of Microbiology ,ArtiKapil Publishing orent Blackswan – 2013.
- Rashmi A. Joshi. A Text book of Immunology, -2013.
- Powar. General Microbiology -2010.
- Powar. General Microbiology – 2010.

**Reference Books:**

- Pelczar, M.J (Jr), Chan, E.C.S and Krieg, N. R. Morphology. Tata McGraw Hill Publishing Company Ltd, New Delhi. 1986.

- Scheigel, H. S. General Microbiology, (6<sup>th</sup> edition). Cambridge University press, London. 1986.
- Sharma, P.D. Microbiology (2<sup>nd</sup> edition). Rastogi Publication, Meerut.
- Aneja, K. K. Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom Cultivation, Wishwa Prakashan, New Delhi. 1996.
- Purohit, S. S. Microbiology-Fundamentals and Applications, (6<sup>th</sup> Edition). Agrobios (India), Jodhpur. 1999.
- Dubey and Mageshwari. Text Book of Microbiology. S. Chand & Co. Ltd.

#### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>
<b>CO2</b>	<b>M</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>M</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>L</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** V

**Course:** Plant Biotechnology

**Course Type:** Elective I

**Course Code:**

**Contact Hours:** 5 Hours/Week

**Credits:** 5

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To enrich the students to have a broad knowledge about techniques used in biotechnology.
- To create awareness and interest about recombinant DNA technology and human health care products.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Acquire knowledge about the techniques used in biotechnology.
<b>K2</b>	CO 2	Students understand the recombinant DNA technology and human health care products.
<b>K2</b>	CO 3	Understand the plant tissue culture techniques and its role in crop improvement.
<b>K2</b>	CO 4	Develop knowledge in transgenic plants and biological control of pathogens..
<b>K3</b>	CO5	Understand the composition of biomass and intellectual property rights.

### **COURSE CONTENT**

#### **Unit: I**

**15 Hours**

Biotechnology – Definition, scope & importance. Vector mediated gene transfer Electroporation & Microinjection, Isolation of DNA, Principles of PCR – Application and uses, DNA Finger printing Techniques in Biotechnology.

#### **Unit: II**

**15 Hours**

Techniques used in Biotechnology – Methods used in direct gene transfer. Recombinant DNA technology vectors, cosmid, transposons- Definitions Agrobacterium and genetic engineering in plant – Ti plasmids – Incorporation of TDNA into DNA Human health care.

- a) Insulin b) Human growth hormone c) Antibiotics d) Edible vaccines

#### **Unit: III**

**15 Hours**

Plant tissue culture – Culture techniques types of medium. Micropropagation – Totipotency, differentiation, re – differentiation. Regeneration of plants Root culture, Anther culture, Role of tissue culture technology in crop improvements. Artificial seeds.

**Unit: IV**

**15 Hours**

Transgenic plants – Definition Transgenic plants for herbicide, pest, fungi, and viral resistance. Biological control of pathogens & weeds through genetically engineered microbes – *Bacillus thuringiensis*, Golden rice and BT cotton.

**Unit: V**

**15 Hours**

Plant Biomass – Definition composition of biomass, Biomass energy conversion, Bioenergy- Biofuels, Biodiesel. Role of genetically recombinant microbes in pollution control – *Pseudomonas*. Intellectual property rights.

**Prescribed Texts:**

- Dr. Sathyanarayana .U. Biotechnology, I- Edition, Kolkata. 2008.
- Gupta P.K. Elements of Biotechnology, Rastogi and Co., Meerut, India. 1994.
- R.C. Dubey. A Textbook of Biotechnology, S. Chand and Company Ltd, Ram nagar, New Delhi. 2007.

**Reference Books:**

- Trivedi .P. Plant Tissue Culture, Scientific Publishers, India. 2004.
- Jagadand .S.N. Environmental Biotechnology, Himalaya Publishing House. Mumbai. 1995.
- Jagdand .S. N. Gene Biotechnology, Himalayan Publishing House, Mumbai. 2006.
- P. K. Gupta Elements of Biotechnology, Rastogi publications, Meerut.

### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>S</b>
<b>CO2</b>	<b>H</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>L</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>L</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Semester:** V

**Course Type:** Elective I

**Contact Hours:** 5 Hours/Week

**CIA:** 25

**Subject:** Botany

**Course:** Habitat Ecology

**Course Code:**

**Credits:** 5

**CE:** 75

### **COURSE OBJECTIVE**

- To make the students to have a wide knowledge about habitat ecology
- To understand the ecology of various habitats.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Impart knowledge about the uniqueness of the varying habitats in the biosphere.
<b>K2</b>	CO 2	Students acquire knowledge about the structure and functions of different ecosystem.
<b>K2</b>	CO 3	Understand the ecology of various habitats.
<b>K2</b>	CO 4	Develop knowledge in understanding the environmental legislations.
<b>K3</b>	CO5	Understand the inventory of habitats.

### **COURSE CONTENT**

#### **Unit - I**

**15 Hours**

Introduction to habitat ecology – historical, ecological and evolutionary perspectives – habitat concepts (edge, ecotones, interspersed and juxtaposition) – units of vegetation (formation, association, consociation, faciation and society); plant succession - processes and types (hydrosere and xerosere).

#### **Unit – II**

**15 Hours**

Ecology of major habitats; Forest (tropical rain forest, deciduous and coniferous) – scrub jungle and deserts (hot, dry and cold deserts) – grasslands (temperate and tropical).

#### **Unit – III**

**15 Hours**

Ecology of major habitats; Aquatic (fresh water – lentic and lotic) – marine (coasts, estuaries, mud, sand and rocky shores, mangroves & coral reefs) – tundra (arctic and alpine).



**Unit – IV****15 Hours**

Physical & anthropogenic factors - impact of habitats – habitat degradation and fragmentation – Environmental Impact Assessment (EIA) – Environmental audits – Environmental Legislations and Regulations.

**Unit –V****15 Hours**

Inventory of habitats – Remote Sensing (RS) and Geographical Information System (GIS) – Principles and applications of remote sensing techniques – land cover classification and mapping – use and values of GIS approaches to habitat ecology.

**Prescribed Texts:**

- Odum, E. P. (ed), Fundamentals of Ecology, W. B. Saunders Company, Philadelphia.
- Sharma P. D. Ecology and Environment, Rastogi Publications, Meerut. 1997.
- Dash, M. C. Fundamentals of Ecology, Tata Mc Graw Hill, New Delhi. 1993.
- Verma. A text book of plant ecology, Emkay publications, Delhi. 1975.
- Sahu, D. D. and R. M. Solanki. Remote sensing techniques in agriculture, Agrobios (India), Jodhpur. 2008.

**Reference Books:**

- Leonard Ortolano, Environmental Regulation and Impact Assessment, John Wiley & Sons, Inc. 1997.

### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>S</b>
<b>CO2</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>L</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** V

**Course:** Horticulture and Landscaping

**Course Type:** Elective II

**Course Code:**

**Contact Hours:** 5 Hours/Week

**Credits:** 5

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To have a broad knowledge about orchard cultivation, landscape gardening, bonsai culture, etc.
- To create awareness and interest about flower arrangement, cultivation of vegetables growing kitchen garden, etc.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Enrich knowledge about the techniques of orchard cultivation, soil management practices and pruning techniques.
<b>K2</b>	CO 2	Students understand the vegetative propagation methods and systems of irrigation.
<b>K2</b>	CO 3	Understand the different methods of gardening and flower arrangement.
<b>K2</b>	CO 4	Develop knowledge in cultivation of vegetables, fruits and flowers and extraction of jasmine.
<b>K3</b>	CO5	Understand the uses of kitchen garden and its necessity.

### **COURSE CONTENT**

#### **Unit: I**

**15 Hours**

Horticulture-scope and divisions – Botanical garden-components. Botanical gardens of the world, Botanical gardens of India- Orchard cultivation-soil management practices, intercropping, principles and suitable intercrops; Training –principles and methods; pruning-special pruning techniques and uses; fruit set and unfruitfulness, fruit drop

#### **Unit: II**

**15 Hours**

A brief account of methods of vegetative propagation- cutting, layering, grafting; manures-organic manures; fertilizers-types and methods of application; irrigation-systems of irrigation

#### **Unit: III**

**15 Hours**

Gardening – Landscape gardening, Lawn making, Rockery, Hanging pots, Bonsai, Water garden, flower arrangement- cut flowers (Only examples), and Ikebana

#### **Unit: IV**

**15 Hours**

Olericulture - Cultivation of Brinjal; Pomology - Cultivation of Mango; Floriculture- Cultivation of jasmine, Extraction of Jasmine concrete.

#### **Unit V**

**15 Hours**

Growth regulators in horticulture; plant protection measures – control of insect pests; Kitchen Garden- principles, plan, layout, cropping pattern and significance.

#### **Prescribed Texts:**

- Vishnu Sworup - Ornamental Horticulture
- Kumar. N Rohini agency, Nagerkovil - Introduction to Horticulture
- Trivedi - Home Gardening
- Manibhussan Rao - Horticulture
- Hatmann and Kestr - Fundamentals of Horticulture

#### **Reference Books:**

- Edmond *et al* – Fundamental of Horticulture Tata Mc. Graw Hill Publishing Co, Bombay.
- Brelt – Planing your garden
- Gopala Swami Ienger .K.S. – Complete gardening
- Percy Lancaster – Gardening in India , Rekha Printing, New Delhi.
- Choudhury - Vegetables
- Veeraghavanathan and others - A Guide on vegetable culture
- Manibhusan Rao – Horticulture
- Roy Genders – Miniature Roses
- Heliyer – Gardener's Golden Treasury
- Introduction to spices plantation crops medicinal and aromatic plants

### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>S</b>
<b>CO2</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>M</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>L</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** V

**Course:** Plant Tissue Culture

**Course Type:** Elective II

**Course Code:**

**Contact Hours:** 5 Hours/Week

**Credits:** 5

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To make the students to have a wide knowledge about plant tissue culture techniques.
- To develop knowledge in understanding synthetic seed production

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Impart knowledge about culture media and aseptic techniques.
<b>K2</b>	CO 2	Students understand the micropropagation
<b>K2</b>	CO 3	Understand the anther culture, pollen culture, ovary culture, etc.
<b>K2</b>	CO 4	Develop knowledge in understanding the artificial seed production.
<b>K3</b>	CO5	Understand the secondary metabolites and cryopreservation.

### **COURSE CONTENT**

#### **Unit – I**

**15 Hours**

Introduction, History, Laboratory organization, Culture Media (MS medium), Aseptic Techniques.

#### **Unit –II**

**15 hours**

Micropropagation – Direct and Indirect (Callus culture, Nodal culture, Meristem culture, Shoot tip culture), Somaclonal variation, Suspension culture.

#### **Unit –III**

**15 Hours**

Haploid culture – Anther culture, pollen culture and ovary culture - Triploid production.

#### **Unit –IV**

**15 Hours**

Isolation and culture of protoplast, Somatic Hybridization, Somatic Embryogenesis, Artificial seed production.

#### **Unit –V**

**15 Hours**

Production of secondary metabolites – alkaloids, steroids, and terpenoids (Brief account only).  
Cryopreservation and germplasm preservation.

**Practicals:**

1. Sterilization techniques (Fumigation, Flame sterilization, Dry heat, Wet heat and Filter sterilization)
2. MS Medium preparation
3. Callus culture
4. Nodal culture

**References:**

- Narayanasamy, S. Plant Cell and Tissue Culture , Tata Mc- Graw- Hill Publishing & Co Ltd
- J. Renert and Y.P.S. Bajaj. Plant Cell, Tissue and Organ Culture, Edited by, Narosa Publishing House New Delhi First Reprint 1989.
- Razdan, M.K. An Introduction to Plant Tissue Culture
- Biotechnology- U Sathyanarayana Books and Allied (P) Ltd, 2005.
- Dubey. R .C S. Chand & Co. Text Book of Biotechnology, New Delhi, First Edition 1993.
- Kumaresan, V. Biotechnology .
- Balasubramanian et al. Concept of Biotechnology- University Press.
- Aneja. K.P. Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom production. New Age International (P) Ltd. New Delhi. 2001.
- P.K Gupta. Elements of Biotechnology, Rastogi Publication (Revised Second Edition 2009-2010), New Delhi.
- S.S.Purohit. A Laboratory Manual Plant Biotechnology. Agrobios (India), Jodhpur. 2006.
- C.C.Giri and Archana Giri. Plant Biotechnology Practical Manual. I.K. International Publishing House Pvt. Ltd. New Delhi. 2007.

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<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>S</b>
<b>CO2</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>L</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**



**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** V

**Course:** Value Added Crop Products

**Course Type:** SBC

**Course Code:**

**Contact Hours:** 2 Hours/Week

**Credits:** 2

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To have a broad knowledge about the value added crop products.
- To understand the preparations and processing of vegetables and fruits.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Enrich knowledge in understanding the preparation of jelly and jam from fruits
<b>K2</b>	CO 2	Students understand the preparation of different kinds of pickles and juices from vegetables
<b>K2</b>	CO 3	Understand the extraction and uses of various edible and non-edible oils
<b>K2</b>	CO 4	Develop knowledge in extraction and preparation of flowers.
<b>K3</b>	CO5	Understand the extraction and uses of various medicinal and aromatic plants

### **COURSE CONTENT**

#### **Unit – I:**

**6 Hours**

**Product from fruit crops:** Fruits and fruit products. Methods of storage of fruits – preservation of fruits – commercial preparation fruits juices, syrup, jam, jelly & squash. Natural and Chemical preservatives.

#### **Unit – II:**

**6 Hours**

**Products from vegetable crops:** Vegetable products – storage of vegetables – Onion & Tomato – Commercial preparation of Pickles, Tomato ketchup, Canned peas, Ginger and Garlic paste – Amla product – pickles and juice.

#### **Unit – III:**

**6 Hours**

**Product for oil yielding plants:** Extraction procedure and uses of – Edible oil – Coconut oil & Gingili oil & Rice bran oil. Non-edible oil – Lemon and Lemon grass oil & Eucalyptus oil.

**Unit – IV:****6 Hours**

**Products from Loose Flowers:** Perfumes - Extraction procedure of Jasmine perfume, Preparation of Gullkandhu and room freshner.

**Unit – V:****6 Hours**

**Products from Aromatic & Medicinal Plants:** Extraction procedure and uses of *Pelargonium*, *Pyrethrum*, *Chrysanthemum*, *Vitex*, *Thespisia* and *Aloe vera*.

**References:**

- Dr. N. Kumar, Introduction to Horticulture, Oxford & IBH Publishing Co., New Delhi.
- Desrosier N.W., and Desrosier J.N., The Technology of Food Preservation, CBS Publishers & Distributors, New Delhi, 1987, 4<sup>th</sup> Edition.
- Hill F. Albert, Economic Botany, Tata Mc Graw Hill Publishing Co., Ltd., New Delhi 1979.
- Cruess W.V. Commercial fruit and vegetable products (2011) Agrobios (India), Jodhpur
- Singh. N.P. (2007), Fruit and vegetable preservations –Oxford Book Company, Jaipur.
- Rajarathnam. S. and Ramteke R.S., advances in presentation and processing technology of fruits and vegetable.
- Ponnuswami V. et.al (2014), Medicinal Herbs and Herbal Cure, Jeya Publication House, Delhi.
- Board N.P.C.S, Handbook on fruits, vegetables & food processing with canning and preservation, Asia Pacific Business Press Inc, Delhi (2012.)
- Viridi. M.S., and Malviya. S (2007), Aromatic Plants and essential oils, Associated Publishing Company, New Delhi.
- Shankaraswamy (2015), Comprehensive Post Harvest Technology of Flowers, Medicinal & Aromatic Plants, Jeya Publishing House, New Delhi.

### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>S</b>
<b>CO2</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>L</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Semester:** VI

**Course Type:** Core Paper IX

**Contact Hours:** 6 Hours/Week

**CIA:** 25

**Subject:** Botany

**Course:** Plant Physiology

**Course Code:**

**Credits:** 5

**CE:** 75

### **COURSE OBJECTIVE**

- To enrich the students to have a broad knowledge about absorption, transpiration Photosynthesis and respiration.
- To create awareness and interest about nitrogen metabolism and physiology of flowering.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Impart knowledge about absorption of water, ascent of sap and transpiration.
<b>K2</b>	CO 2	Students understand the importance of mineral nutrition and photosynthesis
<b>K2</b>	CO 3	Understand the various aspects of respiration, photorespiration and mechanism of respiration.
<b>K2</b>	CO 4	Develop knowledge in nitrogen metabolism.
<b>K3</b>	CO5	Understand the physiology of flowering, seed dormancy and biological clock.

### **COURSE CONTENT**

#### **Unit: I**

**18 Hours**

**Water relations in plants** -Absorption of water: Imbibitions, Diffusion, Osmosis, plant cell as osmotic system, plasmolysis, significance and practical application. Mechanism of water absorption. **Ascent of sap:** Mechanism – Brief mention of vital theories – physical force theories – transpiration pull and cohesion theory only; **Waterloss:** Transpiration - definition, and types, cuticular, stomatal and Lenticular, Mechanism of Stomatal movement, Significance of transpiration – Other methods of loss of water -Guttation

#### **Unit: II**

**18 Hours**

**Photosynthesis:** Mechanism – recent views on light Reaction – Photosynthesis unit – Emerson Effect – Two photosystem – Electron Transport chain – Photophosphorylation – cyclic and

noncyclic –Dark reaction – carbon fixation C<sub>3</sub> and c<sub>4</sub> pathways . Kranz anatomy. Crassulacean acid metabolism –CAM pathway

### **Unit: III**

**18 Hours**

**Respiration** :Introduction, definition, significance and types of respiration– Respiratory quotient, Respiratory substrates – Relation between aerobic and anaerobic respiration, Mechanism of Respiration : Glycolysis – Kreb’s cycle . Terminal Oxidation – Electron Transport and Oxidative phosphorylation – Photorespiration.

### **Unit: IV**

**18 Hours**

**Mineral nutrition-** Hydroponics, Classification of mineral elements. Macro nutrients and micro nutrients. Role of essential elements.

**Nitrogen Metabolism-** Sources of Nitrogen – N<sub>2</sub> fixation – Symbiotic and Non symbiotic, Nitrate reduction- amino acid synthesis and protein synthesizing machinery in plants.

### **Unit: V**

**18 Hours**

**Plant growth regulators:** Physiological roles of auxin, gibberellins, cytokinin, ABA, Ethylene.

**Physiology of flowering:** Theories and concept of Photoperiodism and Vernalization – Role of Phytochromes – Seed Dormancy – causes and methods of breaking seed dormancy.

### **Practicals:**

1. Imbibition – Direct weight method (different seeds).
2. Imbibition – Direct weight method (single seeds).
3. Determination of Osmotic pressure by Plasmolytic method.
4. Osmosis – Determination of water potential by falling drop method.
5. Determination of rate of photosynthesis under variable CO<sub>2</sub> concentrations.
6. Determination of rate of photosynthesis under various light intensities.
7. Extraction and separation of chlorophyll pigments by paper chromatography.

### **Prescribed Texts:**

- Kochhar, P. L. and Krishnamurthy, H.N. Plant Physiology. Atmaram & Sons, New Delhi. 1989.
- Jain, V.K. Fundamentals of Plant Physiology. S. Chand & Co. New Delhi. 1995.
- Hopkins, W.G. Introduction to Plant Physiology. John Wiley & Sons Inc. New York, USA. 1995.

#### **Reference Books:**

- Salisbury, F.B and Ross, C.W. Plant Physiology (4<sup>th</sup> Edition) Wordsworth Publishing Co. California, USA. 1992.
- Devlin and Witham, F.H. Plant Physiology. 4<sup>th</sup> Edition, CBS Publishers and Distributors, New Delhi. 1999.
- Noggle, G.R. and Fritz, G.J. Introductory Plant Physiology. 2<sup>nd</sup> Prentice Hall of India, New Delhi. 2010.
- Verma, S.K. A Textbook of Plant Physiology and Biochemistry. Chand & Company Ltd, New Delhi. 1995.
- Mukherji, S. and A.K. Ghosh. Plant Physiology. Tata McGrawHill Publishing Company Ltd, New Delhi. 1996.
- Subhash Chandra Datta. Plant Physiology. Wiley Esteem Ltd, New Delhi. 1994.
- Sinha, R.K. Modern Plant Physiology, Narosa Publishing House, New Delhi. 2007.

### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>
<b>CO2</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>L</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** VI

**Course:** Classical Genetics and Molecular

Biology

**Course Type:** core paper X

**Course Code:**

**Contact Hours:** 7 Hours/Week

**Credits:** 5

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To enrich the students to have a broad knowledge about Mendel's experiments and Multiple alleles.
- To understand the theories of crossing over, mechanism of sex determination and molecular biology

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Impart knowledge about gene interaction and multiple alleles
<b>K2</b>	CO 2	Students understand the theories of crossing over and mutations
<b>K2</b>	CO 3	Understand the mechanism of sex determination in plants.
<b>K2</b>	CO 4	Develop knowledge in DNA and RNA structure, replication and types .
<b>K3</b>	CO5	Understand the gene regulation in prokaryotes and operon concepts.

### **COURSE CONTENT**

#### **Unit –I Genetics:**

**20 Hours**

Introduction to Genetics- Mendelian inheritance - Mendel's Experiments- Law of Segregation, Law of Independent assortment, Law of Dominance, back cross and test cross; Non Mendelian inheritance - Gene interaction: Allelic interaction -Incomplete dominance and Lethal gene action; Non allelic interaction - Complementary genes, Dominant epistasis, Recessive epistasis, Multiple alleles with reference to ABO blood groups.

#### **Unit: II**

**20 Hours**

Linkage and crossing over with example – theories explaining mechanism of cross over (Chiasma Theory, Breakage First Theory, Contact Theory, Strain Theory, Differential Contraction Theory) – significance of cross over ; Mutation (Spontaneous and induced



mutations), Physical and chemical mutagens; Brief outline of Chromosomal aberration; Application of Mutation & Polyploidy in crop improvement.

**Unit: III**

**20 Hours**

Mechanism of sex determination in lower plants- *Melandrium*, *Sphaerocarpos* and Bacteria; sex determination in higher plants, sex reversal; Extra Chromosomal inheritance in plants. Male sterility in Maize – Plastids inheritance in plants

**Unit: IV Molecular Biology**

**15 Hours**

DNA structure and types of replication, Mechanism of replication; RNA types, structure and function; Proof for DNA as genetic material

**Unit: V**

**15 Hours**

Gene regulation in prokaryotes, Operon concepts – lac operon, Modern concepts of gene- One gene –one enzyme hypothesis.

**Practicals:**

Simple problems on the following aspects: Monohybrid cross, Test cross, Incomplete dominance and Dominant epistasis.

**Prescribed Texts**

- Genetics, verma P.S. Chand and Co ., New Delhi
- Molecular Biology and Genetic Engineering –P.K. Gupta

**Reference Books**

- Simmons and Snustad. Principles of Genetics – Eighth edition - Gardner, John Wiley & Sons, Inc., Newyork. 1991
- R.S. Shukla and P.S.Chandel. Cytogenetics, Evolution and Plant Breeding-. S.Chand& Company (Pvt) Ltd, New Delhi. 1988.
- P.K. Gupta. A Textbook of Cytology, Genetics and Evolution-Third edition - Rastogi Publications, Meerut, India. 1979.
- Mahabal Ram. Fundamentals of Cytogenetics and Genetics- PHI Learning Private Limited, New Delhi. 2010.

- P.K.Gupta. Genetics: Classical to Modern-First Edition- Rastogi Publications, Meerut, India. 2007.
- S.B. Basu M. Hossain. Principles of Genetics- Books & Allied (P) Ltd, Kolkata. 2006.

### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>
<b>CO2</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>M</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** VI

**Course:** Herbal Medicine and Human Welfare

**Course Type:** Elective III

**Course Code:**

**Contact Hours:** 5 Hours/Week

**Credits:** 5

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To make the students to have a thorough knowledge about different systems of medicines
- To understand the systematic study of crude drugs.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Impart knowledge about different systems of medicines.
<b>K2</b>	CO 2	Students understand the systematic study of crude drugs.
<b>K2</b>	CO 3	Understand the drugs obtained from flowers, fruits, seeds and all parts of plants.
<b>K2</b>	CO 4	Develop knowledge in understanding cardio vascular drugs and anticancer drugs.
<b>K3</b>	CO5	Understand the medicinal properties of Ricinus and Citrus.

### **COURSE CONTENT**

#### **Unit: I**

**15 Hours**

Pharmacognocny definition – A general survey of different systems of medicine – Indian system of Medicine, AYUSH- Ayurvedha, Unani, Siddha and Homeopathy system – future of pharmacognocny

#### **Unit: II**

**15 Hours**

A systematic study of crude drugs with reference to their vernacular name, family and uses; Drugs obtained from **Roots** (Rauwolfia, Citrus); Drugs obtained from **Underground Stem** (Garlic, Ginger); Drugs obtained from **Bark** (Cinnamon, Cinchona); Drugs obtained from **Stems & Woods** (Ephedra, Catechu) ; Drugs obtained from **Leaves** (Adhatoda, Aloe )

#### **Unit: III**

**15 Hours**

A systematic study of crude drugs with reference to their vernacular name, family and uses; Drugs obtained from **Flowers** (Safron, Clove); Drugs obtained from **Fruits** (Emblica, Cumin);

Drugs obtained from **Seeds** (Cardamom, Fenugreek); Drugs from **Whole Plant** (Neem, Phyllanthus).

**Unit: IV**

**15 Hours**

A brief account of the following; Drugs acting on the central nervous system (CNS) - Drugs used in the disorders of the gastro intestinal track (GI) - Cardio vascular drugs - Anticancer drugs.

**Unit: V**

**15 Hours**

Cultivation, description, composition, medicinal properties and uses of the following;  
- Ricinus, Guava, Gloriosa and Citrus.

**Prescribed Texts:**

- A. Purohit, S.R. Gokhaletwelth and C.K.Kokate,. Pharmacognosy –edition – publishers Niraliprakasan, Pune.

**Reference Books:**

- George, E.T. and William, C. E. Pharmacognocny –Twelth Edition, Publishers – English Language book society – Baclliere Tindall.
- Varro, E. Tylar, Linn. R. Brady and James, E. Pharmacognocny –Robbers Nineth Edition publishers – Lar and Fabiger – Philidelphia
- R.S. Satoskar and S.D. Bhandarkar. Pharmacognocny and Pharmaco Therapeutics Vol- I & Vol – II Thirteenth Edition – Revised Publishers – Popular Prakashan, Bombay.
- S. S. Handa and V. K. Kapoor, Pharmacognocny. Second Edition, publishers Vattubh Prakashan, Delhi.

### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>
<b>CO2</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>M</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** VI

**Course:** Plant Breeding, Evolution, Seed Technology

and Biostatistics

**Course Type:** Elective Paper III

**Course Code:**

**Contact Hours:** 5 Hours/Week

**Credits:** 5

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To make the students to have a thorough knowledge about plant breeding and evolution
- To understand the seed technology and biostatistics.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Impart knowledge about Hybridization.
<b>K2</b>	CO 2	Students understand the evolution.
<b>K2</b>	CO 3	Understand the Seed Technology.
<b>K2</b>	CO 4	Develop knowledge in understanding the seed processing and certification.
<b>K3</b>	CO5	Understand the Biostatistics - mean, median and mode.

### **COURSE CONTENT**

#### **Unit-I Plant Breeding**

**15 Hours**

Selection (Mass, Pure line and clonal selection), Hybridization- Types, Selection of parents, Methods of Emasculation- Bagging and tagging. Heterosis in crop improvement. Breeding achievements in Rice.

#### **Unit-II Evolution**

**15 Hours**

Introduction to Evolution - Origin of Life, Evidences for organic evolution; Theories of organic evolution (Darwinism, Lamarckism, Mutation Theory and Hugo De Vries and Wisemann theory).

#### **Unit – III Seed Technology**

**15 Hours**

Amphimixis – Scope, Aim and importance of seed technology, structure of seed and seed coat; Seed germination and factors affecting germination, Vivipary, Seed dormancy and its types.

## **Unit – IV**

**15 Hours**

Seed dispersal – types; seed viability – Tetrazolium test; overview of seed collection, processing, storage and seed certification

## **Unit - V Biostatistics**

**15 Hours**

General concepts and Terminology, Data-types (Primary and Secondary Data), Data collection, Sampling methods, Frequency distribution, Tabulation-General rules for Tabulation, Parts of Tables and Types of Tables, Diagrammatic and Graphic representation of Data. Analysis of Data-Measures of Central tendency (Mean, Median and Mode), Measures of Dispersion (Range, Standard Deviation and Standard Error), Test of Significance: Chi-square test.

### **Practicals:**

#### **Plant breeding:**

- Chromosomal mapping
- Simple problems on the following aspects: Monohybrid cross, Test cross, Incomplete dominance and Dominant epistasis.
- Hybridization techniques using potted plants.

#### **Seed Technology**

- Dissection of dicot embryo (any one stage).
- Study of endosperm types (slide).
- Testing of seed viability –Tetrazolium salt test.

#### **Biostatistics:**

- Data analysis to determine Mean & Mode
- Finding out Standard Deviation by giving Data from plant sources
- Chi-square test

### **Reference Books:**

- Simmons and Snustad. Principles of Genetics – Eighth edition - Gardner, John Wiley & Sons, Inc., Newyork. 1991.
- R.S. Shukla and P.S.Chandel. Cytogenetics, Evolution and Plant Breeding- S.Chand & Company (Pvt) Ltd, New Delhi. 1988.
- P.K. Gupta. A Textbook of Cytology, Genetics and Evolution-Third edition - Rastogi Publications, Meerut, India. 1979.
- Mahabal Ram. Fundamentals of Cytogenetics and Genetics- PHI Learning Private Limited, New Delhi. 2010.
- P.K.Gupta. Genetics: Classical to Modern-First Edition- Rastogi Publications, Meerut, India. 2007.
- S.B. Basu M. Hossain. Principles of Genetics- Books & Allied (P) Ltd, Kolkata. 2006.
- P.S.S. Sundar Rao J.Richard. Introduction to Biostatistics and Research Methods- Fourth Edition- Prentice-Hall of India, New Delhi. 2004.
- A. Khan & Atiya Khanum. Fundamentals of Biostatistics- First Edition- Irfan Ukaaz Publications, Hyderabad, Andhra Pradesh, India. 1994.
- Dr. Veer Bala Rastogi. Kedar Nath Ram. Organic Evolution -12<sup>th</sup> Revised Edition- Meerut, New Delhi. 2007.
- S. Christopher and P. Prasanna Samuel. Biostatistics: Principles and Practice - B. Antonisamy, Tata McGraw Hill Education Private Limited, New Delhi. 2010.
- J. R. Sharma. Principles and Practice of Plant Breeding- Tata McGraw Hill Publishing Company Limited, New Delhi. 1994.
- Marcello, P. and Kimberlee, G. Principles of Biostatistics – Second Edition - Cengage Learning India Private Limited, New Delhi. 2008.
- Origin, Evolution and Adaptation- Sanjib Chattopadhyay. Books and Allied (P) Ltd, Calcutta. 2007.
- Essential Genetics - Second Edition- Peter J Russell. Blackwell Scientific Publications, London. 1987.
- R. A. Shukla and P. S. Chandel. Cytogenetics ,Evolution, Biostatistics and Plant Breeding - First Edition –S.Chand & Company Ltd, New Delhi. 2009.
- Agarwal. Principles of Seed Technology. II<sup>nd</sup> Edition Oxford and IBH Publications Pvt. Ltd. New Delhi India. 1995.



### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>S</b>
<b>CO2</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>S</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** VI

**Course:** Core Practical Paper III

**Course Type:** Core Practical Paper

**Course Code:**

**Contact Hours:** 3 Hours/Week

**Credits:** 4

**CIA:** 40

**CE:** 60

### **COURSE OBJECTIVE**

- To develop the skills to observe and identify the specimens.
- To understand the practical techniques.

### **COURSE OUTCOME**

<b>K4</b>	CO 1	Impart knowledge in doing streaking and staining techniques.
<b>K4</b>	CO 2	Students gain knowledge about the spotters and identify the specimens.
<b>K4</b>	CO 3	Understand the morphology and taking sections.
<b>K4</b>	CO 4	Develop skills to identify the different species.
<b>K5</b>	CO5	Develop drawing sketches of the structures of the specimens.

### **COURSE CONTENT**

#### **Taxonomy of Angiosperms**

Study of following families with special reference to morphology of the modified plant parts and plants of economic importance

Annonaceae, Rutaceae, Caesalpinaceae, Cucurbitaceae, Apiaceae

Rubiaceae, Asclepiadaceae, Lamiaceae, Amaranthaceae, Euphorbiaceae,

Orchidaceae, Arecaceae, Poaceae

**Submission herbarium:** Submission of 15 herbarium sheets along with tour/trip report and field note book.

#### **Economic Botany:**

Study of the morphology and structure of useful parts of the plants.

#### **Microbiology:**

1. Calibration of Microscope.
2. Sterilization techniques & Types.
3. Preparation of Basal medium – solid agar and broth
4. Preparation of agar plates, agar slants and agar deep tubes.
5. Isolation and culturing techniques of microbes – streak plate and pour plate methods.
6. Simple staining of bacteria.
7. Gram's staining of bacteria.

### **Biotechnology**

Photographs from Biotechnology as spotters.

### **Submission of Record Notebook**

### Practical Paper III Question Pattern

#### III – B.Sc., Botany

#### Taxonomy of Angiosperms and Economic Botany, General Microbiology and Plant Biotechnology

**Time: 3 Hours**

**Max. Marks: 60 Marks**

1. Refer specimen **A & B** their respective families giving reason. Sketches not required.  
(2×4=8)
2. Describe specimens **C** in technical terms. Draw labeled sketches of the floral diagram and write the floral formula.  
(1×6=6)
3. Spot at sight (Genus and Family) **D, E, F** and **G**.  
(4×1=4)
4. Write down the Botanical Name, Family Morphology of the Useful Part and Uses of Commercially Important Part of **H, I** and **J**.  
(3×2=6)
5. Prepare the bacterial smear using gram staining from the given the cell suspension **K**.  
(2×4=8)
6. Demonstration the inoculation of microbes Streak Method/ Hanging Drop Method from the given Cell Suspension **L**.  
(1×2=2)
7. Write notes on Morphology Interest **M, N** and **O**.  
(3×2=6)
8. Comment on **P** and **Q** Picture/ Photograph of Biotechnological Interest.  
(2×3=6)
9. Submission of Herbarium.      20 Sheets  
(10 Marks)
10. Observation Note Book.  
(10 Marks)

### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>L</b>
<b>CO2</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>M</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

## KEY AND SCHEME FOR VALUATION

1. A & B Refers to the Study of Families and included in the theory of with their economic importance.

2. C Refers to the families in the theory, technical terms explained.

3. D, E, F & G Genus and Family alone should be written for the given specimen.

4. H, I & J – Economically important parts given.

Botanical name – ½ Mark      Family – ½ Mark      Useful part & uses - 1 Mark

5. K Bacterial smears by gram staining.

6. L Streaking method.

7. M, N & O Morphology of specimen.

Identification - ½ Mark    Diagram - ½ Mark    Reason - ½ Mark

8. P & Q Photograph or picture of biotechnology.

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** VI

**Course:** Core Practical Paper IV

**Course Type:** Core Practical Paper

**Course Code:**

**Contact Hours:** 3 Hours/Week

**Credits:** 4

**CIA:** 40

**CE:** 60

### **COURSE OBJECTIVE**

- To develop the skills to do the physiology experiments.
- To understand the practical techniques.

### **COURSE OUTCOME**

<b>K4</b>	CO 1	Impart knowledge in doing physiology experiments.
<b>K4</b>	CO 2	Students gain knowledge about the spotters and identify the specimens.
<b>K4</b>	CO 3	Understand the morphology and taking sections.
<b>K4</b>	CO 4	Develop skills to identify the different species.
<b>K5</b>	CO5	Develop drawing sketches of the structures of the specimens.

### **COURSE CONTENT**

#### **PRACTICAL PAPER – IV**

#### **Plant Physiology, Genetics and Molecular Biology**

To set up the following experiments and explain the working with suitable diagrams, observations and interpretations.

#### **Practicals:**

1. Imbibition – Direct weight method (different seeds).
2. Imbibition – Direct weight method (single seeds).
3. Determination of Osmotic pressure by Plasmolytic method.
4. Osmosis – Determination of water potential by falling drop method.
5. Determination of rate of photosynthesis under variable CO<sub>2</sub> concentrations.
6. Determination of rate of photosynthesis under various light intensities.
7. Extraction and separation of chlorophyll pigments by paper chromatography.

### **Experimental Set up – Demonstration Only**

1. To demonstrate the rate of Imbibition using dilatometer.
2. To demonstrate osmosis through Potato Osmoscope.
3. To demonstrate suction force by Tissue tension.
4. To demonstrate fermentation using Kuhne's tube experiment.
5. Measurement of transpiration using Farmer's potometer.
6. To measure the rate of transpiration using Ganong's photometer experiment.
7. To demonstrate the sunlight necessary for photosynthesis using Ganong's light screen experiment.
8. To determine the RQ using Ganong's respirometer.

### **Genetics and molecular Biology**

- \* To work out simple genetic problems in Mono hybrid and Di hybrid ratios
- \* To write explanatory notes on the Photographs / models / specimens.

### **Submission of Record notebook**



### Question Pattern -III – B.Sc., Botany

#### Plant Physiology, Genetics and Molecular Biology

**Time: 3 Hours**

**Max: 60 Marks**

**Sub Code: MUBP4**

1. Taking a lot, ask for requirement, write the procedure, set up experiment and perform analysis or measurements as indicated (15 Marks)
2. Solve the genetic problems **A** and **B** (10 Marks)
3. Identify and write critical notes on **C, D, E, F** and **G** (5X5 =25 Marks)
4. Record Note Book (10 Marks)

#### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>
<b>CO2</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>S</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

## Key and Scheme of Valuation

### 1. Physiology Experiment (15 Marks)

- Experiment - 5 Marks
- Procedure - 5 Marks
- Data interpretations - 5 Marks

### 2. Genetics Problem (10 Marks)

- Dihybride Ratio - 6 Marks
- Monohybride Ratio - 4 Marks

### 3. Identity and Write Critical Notes on C, D, E, F and G. (5×5=25 Marks)

C – Physiology experiment set up

D – A Chemical of Physiological Important

E – A Graph of Physiology Importance

F – Any Specimen/ Photograph/ Model of Genetics Interest

G – Any Photograph/ Specimen/ Chemical/ Model of Molecular Biological Interest

**Identification - 1 Mark Diagram - 1 Mark Notes - 3 Marks**

### 4. Observation Note Book (10 Marks)

**Programme:** B.Sc.,

**Semester:** VI

**Course Type:** NME II

**Contact Hours:** 2 Hours/Week

**CIA:** 25

**Subject:** Botany

**Course:** Mushroom Cultivation

**Course Code:**

**Credits:** 2

**CE:** 75

### **COURSE OBJECTIVE**

- To understand the nutritional and medicinal value of mushrooms..
- To study the morphology, structure, characteristics and cultivation methods of mushroom.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Gain knowledge about the nutritional and medicinal value of mushrooms.
<b>K2</b>	CO 2	Students understand the structure and characteristics of edible mushrooms.
<b>K2</b>	CO 3	Understand the cultivation methods, spawn production techniques and harvesting of mushrooms.
<b>K2</b>	CO 4	Develop knowledge in studying the problems in mushroom cultivation.
<b>K3</b>	CO5	Understand the preparation of mushroom recipes.

### **COURSE CONTENT**

#### **Unit: I**

**6 Hours**

Introduction: importance, classification and test for identification of mushrooms.  
Nutritional and medicinal value of mushrooms.

#### **Unit: II**

**6 Hours**

Morphology and characteristics of common edible mushrooms.

- a. Button mushroom (*Agaricus bisporus*)
- b. Paddy straw mushroom (*Volvariella volvacea*)
- c. Indian Oyster mushroom ( *Pleurotus sajor- caju*)

Morphology and characteristics of poisonous mushrooms

- a. Amanita phalloids
- b. Amanita verna

**Unit: III****6 Hours**

Cultivation methods – compost preparation – spawn production techniques – spawn running, cropping harvesting.

**Unit: IV****6 Hours**

Post-harvest technology: Preservation and storage of mushrooms and marketing. Insect pests and diseases of mushroom and their control.

**Unit: V****6 Hours**

Delicious recipes of mushrooms (mushroom soup, pickle, biryani, pakoda, omelette, samosa, palak).

**Prescribed Texts:**

- Nita Bahl. Handbook of Mushrooms. Oxford and IBH publishing co .Ltd. New Delhi. 1996.
- Kapoor, J.N. Mushroom cultivation, ICAR, New Delhi. 1989.

**Reference Books:**

- Aneja, K.R. Experiments in microbiology, Plant pathology, Tissue culture and
- Mushroom cultivation. WishwaPrakshan, Ne. 1993.
- Pathak V.N. Yadav N. Goor .M. Mushroom Production and processing technology, Agrobios India Ltd. 2000.

### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>S</b>
<b>CO2</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>L</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>

➤ **S – Strong      H – High      M- Medium      L - Low**

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** VI

**Course:** Environmental Studies

**Course Type:** EVS

**Course Code:**

**Contact Hours:** 2 Hours/Week

**Credits:** 2

**CIA:** 25

**CE:** 75

### **COURSE OBJECTIVE**

- To make the students to have a thorough knowledge about natural resources, ecosystem biodiversity and its conservation
- To understand the environmental pollution.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Impart knowledge about environment.
<b>K2</b>	CO 2	Students understand the natural resources.
<b>K2</b>	CO 3	Understand the ecosystem, ecological succession and ecological pyramids.
<b>K2</b>	CO 4	Develop knowledge in understanding biodiversity and its conservation.
<b>K3</b>	CO5	Understand the environment, its pollution and the human population and environment..

### **COURSE CONTENT**

#### **Unit I: Introduction to Environmental studies**

Introduction – Importance of environmental studies – scope of environmental studies – environmental studies as a multidisciplinary subject – need for public awareness.

#### **Unit II: Natural Resources**

Definition – types of natural resources – non renewable resources – renewable resources

##### **Forest Resources:**

Benefits of forests – Timber extraction – mining – environmental impacts of extracting and using mineral resources – conservation of forest- forest management – deforestation – over exploitation of forests.

##### **Water Resources:**

Over – utilization of surface and ground water – uses of water.

### **Mineral Resources:**

Uses of mineral resources – impact of over exploitation of mineral resources – management of mineral resources – marine resources.

### **Food Resources:**

Balance diet – malnutrition – impacts of modern agriculture on environment – effects of fertilizer – effects of pesticides – salinity.

### **Energy Resources:**

Renewable energy resources – non – renewable energy resources – use of energy in human life – solar energy – wind energy – nuclear energy – conservation of energy – role of individuals in the conservation of natural resources, energy resources, water resources, land resources, forest resources.

## **Unit III: Ecosystems and Biodiversity and its Conservation**

Concept of an ecosystem – structure and functions of ecosystem – structure and functions of ecosystem – role of producers in the ecosystem – ecological succession – food chains – food webs and ecological pyramids.

### **Biodiversity and its Conservation:**

Introduction – definition – significance of biodiversity – hotspots of biodiversity – threats of biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts – endangered and endemic species of India – Conservation of biodiversity: In situ and Ex- situ conservation of biodiversity.

## **Unit IV: Environmental Pollution and Social issues:**

Definition – causes, effects and control measures of air pollution, water pollution and soil pollution – solid waste management: causes, effects and control measures of urban and industrial wastes.

### **Social issues:**

From unsustainable to sustainable development – water conservation – rain water harvesting – watershed management – climate change – greenhouse effect – global warming – acid rain – ozone layer depletion.

#### **Unit V: Human Population and environment:**

Population explosion – family welfare programme – environment and human health – women and child welfare – role of Information technology in environment and human health.

#### **Prescribed Texts:**

- N. Arumugam and V. Kumaresan, Environmental Studies, Saras Publications, Kanyakumari (Tamil and English version) 2005.

#### **Reference Books:**

- D. K. Asthana, MeeraAsthana. A Text Book of Environmental Studies (For Undergraduate studies), S. Chand and Company Ltd. New Delhi. 2006.
- V. Dhulasi Birundha. Environmental Studies, Allied Publications, Chennai. 2006.
- K. S. Kanagasabai. Environmental studies, RaSee Publications, Madurai. 2005.
- R. Kannan, P. Badri Sriman Narayan, Environmental Studies, NGM, Publications, Pollachi.
- A. Thagamani, Shyamal, T. A Text book of Environmental studies, Pranav Syndicate, Sivakasi. 2003.



### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>S</b>
<b>CO2</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>S</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – Strong**

**H – High**

**M- Medium**

**L - Low**

**Programme:** B.Sc.,

**Subject:** Botany

**Semester:** V

**Course:** Biodiversity Conservation and Management

**Course Type:** Extra Credit Paper

**Course Code:**

**Contact Hours:** Self study

**Credits:** 2

**CIA:** ---

**CE:** 100

### **COURSE OBJECTIVE**

- To make the students to have a thorough knowledge about natural resources, ecosystem biodiversity and its conservation
- To understand the plant management

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Impart knowledge about environment.
<b>K2</b>	CO 2	Students understand the natural resources.
<b>K2</b>	CO 3	Understand the threats and natural calamities.
<b>K2</b>	CO 4	Develop knowledge in understanding biodiversity and its conservation.
<b>K3</b>	CO5	Understand the environment, In situ and Ex situ Conservation.

### **COURSE CONTENT**

#### **Unit – I**

Concept and value of plant – Diversity classification types of Biodiversity consumptive, productive, social ethical and aesthetic values – Importance of Plant Diversity.

#### **Unit – II**

Centers of plant diversity in India, Ethno Botanical Survey, ICN – Types of Categories Endangered, Vulnerable, Threatened, Rare, Extinct – Major plant species in Red Data Book and Green Book.

#### **Unit – III**

Major Threats Climatic (Light, Temperature, Rain), Edaphic (Soil Types P<sup>H</sup> Soil Nutrients), Natural Calamities (Cyclone, Tsunami, Earth quake).

## Unit - IV

Conservation of plant diversity – principles types – Insitu and Exsitu Conservation – Conservation management – methods.

## Unit - V

Insitu: Nationals Parks, Nurseries and Botanical Gardens.

Exsitu: Plant Tissue Culture, Germ Plasm Storage, Cryopreservation – (Gene Banks), Needs / Methods of plant management – Forest Production Act/ Biodiversity Act any two important.

### Reference books:

- Kumar, U. and Mahendra Jeet Asiya. Biodiversity, Principles and Conservation. Agrobios (India), Jodhpur India. 2005.
- Kartikeya, K. Biodiversity – Extinction and Conservation. Avavishkar Publishers, Distributors, Jaipur, India. 2005.
- Agarwal, K.C. Biodiversity. Agrobios (India), Jodhpur, India. 2000.

### Bloom's Mapping

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>S</b>
<b>CO2</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>
<b>CO4</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>S</b>
<b>CO5</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>S</b>	<b>S</b>

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

<b>Programme Code:</b>	<b>B.Sc</b>	<b>Programme Title</b>	<b>Botany</b>
<b>Course Code</b>		<b>Title: Value added course I - Organic Farming</b>	<b>Batch: 2022 - 2025</b>
<b>Hours/week</b>	<b>6</b>		<b>Semester: II</b>
			<b>Credits:</b>

### **COURSE OBJECTIVE**

- To make the students understand the organic farming
- To make the students study the concept and simple techniques in organic farming

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Understands the merits of organic farming over conventional farming
<b>K2</b>	CO 2	Students learn the preparation of various organic manures and panchakavya
<b>K2</b>	CO 3	Imparts knowledge to analyse the water and weed management practices
<b>K2</b>	CO 4	Understands to prepare herbal pest repellents
<b>K5</b>	CO 5	Students gain knowledge by visiting organic farms

#### **Unit: I**

**6 hours**

Organic farming – Introduction – concept – conventional vs organic farming

#### **Unit : II**

**6hours**

Organic manuring – farmyard manure – green manure – panchakavya – fish tonic – horn manure – composting - vermicomposting

#### **Unit : III**

**6 hours**

Water and weed management practices – mulching – dry mulching, green mulching, live mulching–stone mulching

**Unit : IV****6 hours**

Integrated plant protection management – biofence – companion plants – herbal pest repellents – neem formulations – bacterial and fungal pesticides

**Unit : V****6 hours**

Practical - Field visit to a organic farm.

**Text Books**

1. Pawar R.K., 2009. Organic farming for Sustainable Horticulture. Oxford Book Company, India.
2. Arun K. Sharma, 2004. Biofertilizers for Sustainable Agriculture. Agrobios India Ltd, Jodhpur.

**Reference Books**

1. Arun K. Sharma, 2004. A handbook of Organic farming. Agrobios India Ltd, Jodhpur.

**Bloom's Mapping**

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>M</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>
<b>CO2</b>	<b>H</b>	<b>M</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>
<b>CO3</b>	<b>M</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO4</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO5</b>	<b>S</b>	<b>H</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>H</b>	<b>H</b>

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

<b>Programme Code:</b>	<b>B.Sc</b>	<b>Programme Title</b>	<b>Botany</b>
<b>Course Code</b>		<b>Title: Value added course II - Landscape Gardening</b>	<b>Batch: 2022 - 2025</b>
<b>Hours/week</b>	<b>6</b>		<b>Semester: IV</b>
			<b>Credits:</b>

### **COURSE OBJECTIVE**

- To make the students understand the basic principles of landscape gardening
- To get familiarized with common ornamental and flowering plants

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Understands the merits of garden designing
<b>K2</b>	CO 2	Students learn the various components of garden
<b>K2</b>	CO 3	Imparts knowledge about the soil, organic and inorganic fertilizers
<b>K2</b>	CO 4	Understands the propagation and plant protection
<b>K5</b>	CO 5	Students gain knowledge by visiting different landscapes

#### **Unit: I**

**6 hours**

Introduction – formal gardening – informal gardening – planning – designing – principles in laying out a garden – parts of modern garden

#### **Unit: II**

**6hours**

Establishment of garden – lawn making – green houses (simple, commercial and conservatories) – indoor gardening – kitchen garden – indoor garden – rockery and water gardens - bonsai

#### **Unit: III**

**6 hours**

Soil and climatic factors – irrigation (normal and special types) – fertilizers (organic and inorganic) fertilizer application

**Unit: IV**

**6 hours**

Plant propagation methods – cutting, layering, grafting, budding - micropropagation –plant protection – causative agents and control measures – integrated pest management

**Unit: V**

**6 hours**

Practical - Field visit to a landscape garden

**Text Books**

1. Kumaresan V. Horticulture and Plant Breeding (first edition), Saras publications, Nagercoil, 2009.
2. Kumar N. Introduction to Horticulture. Rajalakshmi Publications, Nagercoil, India, 1977.

**Reference Books**

1. Edmond JB, Sen TL, Andrews FS Halfacre RG. Fundamentals of Horticulture (fourth edition). Tata McGraw Hill Publishing Co., New Delhi, 1979.
2. Jitendra Sing, Basic Horticulture. Kalyani Publishers, Hyderabad, 2002.

**Bloom's Mapping**

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>M</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>
<b>CO2</b>	<b>H</b>	<b>M</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>
<b>CO3</b>	<b>M</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO4</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO5</b>	<b>S</b>	<b>H</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>H</b>	<b>H</b>
<b>S – Strong                      H – High                      M- Medium                      L - Low</b>							

<b>Programme Code:</b>	<b>B.Sc</b>	<b>Programme Title</b>	<b>Botany</b>
<b>Course Code</b>		<b>Title: Value added course III – Terrace Gardening</b>	<b>Batch: 2022 - 2025</b>
<b>Hours/week</b>	<b>6</b>		<b>Semester: VI</b>
			<b>Credits:</b>

### **COURSE OBJECTIVE**

- To help the students to gain knowledge on planning and maintenance of roof garden
- To widen their knowledge to create garden of their own interest.

### **COURSE OUTCOME**

<b>K1</b>	CO 1	Understands the importance of terrace garden
<b>K2</b>	CO 2	Students learn the preparation of potting mixture
<b>K2</b>	CO 3	Imparts knowledge to grow bonsai plants
<b>K2</b>	CO 4	Understands to maintain the shade houses
<b>K5</b>	CO 5	Students gain knowledge by visiting many roof gardens

#### **Unit: I**

**6 hours**

Introduction and importance of terrace gardening – selection of site, size and shape, layout, soil, climate, cropping season, raising of nursery, transplanting, irrigation, manuring, stacking, training, pruning, weeding and harvesting

#### **Unit: II**

**6hours**

Potting mixture – materials for roof garden – culture aspects of vegetables and fruits (mention any three examples in each group)

#### **Unit: III**

**6 hours**



Bonsai - Introduction, principle and importance. Tools and accessories. Ideal environment – containers and potting compost, methodology – repotting, fixing in shallow pots, dwarfing, watering, weeding and feeding. Different styles. Training of Bonsai – disbudding , pruning, wiring and other methods.

**Unit: IV**

**6 hours**

Shade houses – different types – containers – light weight fills – drainage – filter layer – maintenance considerations.

**Unit: V**

**6 hours**

Practical - Field visit to a terrace garden.

**Text Books**

1. Kumar, N. 1986 Introduction to Horticulture, Rajalakshmi Publications, Nagercoil, Kanyakumari.
2. Dey, S. C. 2006. Bonsai – An Art of miniature plant culture. Agrobios.

**Reference Books**

1. Amarnath, V. 2007. Nursery and Landscaping. Agrobios, Jodhpur, India.
2. Sheela, V.L. 2011. Horticulture, MJP Publishers, Triplicane, Chennai

**Bloom's Mapping**

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>
<b>CO1</b>	<b>M</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>
<b>CO2</b>	<b>H</b>	<b>M</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>M</b>
<b>CO3</b>	<b>M</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO4</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO5</b>	<b>S</b>	<b>H</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>H</b>	<b>H</b>
<b>S – Strong                  H – High                  M- Medium                  L - Low</b>							

**External Question pattern for Value Added Courses**

<b>Section</b>	<b>Pattern</b>	<b>Marks</b>	<b>Total</b>
<b>A</b>	<b>1-8 (any five out of eight)</b>	<b>5x20</b>	<b>100</b>