B.Sc. Botany
Programme Code : UBO

Programme outcome (PO) Bachelor of Science (B.Sc.)

PO1 **Scientific Knowledge and Critical Thinking:**

Apply the knowledge of Life Science, Physical and Chemical Science, Mathematics, statistics, Computer science and humanities for the arrangement of solutions to the problems that come across in our day-to-day life/activities

PO2 **Problem Solving:**

Identify and analyse the problem and formulate solutions for problems using the principles of mathematics, natural sciences with appropriate consideration for the public health, safety and environmental considerations.

PO3 **Communication and Computer Literacy:**

Communicate the fundamental and advanced concepts of their discipline in written and oral form. Able to make appropriate and effective use of information and information technology relevant to their technique.

PO4 **Life-Ling Learning:**

Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PO5 **Ethical, Social and Professional Understanding:**

Commitment to principles, codes of conduct and social responsibility in order to behave consistently with personal respect. Acquire the responsibility to contribute for the personal development and for the development of the community. Respect the ethical values, social responsibilities and diversity.

PO6 **Innovative, Leadership and Entrepreneur Skill Development:**

Function as an individual and as a member or leader in diverse teams and in multidisciplinary settings. Become an entrepreneur by acquiring technical, communicative, problem solving and intellectual skills.

B.Sc., Botany

Vision

Provision of knowledge to contribute towards the sustainable utilization of Plant Biosphere

Mission

- To foster an environment of excellence by providing a comprehensive set of courses inplant sciences that enhances the understanding, depth of knowledge and technical competency of the students.
- To provide the students competence for entry-level research and teaching positions in biological sciences.
- To inculcate the students with an environment that fosters the development of appropriate scientific vocabulary, reasoning skills, and effective oral and written communication abilities for students.
- To create a holistic understanding of the allied subjects through interdisciplinary learning.

Programme Educational Objectives (PEO)

The objectives of B.Sc., Programme is to prepare and further to equip the Graduates ofBotany

PEO1	To develop a strong and competent knowledge in basic Plant Sciences, required for critical learning and to create attitude on research.
PEO2	To develop diversified basic professional skills through various laboratory technical training, communication and presentation skills
PEO3	To make them to possess an ability to identify, formulate, and solve problems, relatedto the subject of Botany and to facilitate them towards community service, by utilizing the professional and private realm
PEO4	To integrate related topics from the course components such as Plant Organization, Techniques related to Taxonomy, Ecology, Anatomy, Cell Biology, Biochemistry, Physiology, Genetics, Embryology, Evolution, Basic Biotechnology and Molecular Biology for their successful career.
PEO5	To create them to be proficient in applying their knowledge to analyze the scope of plant science and address scientifically controversial issues in a rational way

Mapping PEOs against POs

PEO/PO	PO1	PO2	PO3	PO4	PO5	PO6
PEO1	S					
PEO2	S	S	S	S	S	S
PEO3	S	S		S		
PEO4	S	S	S	S		S

PEO5	S			S	S	S

Programme Specific Outcomes - B.Sc.,Botany

Upon successful completion of B.Sc. Botany Programme, the students will be able to

PSO1	Identify various plant life forms, using specific identification key characteristic features
PSO2	Demonstrate the acquired knowledge and to comprehend the core concepts of Botany at organizational (both external morphology, internal morphology), cellular, and molecular levels through which the developmental and physiological functioning of plants
PSO3	Show their skills in practical work, experiments, use of biological tool and techniques, further to orient their attitude towards research
PSO4	Explore various life forms and their intricacies of at the cellular and molecular level
PSO5	Expertise in statistical analyses of data for better interpretations and problem solving

Mapping PSOs against POs

PSO/PO	PO1	PO2	PO3	PO4	PO5	PO6
PSO1	S	S		S		S
PSO2	S	S		S		S
PSO3	S	S	S			S
PSO4	S	S		S	S	
PSO5	S	S	S		S	S

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DEPARTMENT OF BOTANY

Bachelor of Science (B.Sc.,) Botany
(w.e.f. 2020-2021 batch onwards)
Programme Code-UBO

Programme Scheme

SEMESTER – I

Course	Code No	Subject	Hrs/ Week	Cred.	Total Hrs	Max Mark CA	Max Marks SE	Total
Part I	U20TA11	Tamil	6	3	90	25	75	100
Part II	U20EN11	English	6	3	90	25	75	100
Core 1	UBO20C11	Algae and Bryophytes	3	3	45	25	75	100
Core 2	UBO20C12	Mycology and Plant Pathology	3	3	45	25	75	100
Core Lab 1	UBO20CL11	Algae, Bryophytes Mycology and Plant Pathology Lab	4	2	60	40	60	100
Generic Elective 1	UZO20GE11	Zoology paper I	4	4	60	25	75	100
Generic Elective 1 Lab	UZO20GEL11	Zoology Paper I Lab	2	-	30			
AECC1	UBO20AE11	EVS	2	2	30	15	35	50
TOTAL			**30**	**20**	450	180	470	650

Semester – II

Course	Code No	Subject	Hrs/ Week	Cred	Total Hrs	Max Mark CA	Max Mark sSE	Total
Part I	U20TA21	Tamil	6	3	90	25	75	100
Part II	U20EN21	English	6	3	90	25	75	100
Core 3	UBO20C21	Pteridophytes, Gymnosperms and Paleobotany	3	3	45	25	75	100
Core 4	UBO20C22	Cell Biology	3	3	45	25	75	100
Core Lab 2	UBO20CL21	Pteridophytes, Gymnosperms and Paleobotany and Cell biology Lab	4	2	60	40	60	100
Generic Elective 1	UZO20GE21	Zoology paper II	4	4	60	25	75	100
Generic Elective 1 Lab	UZO20GEL21	Zoology Paper II Lab	2	-	30			
Practical Examination for Generic Elective 1				2		40	60	100
AECC		VE	2	1	30	15	35	50
TOTAL			**30**	**21**	450	**220**	**530**	750

Semester – III

Course	Code No	Subject	Hrs/ Week	Cred.	Total Hrs	Max Mark CA	Max Marks SE	Total
Part I Tamil	U20TA31	Tamil	6	3	90	25	75	100
Part II English	U20EN31	English	6	3	90	25	75	100
Core 5	UBO20C31	Plant Anatomy and Embryology	4	4	60	25	75	100
Core 6	UBO20C32	Bioinstrumentation and Computer Applications	4	4	60	25	75	100
Core Lab 3	UBO20CL31	Plant Anatomy and Embryology Lab	2	1	30	40	60	100
Generic Elective 2	UCH20GE31	Chemistry Paper I	4	4	60	25	75	100
Generic Elective 2 Lab	UCH20GEL31	Chemistry paper I Lab	2	--	30			
NME1	UBO20NE31	Horticulture	2	2	30	15	35	50
TOTAL			**30**	**21**	450	**180**	**470**	650

Semester – IV

Course	Code No	Subject	Hrs/ Week	Cred	Total Hrs	Max mark CA	Max Mark SE	Total
Part I Tamil	U20TA41	Tamil	6	3	90	25	75	100
Part II English	U20EN41	English	6	3	90	25	75	100
Core 7	UBO20C41	Microbiology	4	4	60	25	75	100
Core 8	UBO20C42	Herbs and drugs	4	4	60	25	75	100
Core Lab 4	UBO20CL41	Microbiology Lab	2	1	30	40	60	100
Generic Elective 2	UCH20GE41	Chemistry Paper II	4	4	60	25	75	100
Generic Elective 2 Lab	UCH20GEL41	Chemistry paper II Lab	2	--	30			
Practical Examination for Generic Elective 2				2		40	60	100
NME2	UBO20NE41	Mushroom Cultivation	2	2	30	15	35	50
Total			**30**	**23**	**450**	**220**	**530**	**750**

Semester – V

Course	Code No	Subject	Hrs/ Week	Cred.	Total Hrs	Max Mark CA	Max Marks SE	Total
Core 9	UBO20C51	Morphology and Taxonomy of Angiosperms	4	4	60	25	75	100
Core 10	UBO20C52	Plant Biochemistry	4	4	60	25	75	100
Core 11	UBO20C53	Genetics, Evolution and Biostatistics	3	3	45	25	75	100
Core 12	UBO20C54	Biofertilizers and Organic farming	3	3	45	25	75	100
Core Lab 5	UBO20CL51	Morphology and Taxonomy of Angiosperms Lab	3	2	45	40	60	100
Core Lab 6	UBO20CL52	Plant Biochemistry Lab	3	2	45	40	60	100
Core Lab 7	UBO20CL53	Genetics, Evolution and Biostatistics Lab	3	2	45	40	60	100
M elective1	UBO20CE51(A)/ UBO20CE52(B)	Horticulture and Plant Breeding / Nutraceuticals	5	5	75	25	75	100
SBE1	UBO20SE51(A) / UBO20SE51(B)/ UBO20SE51(C)	Histology and staining techniques/ Mushroom Technology/ Bioremediation	2	2	30	15	35	50
Total			**30**	27	450	310	590	900
Internship	UBO20IN	Internship training*		2		50*		50

*Internship report based on the training undergone during Vacation after 4th Semester

Semester – VI

Course	Code No	Subject	Hrs/ Week	Cred.	Total Hrs	Max Mark CA	Max Marks SE	Total
Core 13	UBO20C61	Plant Physiology	4	4	60	25	75	100
Core 14	UBO20C62	Plant Biotechnology	4	4	60	25	75	100
Core 15	UBO20C63	Plant Ecology and Biodiversity	3	3	45	25	75	100
Core 16	UBO20C64	IPR and Biosafety	3	3	45	25	75	100
Core Lab 8	UBO20CL61	Plant Physiology Lab	3	2	45	40	60	100
Core Lab 9	UBO20CL62	Plant Biotechnology Lab	3	2	45	40	60	100
Core lab 10	UBO20CL63	Plant Ecology and Biodiversity Lab	3	2	45	40	60	100
M Elective2 (theory)	UBO20CE61(A)/ UBO20CE61(B)	Basics of Molecular Biology/ Plant resources and Utilisation	5	5	75	25	75	100
SBE2	UBO20SE61(A)/ UBO20SE61(B)/ UBO20SE61(C)	Seed and nursery Technology/ Sea weedTechnology/ Biopesticides	2	2	30	15	35	50
TOTAL			**30**	27	450	260	590	850
TOTAL CREDITS FOR SEMESTERS I to VI				**139**	**(20+21+21+23+27+27)**			
PART V				**01**				
Total Credits for B.Sc. programme				**140**				

Generic Elective offered to B.Sc. Zoology students

Course	Code No	Subject	Hrs/ Week	Cred.	Total Hrs	Max Mark CA	Max Marks SE	Total
SEMESTER III								
GE2	UBO20GE31	Plant Life forms	4	4	60	25	75	100
	UBO20GEL32	Plant Life forms Lab	2	-	30	-	-	-
SEMESTER IV								
GE2	UBO20GE41	Plant Pathology	4	4	60	25	75	100
	UBO20GEL41	Plant Pathology Lab	2	2	30	40	60	100

A) Consolidation of contact hours and credits: UG

Semester	Contact Hours/Week	Credits
I	30 hrs	20
II	30 hrs	21
III	30 hrs	21
IV	30 hrs	23
V	30 hrs	27
VI	30 hrs	27
PART - V	--	01
Total		140

B) Curriculum Credits: Part wise

		No of Courses	Credits per Course	Total Credits
PART I	Tamil	04	3	12
PART II	English	04	3	12
PART III	Core Theory	16	3/4	56
	Core Lab	10	1/2	18
	Core Elective	02	5	10
	Generic Elective Theory	04	4	16
	Generic Elective Lab	02	2	04
PART IV	Ability Enhancement Compulsory Course	01	2	02
	Non Major Elective	02	2	04
	Skill Enhancement Course	02	2	04
	Value Education	01	1	01
Total		49		139
PART V	(NSS/NCC/Physical Education)			01
GRAND TOTAL				140

Mapping Courses Against POsB.Sc., Botany Programme

		COURSE TITLE	PO1	PO2	PO3	PO4	PO5	PO6
YEAR I	SEMESTER I	Algae and Bryophytes	S					
		Mycology and Plant Pathology	S					
		Algae, Bryophytes Mycology and Plant Pathology Lab	S		S	S		
		AECC1 – EVS		S			S	
		GE1 Course 1 Zoology	S					
		GE1 Course 1 Zoology Lab	S					
	SEMESTER II	Pteridophytes, Gymnosperms and Paleobotany	S					
		Cell Biology	S	S				
		Pteridophytes, Gymnosperms and Paleobotany and Cell Biology Lab	S		S	S		
		AECC2 – VE		S			S	
		GE1 Course 2 Zoology	S					
		GE1 Course 2 Zoology Lab	S					
YEAR II	SEMESTER III	Plant Anatomy and Embryology	S			S	S	S
		Bioinstrumentation and Computer applications	S					
		Plant Anatomy and Embryology Lab	S	S		S	S	S
		GE2 Course 1 Chemistry	S					
		GE2 Course 1 Chemistry Lab	S	S				
		Non Major Elective -1						
	SEMESTER IV	Microbiology	S	S	S		S	S
		Herbs and Drugs	S			S		S
		Microbiology Lab	S	S	S			S
		GE2 Course 2 Chemistry	S					
		GE2 Course 2 Chemistry Lab	S					
		Non Major Elective -2						
YEAR III	SEMESTER V	Morphology and Taxonomy of Angiosperms	S	S				
		Plant Biochemistry	S	S		S	S	
		Genetics, Evolution and Biostatistics	S	S	S	S		
		Biofertilizers and Organic farming	S	S		S		S
		Morphology and Taxonomy of Angiosperms Lab	S	S	S			S
		Plant Biochemistry Lab	S	S	S			S
		Genetics, Evolution and Biostatistics Lab	S	S	S		S	S
		Core Elective 1 Horticulture and Plant Breeding/ Nutraceuticals	S	S			S	
		Skill based Elective 1 Histology and staining techniques/ Mushroom Technology/Bioremediation	S	S			S	
	SEMESTER VI	Plant Physiology	S	S				
		Plant Biotechnology	S	S			S	
		Plant Ecology and Biodiversity	S	S				S
		IPR and Biosafety	S	S		S	S	S
		Plant Physiology Lab	S	S	S			
		Plant Biotechnology Lab	S	S	S		S	
		Plant Ecology and Biodiversity Lab	S	S	S			S
		Core Elective 2 Basics of Molecular Biology/ Plant resources and Utilisation	S				S	
		Skill Based Elective 2 Seed and nursery Technology/ Sea weedTechnology/ Biopesticides	S				S	S

Mapping Courses Against PSOsB.Sc., Botany Programm

		COURSE TITLE	PSO1	PSO2	PSO3	PSO4	PSO5
YEAR I	SEMESTER I	Algae and Bryophytes	S				
		Mycology and Plant Pathology	S				
		Algae, Bryophytes Mycology and Plant Pathology Lab	S		S	S	
		AECC1 – EVS		S			S
		GE1 Course 1 Zoology	S				
		GE1 Course 1 Zoology Lab	S				
	SEMESTER II	Pteridophytes, Gymnosperms and Paleobotany	S				
		Cell Biology	S	S	S	S	
		Pteridophytes, Gymnosperms and Paleobotany and Cell Biology Lab	S		S	S	
		AECC2 – VE					S
		GE1 Course 2 Zoology	S				
		GE1 Course 2 Zoology Lab	S				
YEAR II	SEMESTER III	Plant Anatomy and Embryology	S			S	S
		Bioinstrumentation and Computer applications	S				S
		Plant Anatomy and Embryology Lab	S	S		S	S
		GE2 Course 1 Chemistry	S				
		GE2 Course 1 Chemistry Lab	S	S			
		Non Major Elective -1					
	SEMESTER I	Microbiology	S	S	S		S
		Herbs and Drugs	S	S			
		Microbiology Lab	S	S	S		
		GE2 Course 2 Chemistry	S				
		GE2 Course 2 Chemistry Lab	S				
		Non Major Elective -2					
YEAR III	SEMESTER V	Morphology and Taxonomy of Angiosperms	S	S			
		Plant Biochemistry	S	S		S	S
		Genetics, Evolution and Biostatistics	S	S	S	S	
		Biofertilizers and Organic farming	S	S	S		
		Morphology and Taxonomy of Angiosperms Lab	S	S	S		
		Plant Biochemistry Lab	S	S	S		
		Genetics, Evolution and Biostatistics Lab	S	S	S		S
		Core Elective 1 Horticulture and Plant Breeding/ Nutraceuticals	S	S			S
		Skill based Elective 1 Histology and staining techniques/ Mushroom Technology/Bioremediation	S	S			S
	SEMESTER VI	Plant Physiology	S	S			
		Plant Biotechnology	S	S			S
		Plant Ecology and Biodiversity	S	S			
		IPR and Biosafety	S		S	S	S
		Plant Physiology Lab	S	S	S		
		Plant Biotechnology Lab	S	S	S		S
		Plant Ecology and Biodiversity Lab	S	S	S		
		Core Elective 2Basics of Molecular Biology/ Plant resources and Utilization	S				S
		Skill Based Elective 2 Seed and nursery Technology/ Sea weedTechnology/ Biopesticides	S				S

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Department of Botany

(For those joined B.Sc. Botany on or after June 2020)

Course Code	Course Title	Category	L	T	P	Credit
UBO20C51	**Morphology and Taxonomy of Angiosperms**	**Core 9**	**4**	**-**	**-**	**4**

L-Lecture T-Tutorial P- Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	**V**	**25**	**75**	**100**

Preamble

To learn about the modification of different plant parts

Acquiring knowledge about various system of classification and Identification of plants

Course Outcomes

On completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Differentiate Morphological variation of plant parts	100%	70%
CO2	Know the Standard principles of collection, naming and preservation of plants and outlook of ICBN, BSI	100%	70%
CO3	Characterize the plants of families of Polypetalae and their economic importance	100%	70%
CO4	Characterize the plants of families of Gamopetalae and their economic importance	100%	70%
CO5	Characterize plants of families of Monochlamydeae and Monocot and their economic importance	100%	70%

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**M**	**L**	**M**	**M**	**L**
CO2	**M**	**S**	**S**	**M**	**S**	**L**
CO3	**S**	**S**	**M**	**M**	**S**	**M**
CO4	**S**	**S**	**M**	**M**	**S**	**M**
CO5	**S**	**S**	**M**	**M**	**S**	**M**

Strong(S),Medium(M),Low (L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	M
CO2	L	S	L	L	L
CO3	M	S	S	M	M
CO4	L	S	S	M	M
CO5	M	S	S	M	M

Blooms taxonomy

	CA		End of Semester
	First	Second	
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%
Total	52	52	140

Title of the Course: Morphology and Taxonomy of Angiosperms

Unit I: Overview of Plant Morphology – Types of Root System, Structure and Characteristic features of Stem, Phyllotaxy and Venation. Modifications of tap root and fibrous root system, Modification of aerial and underground stem, Modifications of leaf (Phyllode, Pitcher). Inflorescence types – Racemose, Cymose, Mixed and Special types. Fruits – Simple, Aggregate and Multiple fruits.

Unit II: Nomenclature-Botanical Nomenclature, ICBN and its role. Classification – Bentham & Hooker's System, APG system (Outline only). Herbarium technique. Botanical survey of India (BSI) - National herbarium– Regional Centers and their role.

Unit III: Study on the key features, vegetative and floral characters and economic importance of the following families 1.Malvaceae 2. Capparidaceae 3. Rutaceae 4. Caesalpinioideae 5. Cucurbitaceae

Unit IV: Study on the key features, vegetative and floral characters and economic importance of the following families 6. Asteraceae 7. Convolvulaceae 8. Asclepioideae 9. Acanthaceae 10. Lamiaceae

Unit V: Study on the key features, vegetative and floral characters and economic importance of the following families 11. Amaranthaceae 12. Euphorbiaceae 13. Amaryllidaceae 14. Poaceae 15. Cyperaceae

Text Books

1. Venkateswarlu, V. 1982. External morphology of Angiosperms, S.Chand and Co.Ltd., New Delhi.

2. Narayanswami, R.V., K.N. Rao and A.Raman. 1992. Outlines of Botany, S.Viswanathan Printers and Publishers, Chennai.

3. Singh, V. and K.Jain. 1991. Taxonomy of Angiosperms, Rastogi Publications, Meerut.

4. Vasishta, P.C.1992. Taxonomy of Angiosperms, R.Chand and Co. Ltd., New Delhi.

5. Lawrence, G.H.M. 1951. Taxonomy of Vascular plants. The Mac-Millan Co., New York.

6. Heywood, V.K. 1967. Plant Taxonomy Edward Arnold Pub. Ltd., London.

References

1.Sharma, O.P. 2009. Plant Taxonomy, Tata McGraw-Hill publishers, New Delhi.

2.Pulliah, T. 2007. Taxonomy of Angiosperms, Third Edition, Regency Publication, New Delhi.

3.Tod, F. Stueesy, 2009. Plant Taxonomy; The systematic evaluation of comparative data. Columbia Univ. Press. New York.

4.Stace, C.A. 1980. Plant Taxonomy and Biosystematics, Edward Arnold Publishing Limited, London.874

Web Resources

www.easybiologyclass.com
www.slideshare.com

www.biologydiscussion.com.

CourseDesigners:

1. Dr.E.Mohan
2. Dr.M.RamaPrabha

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Department of Botany

(For those joined B.Sc. Botany on or after June 2020)

Course Code	Course Title	Category	L	T	P	Credit
UBO20CL51	Morphology and Taxonomy of Angiosperms Lab	Core Lab 5		-	3	2

L-Lecture T-Tutorial P-Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	**V**	**40**	**60**	**100**

Preamble

To able to identify plants based on characters

To learn about herbarium technique

Course Outcomes

On Completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Differentiate the modification of plant parts	100%	70%
CO2	Identify the plants of selected families in Polypetalae	100%	70%
CO3	Identify the plants of selected families in Gamopetalae	100%	70%
CO4	Identify the plants of selected families in Monochlamydeae and monocot	100%	70%
CO5	Prepare Herbarium sheets	100%	70%

K1-Knowledge K2-Understand K3- Apply

Mapping of Cos with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**S**	**L**	**M**	**M**	**M**
CO2	**S**	**S**	**S**	**M**	**S**	**L**
CO3	**S**	**S**	**S**	**M**	**S**	**L**
CO4	**S**	**S**	**S**	**M**	**S**	**L**
CO5	**L**	**M**	**L**	**L**	**M**	**L**

Strong(S), Medium (M),Low (L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	L	L
CO2	S	S	M	L	L
CO3	S	S	M	L	L
CO4	S	S	M	L	L
CO5	S	S	S	L	M

Strong(S), Medium (M),Low (L)

Title of the Course: Morphology and Taxonomy of Angiosperms Lab

1. Root, Stem and leaf modification of Angiosperms

2. Study on the morphological and floral characters of the following families

Malvaceae, Capparidaceae, Rutaceae, Caesalpinioideae, Cucurbitaceae

Asteraceae, Convolvulaceae, Asclepioideae, Acanthaceae, Lamiaceae

Amaranthaceae, Euphorbiaceae, Amaryllidaceae, Poaceae, Cyperaceae

3. Herbarium preparation

Course Designers:

Dr.E.Mohan
Dr.M.RamaPrabha

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Department of Botany

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Course Code	Course Title	Category	L	T	P	Credit
UBO20C52	Plant Biochemistry	**Core 10**	**4**	**-**	**-**	**4**

L-Lecture T-Tutorial P-Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	**V**	**25**	**75**	**100**

Preamble

On completion of the course the students will be to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Define and classify primary and secondary metabolites	100%	80%
CO2	Describe the structure of primary metabolites	100%	70%
CO3	Depict the mechanism of enzyme action	100%	80%
CO4	Outline the types of vitamins and secondary metabolites	100%	90%
CO5	Explain the pathways of production of secondary metabolites	100%	70%

K1 - Knowledge K2 - Understand K3 - Apply

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**L**	**L**	**L**	**M**	**S**	**S**
CO2	**S**	**S**	**L**	**M**	**S**	**S**
CO3	**M**	**M**	**L**	**M**	**S**	**S**
CO4	**L**	**S**	**M**	**M**	**S**	**S**
CO5	**L**	**S**	**S**	**S**	**S**	**S**

Strong(S), Medium(M), Low (L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**L**	**L**	**L**	**M**
CO2	**S**	**L**	**M**	**L**	**M**
CO3	**L**	**M**	**L**	**S**	**L**
CO4	**S**	**M**	**M**	**L**	**L**
CO5	**L**	**M**	**M**	**M**	**S**

Strong(S), Medium(M), Low (L)

Blooms taxonomy

	CA		Endof
	First	Second	Semester
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%
Total	52	52	140

Unit I: Biochemistry - Scope and application in the various fields - **Biomolecules-** Definition and classification – Primary and secondary metabolites – distinct properties. Carbohydrates: Classification-Mono, Oligo and polysaccharides: Structure, properties and the functional role of Glucose, Sucrose, Lactose, Maltose, Starch and Cellulose. Amino acids – Classification Based on nature of side chains-properties of amino acids, functional role amino acids in plants. (14 Hours)

Unit II: **Primary Metabolites** – Protein – Classification (Brief account of Simple, Conjugated and derived Proteins). Structural of proteins – Primary, secondary, tertiary and quaternary structures. Properties and functional role of proteins in plants. **Lipids** – Classification (brief account on simple, compound and derived lipids). Saturated and unsaturated fatty acids – Properties (14 Hours)

Unit III: Primary Metabolites - Enzymes -classification – Basis of source and substrate and nature of Biochemical activity- IUB system of Nomenclature - physico-chemical properties – mechanism of enzyme action-Theories: Lock and key and induced-fit models; Physical and Chemical factors affecting enzyme action; Enzyme regulators – Activating factors – Enzyme Inhibition – types (14 Hours)

Unit IV: **Nucleic Acids** - DNA and RNA, differences between DNA and RNA. Building Blocks of DNA-Bases, Sugar, Nitrogenous bases, Nucleosides and Nucleotides. Watson and Crick Model of DNA structure. Various forms of DNA (A,B and Z DNA) (10 Hours)

Unit V: Secondary Metabolites – Classification; Alkaloids, Glycosides, Steroids, Terpenoids, Phenols – General structure, properties and functions and Storage (08 Hours)

Text Books:

1. Satyanarayana, U. and U. Chakrapani, 2013. Biochemistry. Elsevier Co-published with Books and Allied Press, New Delhi
2. Lea, P.J and Leegood, R.C. 2001. Plant Biochemistry and Molecular Biology, 2nd Ed. John Wiley and Sons Ltd., England.
3. Jain, J. L. 2000. Fundamentals of Biochemistry. S. Chand & Co. Ltd., New Delhi.

Reference Books:

1. James Bonner, J. E. Varner, 2016. 'Plant Biochemistry', Elsevier Publishers, Netherlands, UK.
2. Lehninger, A.L. 2013. 'Biochemistry', Freeman, W.H. and Company, New York, USA.
3. Gleason, J.K. and Chollet,, R.2012. 'Plant Biochemistry', Jones and Barlett Publishers, London
4. Stryer, L. 2010. 'Biochemistry' – VI Edition, Freeman W.H. and Company, New York, USA

Course prepared by: Dr. K.Jegatheesan

Thiagarajar College (Autonomous): Madurai – 625 009

(Re-Accredited with 'A^{++}' Grade by NAAC)

Department of Botany

(For those joined B.Sc. Botany on or after June2020)

Course Code	Course Title	Category	L	T	P	Credit
UBO20CL52	Plant Biochemistry Lab	**Core Lab 6**	-	-	3	2

L-Lecture T-Tutorial P-Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	**Five**	**40**	**60**	**100**

Preamble

On completion of the course the students will be to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Distinguish between Carbohydrates, amino acids, proteins and lipids	100%	80%
CO2	Estimate the amount of sugars in plant sample	100%	80%
CO3	Estimate the amount of proteins in plant sample	100%	80%
CO4	Estimate the amount of amino acids in plant sample	100%	80%
CO5	Prepare phosphate buffer	100%	80%

K1 - Knowledge K2 - Understand K3 - Apply

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**S**	**S**	**M**	**S**	**S**
CO2	**S**	**S**	**L**	**M**	**S**	**S**
CO3	**S**	**S**	**L**	**M**	**S**	**S**
CO4	**S**	**S**	**M**	**M**	**S**	**S**
CO5	**S**	**S**	**S**	**M**	**S**	**S**

Strong(S), Medium(M), Low (L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**L**	**S**	**S**	**S**	**M**
CO2	**L**	**S**	**S**	**S**	**M**
CO3	**L**	**S**	**S**	**S**	**M**
CO4	**L**	**S**	**S**	**S**	**M**
CO5	**L**	**S**	**S**	**S**	**S**

Strong(S), Medium(M), Low (L)

UBO20CL52 Plant Biochemistry Lab

List of Experiments

1. Qualitative tests for simple sugars, starch, Amino acid, protein and cholesterol

3. Complementary colour determination using colorimeter

3. Quantitative estimation of sugars by Anthrone method

4. Quantitative estimation of starch by gravimetric method

5. Quantitative estimation of amino acids by Ninhydrin Method

6. Quantitative estimation of proteins by Lowry's method

7. Quantitative estimation of Fatty acid through gravimetric method

8. Preparation of Buffers - Phosphate Buffer

9. Pigment extraction and separation through paper chromatography technique

10. Saponification value of Oil

11. Gel electrophoresis separation of leaf protein (Demonstration only)

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Department of Botany

(For those joined B.Sc. Botany on or after June2020)

Course Code	Course Title	Category	L	T	P	Credit
UBO20C53	Genetics, Evolution and Biostatistics	**Core 11**	**3**	**-**	**-**	**3**

L-Lecture T-Tutorial P-Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	**Fifth**	**25**	**75**	**100**

Preamble

To equip the students with the basic principles of Genetics, Evolution and Biostatistics

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Understand Mendel's Law on heredity and Modifications of Mendelian ratios	100%	70%
CO2	Demonstrate the concepts of Linkage, crossing over and polygenic inheritance	100%	75%
CO3	Realize Sex determination, sex linked and extra chromosomal inheritance in plants	100%	70%
CO4	Recognize Evolution studies and theories	100%	85%
CO5	Demonstrate biostatistical methods and application in genetics	100%	75%

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**L**	**M**	**S**	**M**	**L**
CO2	**S**	**S**	**L**	**M**	**S**	**L**
CO3	**S**	**S**	**M**	**S**	**S**	**M**
CO4	**M**	**S**	**L**	**S**	**S**	**M**
CO5	**M**	**M**	**L**	**L**	**S**	**S**

Strong(S),Medium(M),Low (L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**L**	**L**	**L**	**M**
CO2	**S**	**L**	**M**	**L**	**M**
CO3	**L**	**M**	**L**	**S**	**L**
CO4	**S**	**M**	**M**	**L**	**L**
CO5	**L**	**M**	**M**	**M**	**S**

Strong(S),Medium(M),Low (L)

Blooms taxonomy

		First	Second	Semester
Knowledge		40%	40%	40%
Understand		40%	40%	40%
Apply		20%	20%	20%
Total		52	52	140

Title of the Course : Genetics, Evolution and Biostatistics

Unit I: Mendel's law on heredity –Terminologies–Monohybrid cross–Law of dominance and Law of segregation – Incomplete Dominance in *Mirabilis jalapa* – Reciprocal cross, Back cross and Test cross – Method and significance; Dihybrid cross – *Pisum sativum* – Law of Independent Assortment; Modifications of Mendelian ratios –Supplementary genes and Dominant Epistasis.

Unit II: Linkage – Coupling and Repulsion hypothesis. Types of Linkage – Complete (*Drosophila*) and incomplete (*Zea mays*); Crossing over – Mechanism in *Drosophila* and *Maize*, reciprocal crossing in *Lathyrus odoratus*. Theories of Crossing over – Chiasma type, contact first, breakage first and strain theories. Limiting factors of crossing over. Polygenic inheritance – Kernel colour in Wheat and skin colour in Man

Unit III: Sex determination - Mechanism in *Melandrium album*; Sex linked inheritance–Eye colour in *Drosophila*, Haemophilia: Extra chromosomal inheritance – Plastid inheritance in *Mirabilis jalapa*– Uniparental inheritance in *Chlamydomonas reinharditi* ; Chromosomal variations – Euploidy and aneuploidy; Chromosomal aberrations – mechanism and significance of the following categories – addition, deletion, inversion, duplication, and translocation.

Unit IV: Evolution: Morphological, anatomical and embryological evidences for evolution. Evolutionary Theories: Lamarck, Darwin, Mutation Theory and Modern Synthetic Theories – Concept, Principle, Validity and Drawbacks. An Overview of Hardy-Weinberg Equilibrium

Unit V: Biostatistics–Data–Definition–Data classification; Presentation of data–Table forms – Chart forms – Scatter points, line, bar, histogram, pie; descriptive statistics – Mean, Mode, Median, Standard Deviation (Direct method only) – problem and solving method, Chi-square test – Applications in Genetics experiments.

Text Books:

1. Archunan. 2004. Genetics, Sarup& Sons, New Delhi.
2. Shukla, R.N. 2009. A Text Book of Genetics and Evolution, Daya Publishing House, New Delhi.
3. Arora, M.P. Arora, H. 2013, A Text Book of Organic Evolution, Daya Publishing House, New Delhi.
4. Sharma, A.K.2005. Text Book of Biostatistics, Discovery Publishing House, New Delhi

References:

1. Ringo, J. 2004. Fundamental Genetics, Cambridge University Press.
2. Barton, N.H. 2007. Evolution, Cold Spring Harbor Laboratory Press, New York.
3. Ridley, M.2009. Evolution, John Wiley Sons, USA.
4. Zar, J.H. 2010. Biostatisticial Analysis, Prantice – Hall Inc

Web Resources:

www.slideshare.net
https://byjus.com.
https://www.toppr.coms

Designers:

Dr.T.M.Jothimani

Thiagarajar College (Autonomous): Madurai – 625 009

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Department of Botany

(For those joined B.Sc. Botany on or after June2020)

Course Code	Course Title	Category	L	T	P	Credit
UBO20CL53	Genetics, Evolution and Biostatistics Lab	Core Lab -7	**-**	**-**	**3**	**2**

L-Lecture T-Tutorial P-Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	**Fifth**	**40**	**60**	**100**

Preamble

To provide practical knowledge in the basic principles of Genetics, evolution and biostatistics

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Know about Mendel's Law on heredity	100%	70%
CO2	Concept learning of Linkage and crossing over	100%	70%
CO3	Realize Sex determination in plant	100%	70%
CO4	Recognize Evolution studies	100%	70%
CO5	Determine the concepts of biostatistics	100%	70%

K1-Knowledge K2-Understand K3- Apply

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**L**	**L**	**M**	**S**	**M**
CO2	**M**	**S**	**L**	**S**	**M**	**S**
CO3	**S**	**S**	**M**	**L**	**S**	**S**
CO4	**S**	**S**	**L**	**M**	**S**	**M**
CO5	**S**	**S**	**M**	**S**	**M**	**S**

Strong(S),Medium(M),Low (L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**L**	**L**	**L**	**M**
CO2	**S**	**L**	**M**	**L**	**M**
CO3	**L**	**M**	**L**	**S**	**L**
CO4	**S**	**M**	**M**	**L**	**L**
CO5	**L**	**M**	**M**	**M**	**S**

Strong(S),Medium(M),Low (L)

UBO20CL53 Genetics, Evolution and Biostatistics Lab

I Problems solving in the following topics:

1 .Mendelian Monohybrid ratio

2 .Mendelian Dihybrid ratio

3. Monohybrid reciprocal cross, back cross and test cross

4. Gene Interaction – Supplementary genes, Dominant epistasis, Recessive epistasis

II Evolution and Biostatistics experiments

1. Natural Selection using beads
2. Genetic drift using beads
3. Chi - square test using beads to demonstrate population genetics
4. Descriptive statistics – Mean, Mode and Median, calculation for leaf length of randomly selected Polyalthia leaves (or) Albizzia pods

III Models/Spotters – Relevant to theory topics

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Department of Botany

(For those joined B.Sc. Botany on or after June2020)

Course Code	Course Title	Category	L	T	P	Credit
UBO20C54	**Biofertilizers and Organic Farming**	**Core 12**	**3**	**-**	**-**	**3**

L-Lecture T-Tutorial P-Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	**V**	**25**	**75**	**100**

Preamble

To equip the students with basic knowledge of Biofertilizer production, application in various agricultural crops, organic farming techniques, certification and export

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Describe the basic knowledge, advantages and disadvantages of Biofertilizers	100%	70%
CO2	Illustrate the production and application of different Biofertilizers	100%	70%
CO3	Demonstrate the basic quality standards and quality management of Biofertilizers	100%	70%
CO4	Explain the basic principles of organic farming and its techniques	100%	70%
CO5	Exhibit the certification and application of organic farming.	100%	70%

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**S**	**S**	**M**	**L**	**M**
CO2	**S**	**S**	**M**	**M**	**L**	**M**
CO3	**M**	**M**	**S**	**L**	**L**	**M**
CO4	**S**	**S**	**M**	**M**	**L**	**M**
CO5	**S**	**S**	**S**	**S**	**M**	**M**

Strong(S),Medium(M),Low (L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	L	L	M
CO2	M	L	S	M	L
CO3	M	M	L	M	M
CO4	S	L	M	L	L
CO5	L	L	S	L	S

Strong(S),Medium(M),Low (L)

Blooms taxonomy

	CA		Endof
	First	Second	Semester
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%
Total	52	52	140

Unit I: Biofertilizer: Introduction – History - Scope and Applications – types of biofertilizers – Classification of biofertilizers – advantages and disadvantages of biofertilizers. Algal biofertilizers - mass cultivation- application. Bacterial biofertilizers - Mass multiplication and applications of *Rhizobium*, *Azotobacte*r and *Azospirillum*

Unit II: Phosphate solubilizing Bacterial Biofertilizers - Pseudomonas and its mass multiplication, fungal biofertilizers – Mycorrhiza- mass multification – application.

Unit III: Carriers – Dry inoculants- Granules- Liquid inoculants – Polymer base carriers – other carriers- Stickers – additives; Quality control of Biofertilizers – microbial functions – quality parameters – Quality management.

Unit IV: Organic farming: Scope and Applications. Farming Components and Practices. Types of organic fertilizers - Farm yard manure, Compost, Green manure and mulching. Production and application methods of organic manures – Vermicompost – Agricultural waste compost.

Unit V: Botanical pesticides - bio pesticides – bacterial (Bacillus) – fungal (Trichoderma) -Panchagavya and Fish aminoacid. National standards for Organic certification. National and International organic certification agencies, quality consideration, processing and handling, marketing.

Text Books

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

Subba Rao. N.S. 1988. Biofertilizers in Agriculture, second Edition, Oxford & IBH Publishing Company Pvt. Ltd., New Delhi.

Nirmala, C.B., G. Rajalakshmi and C. Karthick. 2009. Plant Biotechnology. MJP publishers, Chennai.

References:

1. Subba Rao, N.S 1982. Advances in Agricultural Microbiology, Oxford & IBH Publishing Company pvt. Ltd., New Delhi.

2. Venkatraman, G.S. 1972. Algal Biofertilizer and Rice Cultivation, Today and Tomorrow printers and Publishers, New Delhi.

3. Tilak, K.V.B.R. 1991. Bacterial Biofertilizers, Indian council for Agricultural Research, New Delhi.

4. Soman, L.L. 2007. A Handbook of Biofertilizers. Agrotech Publishing Academy**,** Udaipur

CourseDesigners:

Dr. M. Viji

Dr.K. Sathiyadash

Thiagarajar College (Autonomous): Madurai – 625 009

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Department of Botany

(For those joined B.Sc. Botany on or after June 2020)

Course Code	Course Title	Category	L	T	P	Credit
UBO20CE51(A)	Horticulture and Plant Breeding	Core Elective I	**5**	**-**	**-**	**5**

L - Lecture T - Tutorial P - Practical

Year	Semester	Int. Marks	Ext. Marks	Total
Third	Fifth	25	75	100

Preamble

To acquire basic knowledge, skills and effective practicing and further development of students as entrepreneurs in the field of Horticulture and Plant Breeding methods for the desired crop production

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Students will acquire fundamental knowledge of Horticulture, its various disciplines, values and various categories of Gardens	100%	85%
CO2	Comprehend the essential requirements, including, physical conditions, containers, soil mix, fertilizers, pest management activities	100%	80%
CO3	Demonstrate different propagation methods for Horticulture practices and also to gain valid ideas on Promotional mechanisms and entrepreneurial skills	100%	80%
CO4	Apply the basic knowledge on the Plant Breeding Techniques for crop improvement	100%	75%
CO5	Demonstrate the special breeding techniques, release of breeds, public participation in plant breeding	100%	85%

K1 - Knowledge K2 - Understand K3 – Apply

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**M**	**M**	**L**	**L**	**S**
CO2	**S**	**S**	**M**	**L**	**L**	**S**

CO3	**S**	**M**	**M**	**L**	**L**	**S**
CO4	**S**	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**	**S**

Strong(S), Medium(M), Low(L)

Mapping of COs with PSOs

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	**S**	**S**	**M**	**L**	**L**
CO2	**S**	**M**	**S**	**L**	**L**
CO3	**S**	**M**	**M**	**L**	**L**
CO4	**M**	**S**	**S**	**M**	**S**
CO5	**M**	**S**	**S**	**S**	**M**

Strong(S), Medium(M), Low(L)

Course Title: **Horticulture and Plant Breeding**

Unit I: Fundamentals of Horticulture – Classification into branches and scope — Societal values, Aesthetic values, Industrial Horticulture Garden Categories - Formal and Informal types – Suitable plants and methods - foliage, straggler, climbers;, Hedges and Edges, Topiary, Water Garden, Rockery, Pergolas Kitchen garden Indoor garden Community Garden, Public and Private Gardens shade-net house, Glass House, Lawns and Golf Turf; Popular Gardens in Tamil Nadu and India 15 Hrs.

Unit – II: Requisites of Gardening Choice of the place – Potting mixture, Containers, pots, trays – Watering methods and significance - Pipes, drips, sprinklers, mistifiers, Garden implements; Pick-axe, cropw bar, mummoty hoe, sickles, lawn movers, scature, scissor, scopes and spades; Fertilizers – Green and farmyard manures, Inorganic fertilizers, plant growth promoters and flowering hormones application – Pest and disease management - Physical, Chemical methods, Bio-control agents 12 Hrs.

Unit – III:: **Propagating techniques:** –Seeds and nursery seedlings, germinules; rhizomes, bulbs, bulbils; Vegetative Propagation: Technique and suitable plants - Root, Stem and Leaf cuttings; Budding-types. Grafting – Scions and Stocks; Approach grafting – Cleft grafting - Repair grafting– Layering: Ground and air layering; Packing and transportation; Special techniques and plants used in: Terrarium, Hanging pots, *Bonsai*; Promotional Mechanism and Entrepreneurial applications: Flower arrangement for events, Flower bouquet, Vegetable carving 18 Hrs.

UNIT IV: **Plant Breeding** - Pre and post-Mendelian History of Plant Breeding, Basic Principles of plant breeding, Types of gene actions and implications in plant breeding. Vovilov Centres of Origin-biodiversity and its significance Plant introduction: Principle, method, advantages and limitations; Pure line and mass selection methods clonal selection, apomixes, pedigree, bulk, backcross, single seed descent and multiline methods 15 Hrs.

UNIT V: **Hybrid breeding**– genetics and physiological basis of heterosis and inbreeding, inbreds; production, breeding approaches for the improvement of inbreds, predicting hybrid performance; seed production of hybrid and their parent varieties/inbreds; Mutation breeding' Cultivar development-

testing, release and notification, Participatory Plant Breeding, Plant breeders' rights and regulations for plant variety protection and farmers rights, Major Indian Plant Breeding and Research Centres15 Hrs.

Text Books

Jitendra Singh, (2014) Basic Horticulture, Kalyani Publishers, Darya Ganj. New Delhi
Manibhushan Rao 2018) Textbook of Horticulture. Laxmi Publications Pvt Ltd. Ernakulam, Kerala
Rajaneesh Singh & Bijendra Kumar Singh (2019), Practical Approaches in Horticulture, , New India Publishing Agency- New Delhi
Rajaneesh Singh & Bijendra Kumar Singh (2020) Text Book on Horticulture. New India Publishing Agency, New Delhi
Allard RW. (1981). Principles of Plant Breeding. John Wiley & Sons, UK.
Chopra VL. (2001). Breeding Field Crops. Oxford & IBH, New Delhi
Chopra VL. (2004). Plant Breeding. Oxford & IBH, New Delhi

Reference Books

Piercy H, (1980). *Flower arranging*, London: Sundial Publication. Print.
Monckton S, (1989). *Arranging flowers*, London: Merehurst Press. Print.
New Paradigms of Business Plan for Selected Horticulture Crops - A Practical Textbook for Entrepreneurship (2017), Trivedi, Bookwell ***Publication***: ***New*** Delhi,
Fundamentals of Horticulture, (2017), Editor, Chris Bird Cambridge University Press, New Delhi

S.N. Gupta (2019), Instant Horticulture (3 Volumes), 13thEdition, , Jain Bros. Publications, New Delhi

Entrepreneurship and Skill Development in Horticultural Processing, (2022) Edited By K.P. Sudheer and V. Indira, CRC Press, USA
J S Khuraijam and R K Roy (2020), Indian Botanic Gardens, Daya Publishing House, New Delhi
Singh BD. (2006). Plant Breeding. Kalyani Publishers, Ernakulam, Kerala

Singh P. (2002). Objective Genetics and Plant Breeding. Kalyani Publishers, Ernakulam, Kerala

Singh P. (2006). Essentials of Plant Breeding, Kalyani Publishers, Ernakulam, Kerala

Kalyani. Singh S &Pawar IS. (2006). Genetic Bases and Methods of Plant Breeding. CBS Publishers & Distributors Pvt. Ltd, New Delhi

OER Videos
https://www.youtube.com/watch?v=jBICmCRR018 (Horticulture and its Branches)
https://www.youtube.com/watch?v=C4EUdp31ezA (Horticulture Methods)
https://www.youtube.com/watch?v=w3WCe0IXMt4 (Tamil Version)
https://www.youtube.com/watch?v=638PZqS7H-g (Landscaping and Principles)
https://www.youtube.com/watch?v=xin4OM5XF70 (Horticulture Distance Education Panel)
https://youtu.be/HinE4ihpjDs CC BY4.0(Closed terrarium mistakes and how to avoid them)
https://www.youtube.com/watch?v=8ATRfaiaOLg (An Introduction to Plant Breeding)

Course Designed by:**Dr. D. Kannan**

Thiagarajar College (Autonomous): Madurai – 625 009

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Department of Botany

(For those joined B.Sc. Botany on or after June 2020)

Course	Course Title	Category	L	T	P	Credit
UBO20CE51 (B)	Nutraceuticals	Core Elective – I	5	-	-	5

Year	Semester	Int. Marks	Ext. Marks	Total
Third	Fifth	25	75	100

Preamble

To acquire knowledge about the suitable food and their health benefits

Course Outcomes

On completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Describe and distinguish Nutraceuticals and functional foods	100%	90%
CO2	Classify the Nutraceuticals category	100%	85%
CO3	Explore the Nutraceuticals applications in the treatment of diseases and disorders	100%	80%
CO4	Recognize the mode of action, dosage level and adverse effects	100%	75%
CO5	Elucidate the common and advanced manufacturing processes of Nutraceuticals and the regulatory bodies	100%	70%

K1-Knowledge K2-Understand K3-Apply

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**S**	**S**	**S**	**M**	**M**
CO2	**S**	**S**	**S**	**S**	**M**	**M**
CO3	**S**	**S**	**M**	**S**	**M**	**M**
CO4	**M**	**S**	**M**	**S**	**L**	**L**
CO5	**M**	**M**	**M**	**S**	**L**	**L**

Strong(S), Medium(M), Low (L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	**S**	**S**	**S**	**S**
CO2	**S**	S	**S**	**S**	**S**
CO3	**M**	S	**S**	**M**	**M**
CO4	**M**	**S**	**S**	**M**	M
CO5	**M**	**S**	**S**	**M**	M

S-Strong M-Medium L-Low

Blooms taxonomy:Assessment Pattern			
	CA		End of Semester
	First	Second	
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%

Title of the Course: Nutraceuticals

UnitI: Nutraceuticals and Functional Foods - Basics, properties, significance, similarities and differences - Scope of nutraceuticals - Indian and global industries - Role of medicinal and aromatic plants in nutraceutical industry

UnitII: Classification of nutraceuticals –Traditional: greens, cereals, pulses, herbals, nuts and dairy products. Microbial and Algal nutraceuticals- nutrient supplements, probiotics. Plant and animal based nutraceuticals, nutraceutical enzymes. Non-Traditional nutraceuticals- fortified neutraceuticals and recombinant nutraceuticals

UnitIII: Nutraceutical for diseases and disorders: cardiovascular diseases, hypertension, diabetes, cancer, cholesterol management, obesity, Under-weight, joint pain, immune enhancement, Anemia and age-related macular disorder.

UnitIV: Biochemistry of nutrition and dietetics: Mechanism of action, dosage level, adverse effects and toxicity -– manufacturing of lycophene, phytosterols, prebiotics and probiotics

Unit V: Nutragenomics and nanobiotechnology in the production of nutraceuticals: Concept, principle,mechanism,production and applications of prebiotics and probiotics -Biotechnology in Phytoneutraceuticals- CODEX regulatory-governing role and limitations

Textbook:

1. Geoffrey P.Webb.2006. Dietary supplements and functional foods. Blackwell Publishing, UK..
2. Losso, JN.2007.Angi-angiogenic functional and medicinal foods. CRCPress.

ReferenceBooks:

1.Cupp,J andTracy,TS.2003.Dietary supplements:Toxicology and Clinical Pharmacology. HumanaPress, US.
2.Manson, P.2001.Dietary supplements (2ndEd) Pharmaceutical Press, UK
3..Shi,J.2007. Functional Food Ingredients and Nutraceuticals:Processing Technologies. Taylor & Francis Publ. CRC Press, US.
4. Goldberg,I 1994.Functional Foods:DesignerFoods,Pharmafoods,NutraceuticalsChapman&Hall, UK.
5.RobertE.C.2006.Handbook of Nutraceuticals and Functional Foods.2nd Ed.Wildman, CRC Press, US..
6.Brigelius-Flohé,JandJoost,HG.2006.Nutritional Genomics:Impact on Health and Disease. Wiley-VCH, US.
7.Neeser,JR and German, BJ.2004.Bioprocesses and Biotechnology for Functional Foods and Nutraceuticals. New York, US

Web Resources:

1. https://solutionpharmacy.in/classification-of-nutraceuticals/
2. https://www.mdpi.com/books/pdfview/book/2849
3. https://www.mdpi.com/books/pdfdownload/book/654 4.

Course designer

Dr. K.Saraswathi

Thiagarajar College (Autonomous):Madurai–625009
(Reaccredited with A++ by NAAC)
Department of Botany

(For those who joined B. Sc., Botany on or after June 2020)

Course Code	Course Title	Category	L	T	P	Credit
UBO20SE51(A)	Histology and Staining Techniques	(Skill Enhancement Course-1)	**2**	**-**	**-**	**2**

Year	Semester	Int. Marks	Ext. Marks	Total
Third	Fifth	15	35	50

Preamble

To equip the students with the basic principles of histology and technical aspects of Staining Techniques

Course Outcomes

On completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Explain the basic principles of Histology and cellular organization	100%	85%
CO2	Evaluate the histological patterns of tissues and organs in plants with reference to their functions	100%	75%
CO3	Comprehend the conventional and advanced histological techniques	100%	80%
CO4	Reveal the types of stains and methods of staining in histology	100%	80%
CO5	Perform microtome sectioning	100%	80%

K1-Knowledge K2-Understand K3-Apply

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**M**	**S**	**L**	**M**	**L**	**M**
CO2	**S**	**S**	**L**	**M**	**M**	**S**
CO3	**S**	**S**	**L**	**M**	**M**	**S**
CO4	**M**	**S**	**L**	**M**	**M**	**S**
CO5	**S**	**S**	**M**	**M**	**M**	**S**

Strong (S), Medium (M), Low (L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**S**	**S**	**M**	**M**

CO2	**S**	S	**S**	**M**	**M**
CO3	**S**	**S**	**S**	M	**L**
CO4	**S**	**S**	**S**	M	**L**
CO5	**S**	**S**	**S**	S	**S**

S-Strong M-Medium L-Low

Blooms taxonomy: Assessment Pattern

	CA		End of Semester
	First	Second	
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%
Total	30	30	65

Title of the Course: Histology and Staining Techniques

Unit I: Introduction – Definition and History. Cell Diversity- Cell size, shape, number and morphology. Types of tissue system – Dermal, Vascular, Ground, Meristematic and Secretary Tissues. Types and formation of intercellular spaces. Histological organization of vegetative and reproductive organs.

Unit II: Histological Techniques - Maceration, Temporary and Permanent Slide Preparation- Fixation, Selection and Trimming, Dehydration, Clearing, Embedding, Sectioning- Free hand sectioning, Paraffin method, Colladian method, Staining agents and methods of staining, Mounting Media. Specialized techniques- Cryosectioning, Ultra Microtomy and Immuno histo chemistry

Textbooks:

1. Prasad, M.K. and Prasad M. Krishna. 1975. Outlines of Microtechniques, Emkay publications, Delhi.
2. Periyasamy,K.1980.Histochemistry,developmental and structural anatomy of angiosperms: a symposium, P&B publications, Tiruchirapalli.

Reference Books:

1. Penney, D.P., J.M.Powers, M.Frank and C. Churukian. 2002. Analysis and testing of biological stains—the Biological Stain Commission Procedures, Biotech Histochem.77(5–6): 237–275. PMID12564600.
2. Clark, G.1981. Staining Procedures, Fourth edition, Baltimore:

Web Resources:

1. https://mmegias.webs.uvigo.es/02-english/2-organos-v/guiada_o_v_semilla.php
2. https://acikders.ankara.edu.tr/pluginfile.php/45699/mod_resource/content/0/Plant%20Histology%20I.pdf
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4804027/
4. https://www.biodiversitylibrary.org/item/16117#page/5/mode/1up

Course Designer

Dr. K. Saraswathi

Thiagarajar College (Autonomous):Madurai –625009
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Department of Botany

(For those joined B. Sc., Botany on or after June2020)

Course Code	Course Title	Category	L	T	P	Credit
UBO20SE51(B)	**MUSHROOM TECHNOLOGY**	Skill Enhancement Course	2	-	-	2

Year	Semester	Int. Marks	Ext. Marks	Total
Third	Fifth	15	35	50

Preamble

To equip the students with the basic ideas of mushroom types, cultivation techniques of edible mushroom and provide entrepreneurial opportunity

Course Outcomes

On completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Identify the mushroom based on their morphology and internal structure	100%	80%
CO2	Cultivate mushroom and its spawn	100%	85%
CO3	Reveal the nutritive and medicinal value of edible mushrooms	100%	75%
CO4	develop mushroom cultivation and mushroom food processing unit and to develop startups	100%	70%
CO5	Store mushroom at different conditions	100%	70%

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**M**	**S**	**L**	**M**	**L**	**M**
CO2	**S**	**S**	**L**	**M**	**M**	**S**
CO3	**S**	**S**	**L**	**M**	**M**	**S**
CO4	**M**	**S**	**L**	**M**	**M**	**S**
CO5	**S**	**S**	**M**	**M**	**M**	**S**

Strong (S), Medium (M), Low (L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**S**	**S**	**M**	**M**
CO2	**S**	S	**S**	**M**	**M**
CO3	**S**	**S**	**S**	M	**L**
CO4	**S**	**S**	**S**	M	**L**
CO5	**S**	**S**	**S**	S	**S**

S-Strong M-Medium L-Low

Blooms taxonomy: Assessment Pattern			
	CA		End ofSemester
	First	Second	
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%
Total	30	30	65

Title of the Course: Mushroom Technology

Unit I: Mushrooms-Introduction -Types of mushrooms: Edible, non-edible mushrooms and medicinal mushrooms. Morphology and internal structure of mushrooms. Nutritional value of mushrooms. Mushroom food recipes. Entrepreneurial scopes and budget estimate of mushroom cultivation. Mushroom poisoning.

Unit II: Production of mother spawn, multiplication of spawn, Inoculation Technique ,Cultivation technology, Substrates, composting technology, bed, polythene bag preparation, spawning, casing , cropping and favourable conditions for mushroom cultivation. Commercial cultivation of mushrooms: *Agaricus* and *Pleurotus*– problems in cultivation - pests, diseases and microbes and its control measures. Post-harvest technology and storage methods of mushrooms.

Text Books:

1. Nita Bahl. 1996, Hand Book on Mushrooms. Oxford and IBH Publishing Company Ltd.,New Delhi.
2. Kapoor,J.N.1989.MushroomCultivation,ICAR,NewDelhi.
3. Tripathi, D. P. 2005. Mushroom Cultivation. Oxford & IBH Publishing Co.Pvt.Ltd., New Delhi.

Reference Books:

1. Aneja, K.R.1993. Experiments in Microbiology, Plant pathology, Tissue culture and mushroom cultivation, Wishwa Prakashan, New Age International(P) Ltd.,NewDelhi.
2. Chang,S. and Miles, P.G. 2004. Mushrooms: Cultivation, Nutritional Value, Medicinal Effect and Environmental Impact, CRC Press online.

Web Resources:

1. https://agritech.tnau.ac.in/farm_enterprises/Farm%20enterprises_%20Mushroom.html
2. https://www.youtube.com/watch?v=ld9OM5w6nf8
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8465629/
4. https://www.madaboutmushrooms.com/mad_about_mushrooms/2007/04/soups.html
5. https://www.mushroomcouncil.com/nutrition-benefits/
6. https://www.researchgate.net/publication/236646616_Nutritional_and_Medicinal_values_of_Mushrooms

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Course Code	Course Title	Category	L	T	P	Credit
UBO20SE51(C)	**Bioremediation**	Skill Enhancement Course	**2**	**-**	**-**	**2**

Year	Semester	Int. Marks	Ext. Marks	Total
Third	Fifth	15	35	50

Preamble

To make the students aware of pollution load and its effective removal mechanisms

Course Outcomes

On completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Explore the biodegradable and non-bio degradable pollutants	100%	85%
CO2	Recognize the mechanisms of bioremediation	100%	80%
CO3	Identify the types of microbes and plants for removing contaminants	100%	75%
CO4	Evaluate the various *in situ* methods of bioremediation techniques	100%	75%
CO5	Evaluate the various *ex situ* methods of bioremediation techniques	100%	75%

K1 – Knowledge K2- Understand K3- Apply

Mapping of Course Outcomes with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	S	M	**L**	**M**	**S**
CO2	**S**	**S**	M	**L**	**L**	**S**
CO3	**S**	S	S	**L**	**L**	**S**
CO4	**S**	**S**	M	**L**	**L**	**S**
CO5	**S**	**S**	S	**S**	**S**	**S**

Mapping of Course Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**M**	M	S	**M**	**M**
CO2	**M**	**S**	S	**S**	**M**
CO3	**S**	M	S	**S**	**M**
CO4	**M**	**S**	S	**M**	**S**

CO5	**S**	**S**	S	**S**	**S**

S-Strong M-Medium L-Low

Blooms taxonomy: Assessment Pattern

	CA		End ofSemester
	First	**Second**	
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%
Total	30	30	65

Title of the Course: Bioremediation

Unit I: Introductiontopollution – Organic and inorganic pollutants -– effects on environment - recalcitrant compounds and xenobiotics - radioactive wastes. Bioremediation –definition, mechanism - reduction, degradation, detoxification, mineralization or transformation. Microbial bioremediation – types of microbes, factors regulating microbial remediation. Phytoremediation – Phytoextraction, Phytodegradation, Phytostabilization and Rhizofilteration.

Unit II: Bioremediation techniques: *In situ* methods - biosparging, bioventing, biosurfing,

biostimulation, bioaugmentation and natural attenuation. *Ex situ* methods – bioreactor,

biopiling, landforming, composting and biofilter. Applications of bioremediation, advantages,

disadvantages and limitations of bioremediation

Textbooks:

1. Rajendran, P. and P. Gunasekaran, 2006. Microbial bioremediation, MJP publishers,Chennai.
2. Dubey,R.C.2002.A text book of Biotechnology. S.Chand and Co.Ltd.,New Delhi.
3. Singh,B.D., 1998. Biotechnology. Kalyani publishers, NewDelhi.

Reference books:

1. Gupta, P.K.1994.ElementsofBiotechnology,Rastogiand Co.,Meerut,India.
2. Dubey,R.C.2000.AtextbookofBiotechnology,S.ChandandCo.Ltd.,NewDelhi.

Web Resources:

https://www.waste2water.com/bioremediation-benefits-and-uses/
https://microbiologysociety.org/blog/bioremediation-the-pollution-solution.html
https://www.intechopen.com/chapters/70661

Course designer

1. **Dr. K. Saraswathi**

Thiagarajar College (Autonomous):Madurai–625009

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Department of Botany

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CourseCode	Course Title	Category	L	T	P	Credit
UBO20C61	Plant Physiology	Core-13	4	-	-	4

L - Lecture T - Tutorial P - Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
III	VI	25	75	100

Preamble

Stimulating the knowledge of students in the subject with different theories and physiological mechanisms in Plants which promoting the growth

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Explain the functional and physiological role of water relations in plants show its uptake and transpiration mechanism	100%	80%
CO2	Deal the plant nutrient requirements and its deficiencies in plant growth	100%	70%
CO3	Represent the basic of photo biology and its relevance to photosynthetic function	90%	70%
CO4	Describe the plant respiratory system with significant energetics and nitrogen metabolism	80%	80%
CO5	Reason out the different nature of physiological activity of plant growth substances, flowering, fruit ripening	100%	80%

K1 - Knowledge K2 - Understand K3 – Apply

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**S**	**L**	**S**	**M**	**S**
CO2	**S**	**M**	**L**	**M**	**S**	**S**
CO3	**S**	**S**	**M**	**S**	**L**	**S**
CO4	**M**	**M**	**S**	**L**	**L**	**S**
CO5	**M**	**S**	**S**	**M**	**S**	**S**

Strong(S), Medium(M), Low(L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**S**	**L**	**S**	**M**
CO2	**S**	**M**	**L**	**M**	**S**
CO3	**S**	**S**	**M**	**S**	**L**
CO4	**M**	**M**	**S**	**L**	**L**
CO5	**M**	**S**	**S**	**M**	**S**

Strong(S), Medium(M), Low(L)

Blooms taxonomy

	CA		Endof Semester
	First	Second	
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%
Total	52	52	140

Title of the Course: Plant Physiology

Unit I: Water relations in plants: Water – Physical and Chemical properties – Physiological role in plants, Mechanism of mineral absorption, Water potential: Definition- Osmotic and pressure potential, DPD, turgor pressure, Water movements in plants - Imbibition, Diffusion and Osmosis –Ascent of sap: Definition– Theories – Physical-force and vital; Transpiration– Definition and Types; Stomatal organization and movement – physiological mechanism: Starch-sugar hypothesis, active K^+transport, Guttation and its significance.

Unit II: Mineral Nutrition in plants – classification of nutrients-Micro and macronutrients, physiological role and nutrient deficiency symptoms in plants – Passive Absorption and Active Absorption – Theories – Carrier concept, ion channels, ATPase pump– Solute Translocation: definition- Evidences showing translocation through phloem; Protoplasmic streaming and Munch‘s Pressure flow theories.

Unit III: Photosynthesis: Chloroplasts and its role in photosynthesis. Photosynthetic pigments-types– action and absorption spectrum of pigments – Quantum yield, Emerson‘s red drop and enhancement effect–Light reaction of photosynthesis- PS-I and PS-II – system, Photophosphorylation – Zscheme- Cyclic and Non-cyclic; Dark Reaction - Calvin &Benson (C3) cycle- C4 cycle, C 2 cycle and CAM pathway – Physiological mechanism and its significance.

Unit IV: Respiration: Definition, Respiratory quotient (RQ) aerobic and anerobic respiration. Glycolysis, TCA cycle, Oxidative Phosphorylation, Pentose Phosphate Pathway and Gluconeogenesis. Factors affecting respiration. Nitrogen metabolism – Sources of nitrogen, natural and biological nitrogen fixation – Free-living and symbiotic mechanisms involved in nitrogen cycle. Nitrogen movements in amino acids and protein synthesis in plants.

Unit V: Photoperiodism: Concept, phytochromes – types and physiological role in flowering, Vernalization-Definition, mechanism and its importance, Seed dormancy –definition, causal factors, methods of breaking seed dormancy, physiology of seed germination. Plant movements: directional and non-directional. Plant growth regulators – natural and synthetic hormones, structure and physiological role of auxins, gibberellins, cytokinins, abscissic acid, ethylene in plants

Text Books:

1. Das, S. and Bharadwaj, A.B. Plant Physiology Wisdom Press, New Delhi

2. Gupta, N. K. and S. Gupta. 2005. _Plant Physiology‘, Oxford & IBH publishing Co. Ltd., New Delhi

3. Dutta, K. _Plant Physiology‘, 2000. Narosa Publishers, New Delhi.

4. Noggle, G. R. and G. J. Fritz. Introductory Plant Physiology, Second Edition, Prentice-Hall of India Ltd., New Delhi.

5. Srivastava, L.M. 2010. _Plant Growth and Development: Hormones and Environment‘, Academic Press, California.

6. Verma, S. K. A Text Book of Plant Physiology and Biochemistry, Fourth Edition, ISBN: 81-219-0627-X

References:

1. Tazia, L. and Zeiger, E. _2010. _Plant Physiology‘, V Edition, The Benjamin and Cummings Publishers, California

2. Hopkins, W.G. and Hunter, N.P.A. 2009. _Introduction to Plant Physiology‘, IV Edition, Wiley, New York.

3. Salisbury, F. B. and Ross, C. W. 1992. _Plant Physiology‘, Asia Ltd., Singapore.

4. Devlin, R. M. and Witham, F.H.1986. _Plant Physiology‘, Fourth Edition, CBS Pub., Delhi.

Web Resources:

1.https://www.pdfdrive.com/introduction-to-plant-physiology-4th-edition-e43384728.html
2.https://www.pdfdrive.com/plant-physiology-3rd-ed-e18720390.html
3. https://www.pdfdrive.com/plant-physiology-development-and-metabolism-e187696874.html
4. https://www.pdfdrive.com/plant-physiology-development-and-metabolism-e187696874.html
5. file:///C:/Users/admin/Downloads/Plant%20Physiology%20(%20PDFDrive%20).pdf

Course Designers:

1.Dr.B.Sadhana

2.Dr.R.Aruna

Thiagarajar College (Autonomous):Madurai–625009
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Department of Botany

(For those who joined B. Sc., Botany on or after June 2020)

Course Code	Course Title	Category	L	T	P	Credit
UBO20CL61	**Plant Physiology lab**	**Core Lab 8**	**-**	**-**	**3**	**2**

L - Lecture T - Tutorial P - Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
III	**VI**	**40**	**60**	**100**

Preamble

Imparting the knowledge to the students in the subject of different physiological mechanisms in plants and stimulate the plant growth based on the regulatory factor

Course Outcomes

On completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Explain the functional behavior of plasma membrane system and water transport in plants	100%	80%
CO2	Calculate stomata frequency in different plants	100%	80%
CO3	Identify the photosynthetic efficiency of plants under different light source	100%	70%
CO4	Calculate the RQ value of physiological reactions in plants	100%	80%
CO5	Measure the plant growth by graphical method	100%	80%

K1 - Knowledge K2 - Understand K3 - Apply

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**S**	**L**	**S**	**M**	**S**
CO2	**S**	**M**	**L**	**M**	**S**	**S**
CO3	**M**	**S**	**M**	**S**	**L**	**S**
CO4	**S**	**S**	**L**	**M**	**L**	**S**
CO5	**S**	**S**	**L**	**L**	**M**	**S**

Strong(S), Medium(M), Low(L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	S
CO2	S	M	S	M	S
CO3	S	S	M	S	M
CO4	S	S	M	M	S
CO5	S	S	M	M	M

Strong(S), Medium(M), Low(L)

Title of the paper: Plant Physiology Lab

I. Experiments

1.Determine the water potential of plant material using Gravimetric method, plasmolytic method and Charkadov's/Methylene blue falling-drop method

2. Determine the imbibition rate of plant seeds under varying temperature

3. Determine the membrane permeability of plant material at varying temperature

4. Determine of membrane permeability of plant material under varying concentration of detergent

5. Comparatively determine the stomatal frequency and stomatal index of different leaf samples

6. Effect of various light intensity on the photosynthetic efficiency of *Hydrilla* plant

7. Effect of various concentrations of Sodium bicarbonate on the photosynthetic efficiency of Hydrilla

8. Measurement of leaf area in ascending/descending leaf positions in *Acalypha indica*

II. Demonstration

1. Ascent of sap in Balsam plant

2. Potato osmoscope

3. Ganong'spotometer for the rate of transpiration

4. Respiration efficiency of germinating seeds using respiroscope

5. Kune's tube – Fermentation

6. Clinostat

7. Lever auxonometer

8. Nastic movements

9. Girdling Experiment

III. Field study: Collect ten samples from mineral deficient plant

Course Designers:

1.Dr.B.Sadhana

2. Dr.R.Aruna

Thiagarajar College (Autonomous):Madurai–625009
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Department of Botany

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Course Code	Course Title	Category	L	T	P	Credit
UBO20C62	Plant Biotechnology	Core-14	4	-	-	4

L - Lecture T - Tutorial P - Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
III	VI	25	75	100

Preamble

To equip the students with the basic principles of biotechnology, updated methodologies, techniques and applied aspects of Plant Biotechnology

Course Outcomes

On completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Explain the basic principles of biotechnological innovations	100%	60%
CO2	Distinguish between the types of fermentation	90%	70%
CO3	Demonstrate the production of biofuels and Biopesticides	80%	80%
CO4	Depict the production of organic acids through biotechnology	80%	80%
CO5	Prepare medium for tissue culture and produce plants	80%	80%

K1 - Knowledge K2 - Understand K3 – Apply

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**S**	**L**	**S**	**M**	**S**
CO2	**S**	**M**	**L**	**M**	**S**	**S**
CO3	**S**	**S**	**M**	**S**	**L**	**S**
CO4	**S**	**M**	**S**	**L**	**L**	**S**
CO5	**S**	**S**	**S**	**M**	**S**	**S**

Strong(S), Medium(M), Low(L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**S**	**S**	**S**	**M**
CO2	**S**	**M**	**M**	**M**	**S**
CO3	**S**	**S**	**M**	**S**	**S**
CO4	**S**	**M**	**S**	**M**	**S**
CO5	**S**	**S**	**S**	**M**	**S**

Strong(S), Medium(M), Low(L)

Blooms taxonomy

	CA		Endof Semester
	First	Second	
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%
Total	52	52	140

Title of the paper: Plant Biotechnology

Unit I: Biotechnology-Introduction and application in various fields. Genetic engineering tools: Restriction endonuclease, DNA ligase, reverses transcriptase and alkaline phosphatase. Vectors-Plasmid vectors (pBR322, pUC and Ti Plasmid) and lambda bacteriophage vectors. Transformation techniques. Screening of recombinants – Replica plating method and Visual selection.

Unit II: Fermentation–solid state fermentation(SSF)–submerged state fermentation (SmSF) – Batch, continuous, fed batch fermentation – design of batch fermenter, alcoholic fermentation: industrial production of beer, wine and industrial alcohol.

Unit III: Bio fuels: Methanogenesis and biogas production, Bio dyes, Petro crops, Biodegradable plastics. Biopesticides – *Bacillus thuringiensis*. Mass production of single cell protein: Yeast and *Spirulina.*

Unit IV: Industrial production of organic acid (citric acid), Enzymes (amylase), amino acid (glutamicacid), vinegar, enzymes (protease) and antibiotics (penicillin). Immobilization of enzymes - methods and applications.

Unit V: Plant tissue culture: Introduction, principles, callus culture, suspension culture, organogenesis and application of plant tissue culture. Transgenic plants: Insect resistance, Herbicide resistant plants and Golden rice.

TextBooks:

1. Dubey R.C.,2002. A Text Book of Biotechnology, S.Chand and Co. New Delhi.
2. Patel A.H.,1996.IndustrialMicrobiology.MacMillan India Ltd. Delhi.
3. Slater,A.,N.W.Scottand M.R.Fowler.2009. Plant Biotechnology: the genetic manipulation of plants, Oxford University Press, US.

References:

1. Ignacimuthu,S.J.,1997.Plant Biotechnology, Oxford and IBH Publishing Company, New Delhi.
2. KumaresanV.1994. Biotechnology, Saras Publications, Nagercoil.

Course designers:

1. Dr. K. Jegathesan
2. Dr.M. Viji

Thiagarajar College (Autonomous):Madurai–625009

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Department of Botany

(For those who joined B. Sc., Botany on or after June 2020)

Course Code	Course Title	Category	L	T	P	Credit
UBO20CL62	Plant Biotechnology Lab	Core Lab 9	-	-	3	2

L - Lecture T - Tutorial P - Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
III	VI	40	60	100

Preamble

To equip the students with the basic principles of biotechnology, updated methodologies, techniques and applied aspects of Plant Biotechnology

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Isolate DNA from Plants	100%	80%
CO2	Produce and estimate alcohol by fermentation	100%	80%
CO3	Demonstrate Immobilization of microbes	100%	80%
CO4	Depict the production of organic acids through biotechnology	100%	80%
CO5	Prepare medium for tissue culture and produce plants	100%	80%

K1 - Knowledge K2 - Understand K3 - Apply

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**S**	**L**	**S**	**M**	**S**
CO2	**S**	**S**	**L**	**M**	**S**	**S**
CO3	**S**	**S**	**M**	**S**	**S**	**S**
CO4	**S**	**S**	**L**	**M**	**S**	**S**
CO5	**S**	**S**	**L**	**M**	**M**	**S**

Strong(S), Medium(M), Low(L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**S**	**S**	**M**	**S**
CO2	**S**	**M**	**S**	**M**	**S**
CO3	**S**	**S**	**M**	**S**	**S**
CO4	**S**	**S**	**M**	**M**	**S**
CO5	**S**	**S**	**S**	**S**	**M**

Strong(S), Medium(M), Low(L)

Title of the paper: Plant Biotechnology Lab

1. Isolation of genomic DNA from Onion
2. Demonstration of wine fermentation–estimation of ethanol
3. Yeast biomass estimation by turbidity method
4. Cell counting using haemocytometer
5. Immobilization of yeast cell
6. *Spirulina* cultivation
7. Agar production from *Gracilaria*
8. Citric acid production using *Aspergillus niger*
9. Amylase production using fungi (Plate assay)
10. Replica plating method for identifying antibiotic resistant mutants

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Department of Botany

(For those who joined B. Sc., Botany on or after June 2020)

Course Code	Course Title	Category	L	T	P	Credit
UBO20C63	Plant Ecology and Biodiversity	**Core 15**	**3**	**-**	**-**	**3**

L-Lecture T-Tutorial P-Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	**Sixth**	**25**	**75**	**100**

Preamble

To inculcate the knowledge on components and interactions in the environment with their values

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Comprehend the components in an ecosystem and biogeochemical cycles	80%	70%
CO2	Recognize the pattern of interactions among the living organisms and plant adaptations	80%	70%
CO3	Sensitize the causes and consequence of natural and man-made disasters	80%	70%
CO4	Acquire the values of biodiversity and vegetation analysis	80%	70%
CO5	Explore the methods of conservation of nature	80%	70%

K1 - Knowledge K2 - Understand K3 - Apply

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**L**	**M**	**S**	**M**	**L**
CO2	**S**	**S**	**L**	**M**	**S**	**L**
CO3	**S**	**S**	**M**	**S**	**S**	**M**
CO4	**M**	**S**	**L**	**S**	**S**	**M**
CO5	**M**	**M**	**L**	**L**	**S**	**S**

Strong(S), Medium(M), Low (L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**S**	**L**	**S**	**L**
CO2	**L**	**S**	**L**	**S**	**L**
CO3	**M**	**S**	**L**	**S**	**M**
CO4	**L**	**M**	**M**	**L**	**S**
CO5	**M**	**L**	**M**	**M**	**S**

Strong(S), Medium(M), Low (L)

Blooms taxonomy

	CA		Endof Semester
	First	Second	
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%
Total	52	52	140

Title of the Course: Plant Ecology and Biodiversity

UnitI: Ecology – Introduction, concept and scope. Ecosystem –types- aquatic, terrestrial Components and their interrelationships; Food chain, Food web; Energy flow in ecosystems, Ecological pyramid models; Biogeochemical cycles – Carbon cycle and Nitrogen cycle

UnitII: Ecological succession – Definition and terminologies – Hydrosere and Xerosere; Autecology – Plant adaptations (External and internal structures only) – Hydrophytes and Xerophytes, Synecology - Interrelationships among organisms – Mutualism and Parasitism

Unit III: Natural disasters (causal factors and impacts only) – Cyclones, landslides volcanic eruption – Pollution – Categories – Causal factors, effects and control measures – Air pollution, water pollution and noise pollution; Global Warming and Green House effect – Natural and man-made causes and impacts – preventive measures – Climate Change Summits - Rio Summit (1992) and Warsaw Summit (2013)

Unit IV: Biodiversity – Scope of the study – Components and Categories of biodiversity; Diversity Hotspots – Hotspots in India, Forest Types. Biodiversity values – Consumptive, productive, ethnobotanical values; – Methods of vegetation analysis – Quadrat method – frequency, density, abundance. Role of Remote sensing and GIS in vegetation analysis

Unit V: Biodiversity conservation – Categories – In-situ and ex-situ methods: Reserve forests, National Park, Wildlife sanctuaries – Ex-situ methods: Botanical garden, seed bank. IUCN Red Data Book – red listed Categories. Forest Protection Act and Biodiversity Protection Act (Key features only)

Text Books:

1. Saha, T.K. 2011. Text Book of Ecology & Environmental Biology, Books and Allied Publishers, Kolkatta.
2. Krishnamurthy, K.V. 2004. Text Book of Biodiversity, Oxford and IBH Publishing Company Pvt. Ltd., New Delhi.

References:

1. Peter Stiling. 2002. Ecology: Theories and Applications, Prentice-Hall of India, New Delhi.
2. Daniels, R.J.B. and J.K. Krishnamoorthy. 2009. Environmental Studies, Wiley India, New Delhi.
3. Colin R., Townsend, M. Begon and J.L. Harper. 2006. Essentials of Ecology, Second Edition, Blackwell
4. Publications, USA.
5. Dan L. Pelman and Glenn Adelson. 2007. Biodiversity: Exploring values and Priorities in Conservation. Blackwell Publishers, UK.
6. David William Pearce and Dominic Moran. 2013. The Economic value of Biodiversity, Routledge, Taylor & Francis Group, UK.

Web Resources:

www.easybiologyclass.
www.slideshare.com
https://www.biologydiscussion.com

Course Designers:

1.Dr.T.M.Jothimani

Thiagarajar College (Autonomous):Madurai–625009
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Department of Botany

(For those who joined B. Sc., Botany on or after June 2020)

Course Code	Course Title	Category	L	T	P	Credit
UBO20CL63	Plant Ecology and Biodiversity Lab	**Core Lab - 10**	**-**	**-**	**3**	**2**

L-Lecture T-Tutorial P-Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	**Sixth**	**40**	**60**	**100**

Preamble

To inculcate the knowledge on components and interactions in the environment with their values

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Construct Quadrats	100%	70%
CO2	Calculate IVI	100%	70%
CO3	Estimate DO and other nutrients	100%	70%
CO4	Depict the hydrophytic and xerophytic adaptations	100%	70%
CO5	Determine the soil nutrients	100%	70%

K1 - Knowledge K2 - Understand K3 - Apply

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**L**	**M**	**S**	**M**	**L**
CO2	**S**	**S**	**L**	**M**	**S**	**L**
CO3	**S**	**S**	**M**	**S**	**S**	**M**
CO4	**M**	**S**	**L**	**S**	**S**	**M**
CO5	**M**	**M**	**L**	**L**	**S**	**S**

Strong(S), Medium(M), Low (L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**S**	**L**	**S**	**L**
CO2	**L**	**S**	**L**	**S**	**L**
CO3	**M**	**S**	**L**	**S**	**M**
CO4	**L**	**M**	**M**	**L**	**S**
CO5	**M**	**L**	**M**	**M**	**S**

Title of the Course Plant Ecology and Biodiversity Lab

1. Study of plant community by Quadrat method.
2. Calculation of important value index.
3. Determination of dissolved oxygen in the given water sample.
4. Determination of free CO2 in the given water sample.
5. Determination of chlorides in the water sample.
6. Determination of soil organic carbon
7. Determination of soil nitrogen
8. Determination of BOD
9. Study of morphology and anatomy of hydrophytes (any two)
10. Study of morphology and anatomy of xerophytes (any two)

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Course Code	Course Title	Category	L	T	P	Credit
UBO20C64	IPR AND BIOSAFETY	L	3	-	-	3

L - Lecture T - Tutorial P - Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third year	VI	25	75	100

Preamble

To equip students with basic knowledge about IPR and Biosafety

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Acquire knowledge on various concepts of IPR.	80%	70%
CO2	Apply the knowledge of Patenting.	70%	70%
CO3	Analyze the concepts of copyright	60%	80%
CO4	Make use of knowledge in trademark and practices	70%	80%
CO5	Evaluate biosafety measures	70%	70%

K1 - Knowledge K2 - Understand K3 - Apply

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	M	S	S	S
CO2	S	M	M	S	S	S
CO3	S	S	M	S	S	S
CO4	S	M	M	S	S	S
CO5	S	S	M	S	S	S

Strong(S), Medium(M), Low(L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**S**	**M**	**S**	**S**
CO2	**S**	**S**	**M**	**S**	**S**
CO3	**S**	**S**	**S**	**S**	**S**
CO4	**S**	**S**	**M**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**

Strong(S), Medium (M), Low(L)

Blooms taxonomy

	CA		End of Semester
	First	**Second**	
Knowledge	**40%**	**40%**	**40%**
Understand	**40%**	**40%**	**40%**
Apply	**20%**	**20%**	**20%**
	52	**52**	**140**

Title of the paper

Unit I: Principles of IPR - Introduction to Intellectual Property Rights - Concept and Theories - Kinds of Intellectual Property Rights - Need for Private Rights versus Public Interests - Advantages and Disadvantages of IPR.

Unit II: Patent law and Practices - Introduction to Patents - Historical development - Patent Act 1970 – amendments of 1999, 2000, 2002 and 2005 - Patentable subject matter, Patentability criteria, Pharmaceutical products, Working of Patents, Compulsory License, Acquisition, Surrender, Revocation, restoration, Transfer of patent rights.

Unit III: Copyright and Practices: Concept and Principles - Historical background - Development of Copyright Law - Universal Copyright Convention, International Copyright Act - Copyright Act, 1957 - Terms of Copyright conditions for grant of copyright.

Unit IV: Trademark and Practices –Introduction - Historical development of the trademark -Need for Protection. Kinds of trademarks, Concept of Well known trademark, Registration of trademark - Procedure of registration of trademark.

Unit V: Bio-safety: Institutional biosafety Committee (IBSC) – Functions of IBSCs – Organization network.- National Good Laboratory Practice Programme – GLP authority functions – standard tests for clinical trials.

Text Books:

1. B.L. Wadera (2010), Patents, trademarks, copyright, Designs and Geographical Iudications, Universal Law Publishing, India

2. N.S. Gopalakrishnan & T.G. Agitha, Principles of Intellectual Property (2009), Eastern Book Company, Lucknow

3. Senthil Kumar Sadasivam and Mohammed Jaabir M. S. (2008). IPR, Biosafety and Biotechnology Management, Jasen Publications, India

References:

1. V. Scople Vinod, Managing Intellectual Property (2012)., Prentice Hall of India Pvt Ltd.

2. S. V. Satakar, "Intellectual Property Rights and Copy Rights (2002), EssEss Publications, New Delhi.

Web Resources:

1. https://www.coursera.org/learn/patenting-bio-ipr
2. https://onlinecourses.nptel.ac.in/noc20_bt42/preview

Course Designers:

1.Dr.R.Aruna

Thiagarajar College (Autonomous):Madurai–625009
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Department of Botany

(For those who joined B. Sc., Botany on or after June 2020)

Course Code	Course Title	Category	L	T	P	Credit
UBO20CE61(A)	Basics of Molecular Biology	Core Elective- 2	5	-	-	5

L-Lecture T-Tutorial P-Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	Sixth	25	75	100

Preamble

To acquire the realisation of basic Nucleic acids architecture and its expressions

Course Outcome

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	demonstrate the basic structure of DNA & RNA	80%	80%
CO2	explain about replication and its errors	80%	80%
CO3	explain the mechanism of transcription	80%	80%
CO4	differentiate various RNA and its transcriptional modifications	80%	80%
CO5	depict the mechanism of translation	80%	80%

K1 - Knowledge K2 - Understand K3 - Apply

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	L	S	S	S
CO2	S	S	M	S	M	S
CO3	S	S	L	S	S	S
CO4	S	M	L	M	M	S
CO5	S	M	M	S	L	S

Strong(S),Medium(M),Low (L)

Mapping of COs with PSOs

	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	M	M	S	S	S
CO4	S	S	M	M	S
CO5	S	S	S	S	S

Blooms taxonomy

	CA		Endof Semester
	First	Second	
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%
Total	52	52	140

Title of the Course: Basics of Molecular Biology

Unit I: Nucleic acids: DNA & RNA structure and organization. DNA Replication - principles and types - bidirectional replication, Semiconservative, Semi discontinuous. Replication Fork, Okazaki fragments.

Unit II: Role of Enzyme involved in DNA replication – DNA polymerases, DNA ligase and Primase DNA Replication Errors, DNA Damage–Types of damage. DNA Repair–types and mechanisms

Unit III: Transcription – DNA to RNA, RNA Polymerase and the transcription unit. Mechanism of Transcription in Prokaryotes Transcription in Eukaryotes

Unit IV: RNA: tRNA, mRNA and rRNA - Concept of introns and exons, Post transcriptional modifications- mRNA splicing mechanisms, 5‘capping and 3‘poly A tailing

Unit V: Translation in Prokaryotes and Eukaryotes. Salient features of Genetic Code. Protein synthesis: Initiation, elongation and termination of polypeptides.

Text books:

1. Freifelder, D. Molecular Biology. Singh, B.D., 1998. Biotechnology. Kalyani publishers, New Delhi.
2. Sheeler, P. and D.E. Binachi 2004. Cell &Molecular Biology, John Wile & Sons, NewYork
3. Gupta, P.K.1994. Elements of Biotechnology, Rastogi and Co., Meerut, India.

Course designers

1. Dr. V. Karthikeyan

2. Dr. M.Viji

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Department of Botany

(For those who joined B. Sc., Botany on or after June 2020)

Course Code	Course Title	Category	L	T	P	Credit
UBO20CE61(B)	Plant Resources and their Utilisation	Core Elective- 2	5	-	-	5

L-Lecture T-Tutorial P-Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	Sixth	25	75	100

Preamble

To furnish with the basic concepts of economically important plants

Course Outcome

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Basic knowledge about the Plant resources and their uses	80%	80%
CO2	Economic importance of economically important plants like food plants, spices, beverages	80%	80%
CO3	Economic importance of economically important plants like fibre, wood and cork, dye and resins	80%	80%
CO4	Economic importance of economically important plants like plantation crops and medicinal plants	80%	80%
CO5	Economic importance of economically important plants like	80%	80%

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	L	S	S	S
CO2	S	S	M	S	M	S
CO3	S	S	L	S	S	S
CO4	S	M	L	M	M	S
CO5	S	M	M	S	L	S

Strong(S),Medium(M),Low (L)

Mapping of COs with PSOs

	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	M	M	S	S	S
CO4	S	S	M	M	S
CO5	S	S	S	S	S

Strong(S),Medium(M),Low (L)

	CA		Endof Semester
	First	Second	
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Blooms taxonomy			
Total	52	52	140

Title of the Course: Plant Resources and their Utilisation

Unit I: Understanding Plant resources – Categorisation important plants: Food plants, Medicinal plants, Food Adjuncts – Spices and condiments. Nutraceutical values of lower plants: Algae, Fungi, Lichens.

Unit II: Botanical names, Morphology, useful parts and uses of the following: Food plants: *Oryza sativa* (Rice), *Triticum aestivum* (Wheat), *Vigna mungo*(Black gram), *Cocos nucifera* (Coconut), *Solanum tuberosum* (Potato), *Brassica oleracea* (Cabbage), *Solanum lycopersicum* (Tomato), *Mangifera indica* (Mango) and (Banana) Beverages: *Coffea arabica* (Coffee) and *Camellia sinensis* (Tea) Spices and Condiments: *Zingiber officinale* (Ginger) and *Cuminum cyminum* (Cumin)

Unit III: Botanical names, Morphology, useful parts and uses of the following: Fibre and fibre yielding plants: *Gossypium hirsutum* (Cotton) and *Corchorus capsularis* (Jute).Wood and Cork: *Dalbergia latifolia* (Rose wood), *Tectona grandis* (Teak). Tannin and Dye yielding plants: *Albizzia lebbeck* (Vagai), *Cassia alata* (SeemaiAgathi), and *Lawsonia inermis* (Maruthani) Gums and Resins: *Acacia senegal* (Suddaykeeray), *Moringa oleifera* (Murungai).

Unit IV: Botanical names, Morphology, useful parts and uses of the following: Plantation crops: *Casuarina equisetifolia* (Sea oak) and *Hevea brasiliensis* (Rubber). Medicinal Plants: *Allium cepa* (Onion), *Ocimum tenuiflorum* (Holy Basil), *Piper nigrum* (Pepper), *Curcuma longa,* (Turmeric) and *Azadirachta indica (*Neem).

Unit V: Botanical names, Morphology, useful parts and uses of the following: Oil yielding plants: *Helianthus annus* (Sunflower), *Sesamum indicum* (Sesame), *Ricinus communis*(Castor) and *Eucalyptus globulus* (Eucalyptus). Organic manure – Types: Agriculture waste compost, Coir pith compost and Vermi compost.

Text Books:

1. Sambamurthy, A.V.S.S. and N.S. Subramanyam, 1989. A Text Book of Economic Botany, Wiley-Eastern Ltd, New Delhi.

2. Pandey, B.P. 2012. Economic Botany, S.Chand & Company Ltd, New Delhi.

Reference Books:

1. Kochhar, S.L. 1995. Economic Botany in the Tropics, Macmillan India Ltd., Delhi.

2. Sharma, O.P. 1996. Hill s Economic Botany, Tata McGraw Hill Co. Ltd., New Delhi.

3. Peter B. Kaufman et al., 1999. Natural Products from Plants, Second Edition,

Google ebook. http://trove.nla.gov.au/version/46518552

Course Designer:

Dr.V.Karthikeyan

Thiagarajar College (Autonomous):Madurai–625009
(Reaccredited with A++ by NAAC)
Department of Botany

(For those who joined B. Sc., Botany on or after June 2020)

Course Code	Course Title	Category	L	T	P	Credit
UBO20SE61(A)	Seed and Nursery Technology	SBE2	2	-	-	2

L - Lecture T - Tutorial P - Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
III	VI	15	35	50

Preamble

To develop the students with the knowledge and skills in the field of Seed and Nursery Management Techniques

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Reveal the structure of seeds with their categories and to differentiate between the seed and grain	80%	60%
CO2	Specify the qualities of seeds for their better performance	80%	60%
CO3	Apply the knowledge of seed technology in seed certification process	80%	60%
CO4	Recognize the types, basic requirements, soil mix and nursery lay out design	80%	60%
CO5	Relate the pest and disease management, packing and transportation,	80%	60%

K1 - Knowledge K2 - Understand K3 - Apply

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	L	L	S	S	L
CO2	S	S	L	S	L	M
CO3	L	S	M	S	L	S
CO4	S	L	L	S	L	L
CO5	S	M	L	S	M	M

Strong(S), Medium(M), Low(L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**L**	**L**	**M**	**L**
CO2	**S**	**M**	**L**	**S**	**L**
CO3	**M**	**S**	**M**	**M**	**S**
CO4	**S**	**M**	**M**	**L**	**L**
CO5	**S**	**L**	**M**	**L**	**L**

Strong(S), Medium(M), Low(L)

Blooms taxonomy

	CA		End of Semester
	First	**Second**	
Knowledge	**30%**	**30%**	**30%**
Understand	**30%**	**30%**	**30%**
Apply	**40%**	**40%**	**40%**

Title of the paper

Unit I: Seed Technology Seed: Definition, Structure of monocot and dicot seed, Categories with examples: size, shape, endosperm nature., Grain and seed differences, Attributes of quality - appearance, disease -free conditions, viability, dormancy seeds; Seed Technology - Principle, seed collection, storage and packing - indigenous techniques, physical and chemical and biological methods for storage; Seed testing and certification - Standards and basic methods; International Seed Testing Association (ISTA), OECD seed certification guideline and National testing and certifying agencies, Government and Private Seed Organizations and role - 15 Hrs.

Unit 2: Nursery Technology: Nursery – types - open, shade net, glass house - general structures, basic requirements; planning and layout design. Nursery management practices - Principle and practice - site selection, Soil mix, Mother bed preparation, container types, watering methods and schedule planting methods, weed management, training methods, Integrated pest and disease management; Seedling collection, packing and transpiration, Cost estimation on seedling production and packing 15 Hrs.

Text Books:

1. Roy, 2020. Essentials of Plant Nursery Management 2nd Edition, Scientific Publishers, New Delhi
2. Subir Sen and Nabinandha Gosh, 2014, Seed Science Technology, Kalyani Publishers, Ernakulam
3. Jodhpur Padmavathi, S., 2012, A Text Book of Seed Science And Technology, NIPA Genx Electronic Resources & Solutions P. Ltd., New Delhi
4. Tomer Harpal Singh., 2014 Seed Technology Aman Publishing House, Meerut
5. Agrawal RL. 1996. Seed Technology. Oxford Publ. UK

References:

1. Shirley Doy (Ed.), Seed Science and Technology, 2017 White Word Publications, USA

2. Rathakrishnan, P., Kalia J.C. Tewari M.M. Roy, 2014. Plant Nursery Management: Principles and
Practices, ICAR Institute, Jodhpur
3. Ellis, R H | Hong, T D | Roberts, E H, 1985. Handbook of seed technology for gene banks Vol 2
compendium of specific germination information and test recommendations,
4. Barton LV. 1985. Seed Preservation and Longevity. International Books and Periodicals Supply
Service, New Delhi

Web Resources:

https://onlinecourses.swayam2.ac.in/cec22_ag03/preview(Principles of Seed Technology)
https://sac-elearning.com/courses/seed-technology/(Seed Technology)

Course Designers:

1. Dr. D. Kannan

Thiagarajar College (Autonomous):Madurai–625009
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Department of Botany

(For those who joined B. Sc., Botany on or after June 2020)

Course Code	Course Title	Category	L	T	P	Credit
UBO20SE61(B)	Seaweed Technology	SBE2	2	-	-	2

L - Lecture T - Tutorial P - Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
III	VI	15	35	50

Preamble

To develop the students with the knowledge and skills in the field of Seaweeds and their utilisation

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Reveal the various types of Seaweeds	80%	60%
CO2	Specify structure of Phycocolloids	80%	60%
CO3	Extract phycocolloids	80%	60%
CO4	describe the methods seaweed cultivation	80%	60%
CO5	Install seaweed cultivation test plants	80%	60%

K1 - Knowledge K2 - Understand K3 - Apply

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**L**	**L**	**S**	**S**	**L**
CO2	**S**	**S**	**L**	**S**	**L**	**M**
CO3	**L**	**S**	**M**	**S**	**L**	**S**
CO4	**S**	**L**	**L**	**S**	**L**	**L**
CO5	**S**	**M**	**L**	**S**	**M**	**M**

Strong(S), Medium(M), Low(L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**L**	**L**	**M**	**L**
CO2	**S**	**M**	**L**	**S**	**L**
CO3	**M**	**S**	**M**	**M**	**S**
CO4	**S**	**M**	**M**	**L**	**L**
CO5	**S**	**L**	**M**	**L**	**L**

Blooms taxonomy

	CA		End of Semester
	First	**Second**	
Knowledge	**30%**	**30%**	**30%**
Understand	**30%**	**30%**	**30%**
Apply	**40%**	**40%**	**40%**

Title of the paper: Seaweed Technology

Unit I: Seaweed resources in India and abroad. General features of Rhodophyta (*Gracilaria*) and Chlorophyta(*Ulva*). Chemical structure, Method of extraction and uses of industrial phycocolloids – Agar, Carrageenan, Alginate and fucoidan

Unit II: Methods of commercial cultivation of Seaweeds. Objectives – Site selection, Installation of test plants, Kinds of test planting, Introduction of test plants. Preparation of the farm site and – construction of farm – Line method, Rope & Raft methods, Net method – Floating bamboo method – Mangrove stakes and nets-method.

Text book:

1. Christopher S. Lobban ; Michael James Wynne ; 1981 The Biology of seaweeds Berkeley : University of California Press

Books for Reference:

1. Bold, H.C. and Wynne, M.J., 1978: Introduction to the Algae. Structure and Reproduction. Prentice-Hall, Englewood Cliffs. New Jersey
2. Tait R.V. and Dipper F.A. 1998 Elements of Marine Ecology Edn 4 Butterworth-Heinemann Linacre House, Jordan Hill, Oxford OX2 8DP

Course Designers:

1. Dr. K.Jegatheesan

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Department of Botany

(For those who joined B. Sc., Botany on or after June 2020)

Course Code	Course Title	Category	L	T	P	Credit
UBO20SE61(C)	Biopesticides	SBE2	2	-	-	2

L - Lecture T - Tutorial P - Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
III	VI	15	35	50

Preamble

To develop the students with the knowledge and skills in the field of Biopesticides

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Reveal the various types of Biopesticides	80%	60%
CO2	Specify the mechanism of action of Biopesticides	80%	60%
CO3	Demonstrate the formulation of Biopesticides	80%	60%
CO4	perform dry formulation methods	80%	60%
CO5	Perform wet formulation methods	80%	60%

K1 - Knowledge K2 - Understand K3 - Apply

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	L	L	S	S	S
CO2	S	S	L	S	S	M
CO3	S	S	M	S	S	S
CO4	S	L	L	S	S	S
CO5	S	M	L	S	M	M

Strong(S), Medium(M), Low(L)

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**S**	**S**	**M**	**S**
CO2	**S**	**M**	**S**	**S**	**S**
CO3	**M**	**S**	**M**	**M**	**S**
CO4	**S**	**M**	**M**	**S**	**M**
CO5	**S**	**S**	**M**	**S**	**S**

Strong(S), Medium(M), Low(L)

Blooms taxonomy

	CA		End of Semester
	First	**Second**	
Knowledge	**30%**	**30%**	**30%**
Understand	**30%**	**30%**	**30%**
Apply	**40%**	**40%**	**40%**

Title of the paper: Biopesticides

Unit I: Types of Plant pests: Insects & Nematodes, Biopesticides: Introduction, importance and classification – Botanical, Bacterial and viral Biopesticides – Mechanism of action and uses – Advantages of Biopesticides. Isolation, identification, mode of action and mass production of *Pseudomonas fluorescence* (bacterial agent), *Trichoderma viride* (fungal agent);

Unit II: Production methods of biopesticides: Liquid culture fermentation – Types of biopesticide formulations; Dry inoculum, Granules, Pellets, Capsules, Wettable powder and liquid formulations. Genetic engineering and pest resistant plants (outline only).

Text Books:

1. Ghosh, G.K. 2000. Biopesticide and Integrated pest management, APH Publishing corporation, New Delhi.
2. Subba Rao, N.S. 1982. Advances in Agricultural Microbiology, Oxford & IBH Publishing Company, Chennai.

Reference Books:

1. Hell, F.R. and Menn, J.J. 1999. Biopesticides – Use and delivery, Humene Press, New Jersey.
2. Dent, D. 2000. Insect Pest Management, Second Edition, ABI Publishers, UK.

Course Designers:

1. Dr. K.Jegatheesan