



SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE

(Autonomous)

[An Autonomous College Affiliated to Periyar University, Salem, Tamil Nadu]

[Accredited by NAAC with 'A' Grade with CGPA of 3.27]

[Recognized 2(f) & 12(B) Status under UGC Act of 1956]

Katteri – 636 902, Uthangarai (Tk), Krishnagiri (Dt)

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DEGREE OF BACHELOR OF SCIENCE IN BOTANY

CHOICE BASED CREDIT SYSTEM (CBCS)

REGULATIONS AND SYLLABUS FOR

B.Sc. BOTANY PROGRAMME

(SEMESTER PATTERN)

(For Students Admitted in the College from the
Academic Year 2020-2021 Onwards)



Programme Outcomes (POs)

PO1	The study of botany will provide a good knowledge about Microbiology, Phycology, Taxonomy, Molecular Biology, Medicinal plants, Plant Tissue Culture and Ecological distributions.
PO2	Acquire tremendous opening to enhance the plant science knowledge on Plant Diversity and ecological dimension of vascular cryptogams and Angiosperms and to study the plant kingdom.
PO3	Gain knowledge and understand the range of plant diversity in terms of structure, function and environmental relationship from primitive to highly evolved plant groups.
PO4	Gather knowledge on various physiological and biochemical pathways and their vital role in biotic factors.
PO5	Apply logical information on the significance of moral natural standards and resulting duties applicable to biodiversity protection, practical and manageable utilization of plants.
PO6	Students can reveal the medicinal properties of plants in the socioeconomic values of identified plant sciences and to spread information on different parts of therapeutic plants and proper contemplations on human health issues.
PO7	Information on conservation of plant resources and different hotspots expand studies to investigate their helpful qualities economically, socially and aesthetically.
PO8	Use look into research based information and research techniques including the lab experiments, analysis and data prediction, information, and advancement of the data to provide a substantial ends.



Programme Specific Outcomes (PSOs)

PSO1	Through scientific classification, the students understand about the plant communities and binomial names, economic significance including the utilizations and varieties among several types of Angiosperms.
PSO2	Students can apply the knowledge and relate the information gained from the allied subjects viz; Zoology and Chemistry, to explain and conclude through the interdisciplinary approaches.
PSO3	The students enhance knowledge on the pathways of metabolisms, transport and translocation of water and solutes and biochemical parameters like carbohydrate, protein and lipid together with a better understanding of regulation of growth, development and influence of environment.
PSO4	The students will have the option to secure tremendous academic information on the science of fossils and living plants alongside their associations with their condition in the environment.
PSO5	Investigation of horticulture and arranging procedures helps to the students to execute information on the procedure of development of nurseries and the management and maintenance of the gardens.



SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE

(Autonomous)

Bachelor of Science (B.Sc.) in Botany

Programme Pattern and Syllabus (CBCS)

(For Students Admitted in the College from the Academic Year 2020-2021 Onwards)

Sl. No.	Part	Nature of Course	Course Code	Name of the Course	Hours/Week	Credits	Marks		
							CIA	ESE	Total
SEMESTER I									
1	I	Language	20UTA1F01	Tamil – I	6	3	25	75	100
2	II	Language	20UEN1F01	English– I	6	3	25	75	100
3	III	Core – I	20UBO1C01	Plant Diversity – I (Algae, Fungi, & Lichen)	4	5	25	75	100
4		Core Practical – I Extended to Semester II	20UBO2P01	Practical – I	3	Credit and marks are carried to Core Practical – I of Semester II			
5		Allied – I	20UZO1A01	Allied Zoology – I	6	4	25	75	100
6		Allied Practical – I Extended to Semester II	20UZO2AP01	Allied Zoology Practical – I	3	Credit and marks are carried to Allied Practical – I of Semester II			
7	IV	Value Education	20UVE101	Yoga	2	2	25	75	100
Total					30	17	125	375	500
SEMESTER II									
8	I	Language	20UTA2F02	Tamil – II	6	3	25	75	100
9	II	Language	20UEN2F02	English -II	6	3	25	75	100
10	III	Core – II	20UBO2C02	Plant Diversity – II (Bryophytes, Pteridophytes, Gymnosperms and Paleobotany)	5	5	25	75	100
11		Core Practical – I Extended from Semester I	20UBO2P01	Practical – I (Algae, Fungi, Lichen, Bryophytes, Pteridophytes, Gymnosperms and Paleobotany)	3	3	40	60	100



12		Allied – II	20UZO2A02	Allied Zoology – II	4	4	25	75	100
13		Allied Practical – I Extended from Semester I	20UZO2AP01	Allied Zoology Practical – I	3	3	40	60	100
14	IV	SBEC – I	20UBO2S01	Mushroom Culture Technology	2	2	25	75	100
15		Common Paper	20UE2S02	Environmental Studies	1	2	25	75	100
Total					30	25	230	570	800
SEMESTER III									
16	I	Language	20UTA3F03	General Tamil –III	6	3	25	75	100
17	II	Language	20UEN3F03	General English – III	6	3	25	75	100
18	III	Core – III	20UBO3C03	Anatomy, Embryology of Angiosperms and Microtechniques	4	4	25	75	100
19		Core Practical – II Extended to Semester IV	20UBO4P02	Practical – II	3	Credit and marks are carried to Core Practical – II of Semester IV			
20		Allied – III	20UCH3A01	Allied Chemistry – I	4	4	25	75	100
21		Allied Practical – II Extended to Semester IV	20UCH4AP01	Allied Chemistry Practical – I	3	Credit and marks are carried to Allied Practical – II of Semester IV			
22	IV	SBEC – II	20UBO3S02	Horticulture	2	2	25	75	100
23		NMEC-I		Non-Major Elective – I	2	2	25	75	100
Total					30	18	150	450	600
SEMESTER IV									
24	I	Language	20UTA4F04	General Tamil – IV	6	3	25	75	100
25	II	Language	20UEN4F04	General English – IV	6	3	25	75	100
26	III	Core Course – IV	20UBO4C04	Cell and Molecular Biology	4	4	25	75	100
27		Core Practical – II Extended from Semester III	20UBO4P02	Practical – II Anatomy, Embryology of Angiosperms, Microtechniques,	3	3	40	60	100



				Cell and Molecular Biology					
28		Allied – IV	20UCH4A02	Allied Chemistry – II	4	3	25	75	100
29		Allied Practical – II Extended from Semester IV	20UCH4AP01	Allied Chemistry Practical – I	3	3	40	60	100
30	IV	SBEC – III	20UBO4S03	Plant Tissue Culture	2	2	25	75	100
31		NMEC-II		Non-Major Elective – II	2	2	25	75	100
Total					30	23	230	570	800
SEMESTER V									
32	III	Core Course – V	20UBO5C05	Plant Morphology, Taxonomy and Economic Botany	5	5	25	75	100
33		Core Course – VI	20UBO5C06	Genetics, Plant Breeding and Evolution	5	5	25	75	100
34		Core Course – VII	20UBO5C07	Bioinstrumentation and Biostatistics	5	5	25	75	100
35		Core Practical – III Extended to Semester VI	20UBOP603	Practical – III	6	Credit and marks are carried to Core Practical – III of Semester VI			
36		Major Elective – I	20UBO5E01	Plant Biotechnology	5	5	25	75	100
37	IV	SBEC – IV	20UBO5S04	Medico Ethno Botany	2	2	25	75	100
38		SBEC – V	20UBO5S05	Seed Technology	2	2	25	75	100
Total					30	24	150	450	600
SEMESTER VI									
39	III	Core Course – VIII	20UBO6C08	Plant Physiology, Biochemistry and Biophysics	5	5	25	75	100
40		Core Course – IX	20UBO6C09	Ecology, Phytogeography and Resource Conservation	5	5	25	75	100
41		Core Course – X	20UBO6C10	Microbiology and Plant Pathology	5	5	25	75	100
42		Core Practical – III	20UBOP603	Practical – III	3	4	40	60	100



		III Extended from Semester V		Plant Morphology, Taxonomy, Economic Botany Genetics, Plant Breeding, Evolution Bioinstrumentation and Biostatistics					
43		Core Practical – IV	20UBO6P04	Practical – IV Plant Physiology, Biochemistry Biophysics Ecology, Phyto geography Resource Conservation Microbiology and Plant Pathology	3	4	40	60	100
44		Major Elective – II (Any One)	20UBO6E02	Forestry	5	5	25	75	100
			20UBO6E03	Food and Nutrition					
45	IV	SBEC – VI	20UBO6S06	Algal Biotechnology	2	2	25	75	100
46		SBEC – VII	20UBO6S07	Nursery and Gardening	2	2	25	75	100
47	V			Extension Activities		1			
Total					30	33	230	570	800
Grand Total					180	140	1115	2985	4100

Note:

CBCS – Choice Based Credit system

CIA – Continuous Internal Assessment

ESE – End of Semester Examinations

SWAYAM – Study Webs of Active-Learning for Young Aspiring Minds

NPTEL – National Programme on Technology Enhanced Learning

**Major Elective Courses**

1. Plant Biotechnology
2. Forestry
3. Food and Nutrition

Non-Major Elective Courses

1. Mushroom Cultivation
2. Home Gardening

List of Extension Activities

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



PROGRAMME SYLLABUS



Program: B.Sc. Botany				
Core – I	Course Code: 20UBO1C01	Course Title: Plant Diversity – I (Algae, Fungi and Lichen)		
Semester I	Hours/Week 5	Total Hours 75	Credits 5	Total Marks 100

Course Objectives

1. To enhance the knowledge on Primitive plants and to know about the diversity distributions of the primitive life of the lower plants.
2. To understand the distribution, structure, reproduction and life cycle patterns of lower life forms.
3. To know the economic importance of lower plants.

SYLLABUS

UNIT - I

Algae: Introduction and general characters; detailed study of habits, habitats and distribution of algae, outline classification of algae by Fritsch (1945). Detailed study of occurrence, thallus structure, reproduction and life cycle of Cyanophyceae - *Nostoc*, Chlorophyceae – *Caulerpa* and Charophyceae- *Chara*

UNIT - II

Detailed study of occurrence, thallus structure, reproduction and life cycle of Bacillariophyceae - *Cyclotella*; Phaeophyceae - *Sargassum*; Rhodophyceae - *Gracilaria*. Economic importance of Algae.

UNIT - III

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

UNIT - IV

Detailed study of occurrence, structure, reproduction and life cycle of Ascomycetes - *Peziza*, *Saccharomyces*; Basidiomycetes – *Puccinia*; Deuteromycetes – *Cercospora*. Economic importance of Fungi.



UNIT - V

Lichen: General characteristics, thallus organization (*Usnea*), types, reproduction. Economic and ecological importance of Lichens.

Text Books

1. Alexopoulos, C.J. and Mims, C.W. (1979). Introductory Mycology. Wiley Eastern Ltd., New Delhi.
2. Bilgrami K. S. (2015). A Text book Of Algae. CBS Publication.
3. Bold, H.C. and Wynne, M.J. (1985). Introduction to the Algae. Prentice Hall of India, New Delhi.
4. Dharani Dhar Awasthi (2000). A Handbook of Lichens Vedams Books (P) Ltd. New Delhi.
5. Dube, H.C. (1983). Introduction of Modern Mycology. Blackwell Science Publication. Oxford.
6. Dube, H.C. (1990). An Introduction of Fungi. Vikas Publication House Ltd, New Delhi.
7. Fritsch, F.E. (1945). Structure and reproduction of Algae. Cambridge University press, New York.
8. Kumar, H.D. (1999). Introductory Phycology. 2nd Edition. Affiliated East-West. Press Pvt. Ltd. New Delhi.
9. Lee, R.D. (2008). Phycology 4th Edition, Cambridge University Press, New York
10. Pandey, B.P. (1994). Algae.S. Chand & Company Ltd. New Delhi.
11. Round, FE. (1984). The Ecology of Algae. Cambridge University Press, New York.
12. Sharma, O.P. (2011). Algae, Tata McGraw Hill Education Private limited, New Delhi.
13. Sharma, O.P. (2011). Fungi and allied microbes The McGraw –Hill companies, New Delhi.
14. Sharma, P.D. (2003). The Fungi. Rastogi Publications, Meerut, New Delhi.
15. Vashishta, B.R., Sinha, A.K. and Singh, V.P. (2011). Botany for Degree Students Algae, S. Chand. Pub. New Delhi.

Reference Books

1. Bessey, E.A. (1979). Morphology and Taxonomy of fungi, Vikas publishing House Pvt. Ltd, New Delhi.
2. Bold, H.C. and Wynne, M.J. (1985). Introduction to the Algae. Prentice Hall of India, New Delhi.
3. Burnett, J.H. (1971). The fundamentals of Mycology. ELBS Publication, London.



4. Fritsch, F.E. (1945). Structure and reproduction of Algae. Cambridge University press.
5. Hale, M.E. (1983). The Biology of Lichens. Edward Arnold, London.
6. Lee, R.D. (2008). Phycology 4th Edition, Cambridge University Press, New York.
7. Mehrotra, R.S. and Aneja, K.R. (1990). An Introduction to Mycology, New Age International Pub, New Delhi.
8. Muthukumar, S. and Tarar, J.L. (2006). Lichen Flora of Central India, Eastern book Corporation , New Delhi.
9. Nash, T.H. (1996). Lichen Biology. Cambridge University Press, London.
10. Round, F.E. (1984). The Ecology of Algae. Cambridge University Press.
11. Sundararajan, S. (2004). Practical manual of fungi, Anmol publications Pvt.ltd New Delhi.
12. Webster, J. (1970). Introduction to Fungi , Cambridge university press, London.

Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Differentiate and identify the algal species using algal pigments.	K1
CO2	Know about the distribution and mode of nutrition on fungal species.	K2
CO3	Apply knowledge on lichen as indicators of pollution.	K3
CO4	Enlarge the knowledge of Lichen and its functions.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
Core – II	Course Code: 20UBO2C02		Course Title: Plant Diversity – II (Bryophytes, Pteridophytes, Gymnosperms and Paleobotany)	
Semester II	Hours/Week 5	Total Hours 75	Credits 5	Total Marks 100

Course Objectives

1. To know about the diversity of Cryptogams and Phanerogams.
2. To understand the life cycle pattern of Bryophytes, Pteridophytes and Gymnosperms.
3. To study the fossil remains of plants belonging to various eras of Paleobotany.

UNIT – I

Bryophytes: Introduction and general characters of Bryophytes. Classification of Bryophytes (Smith, 1955). A detailed study of occurrence, structure, reproduction and life cycle of *Marchantia*, *Anthoceros* and *Funaria*. Economic importance of Bryophytes.

UNIT – II

Pteridophytes: Introduction and general characters of Pteridophytes. Classification of Pteridophytes (Riemer, 1954). Sporangial organization – Homospory, Heterospory and seed habit, Apogamy and apospory. Vascular organization and Stelar evolution in Pteridophytes.

UNIT – III

A detailed study of occurrence, structure, reproduction and life cycle of *Selaginella*, *Equisetum* and *Adiantum*. Economic importance of Pteridophytes.

UNIT – IV

Gymnosperms: Introduction and general characters of Gymnosperms. Classification of Gymnosperms (Sporne, 1965). Detailed study of occurrence, structure, reproduction and life cycle of *Cycas*, *Pinus* and *Gnetum*. Economic importance of Gymnosperms.

UNIT – V

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

**Text Books**

1. Gangulee, Das, and Kar. (2001). College Botany Vol II. New central Book agency Pvt. Ltd. Calcutta.
2. Pandey, B.P. (1981). Gymnosperms. Chand & Co., New Delhi.
3. Sambamurty, A.V.S.S. (2006). A Textbook of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany. IK International Publishing House, New Delhi, India
4. Shukla and Mishra. (1982). Essentials of Paleobotany. Vikas Publishing House, Pvt Ltd., New Delhi.
5. Vashista, P.C. (1992). Pteridophyta. Chand & Co., New Delhi.
6. Vashista, P.C., Sinha and Anil Kumar. (2008). Text book of Bryophytes. Chand &Co., New Delhi.

Reference Books

1. Pandey, B.P. (1994). A Text book of Botany - Pteridophyta. Chand & Co. New Delhi.
2. Rashid. (1995). An introduction to Pteridophytes. Vikas Publishing House, Pvt. Ltd., New Delhi.
3. Smith, G.M. (1955). Cryptogamic Botany Vol. II. Tata McGraw Hill Publications, New Delhi.
4. Sporne, K.R. (1980). Morphology of Petridophytes -B.I. Publications, New Delhi.



Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Explore the knowledge on Plant diversity i.e. Bryophytes, Pteridophytes and Gymnosperms.	K1
CO2	To understand the internal structure and reproduction of Cryptogams and Phanerogams.	K2
CO3	Apply the medicinal and economic knowledge of Bryophytes, Pteridophytes and Gymnosperms for the benefit of human welfare.	K3
CO4	Apply the knowledge on earlier period evidences of fossils for the identification and also to establish the age of the fossil plants through radiocarbon dating.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
SBEC – I	Course Code: 20UBO2S01		Course Title: Mushroom Cultivation Technology	
Semester II	Hours/Week	Total Hours	Credits	Total Marks
	2	30	2	100

COURSE OBJECTIVES

1. To acquire knowledge of on the mushroom culture.
2. To understand the importance of mushrooms.
3. To learn the methodology involved in mushroom cultivation.
4. To know the various recipes preparation.

UNIT – I

Introduction to mushroom cultivation: General characters, structure and reproduction of mushrooms – Identification of mushrooms – Types of mushroom – Poisonous mushroom.

UNIT – II

Uses of mushroom: Nutritive, food and Medicinal value.

UNIT III

Mushroom culture techniques: Mushroom sheds construction – Spawn preparation – Medium preparation – Spawn running – Incubation – Cultivation methods for button and oyster mushrooms – Disease and control measures.

UNIT IV

Post harvest operations: Harvesting – Storage and preservation – Spoilage of mushrooms – Packing – Marketing.

UNIT V

Mushroom recipes: Mushroom soup – Sandwich – Gravy – Omelette – Mushroom chilly manchurian and briyani.

**Text Books**

1. Suman, B.C and Sharma, V.P. (2007) Mushroom Cultivation in India. Daya Publishing House. New Delhi.
2. Gogoi, R., Rathaiah, Y and Borah, T.R. (2006). Mushroom Cultivation Technology. Scientific Publishers. Jodhpur, Rajasthan.
3. Kanniyar, (1980). Text book of Mushroom, Today and Tomorrow publishers, Chennai.
4. Nita bahl, (1988). Hand book of mushrooms, Vol. II, IBH publishers, New Delhi.
5. Subrata Biswas, Datta, M., Ngachan, S.V. (2011) Mushrooms: A Manual For Cultivation. PHI Learning, New Delhi.

Reference Books

1. Chang S.T. and N.A.Hayer, 2002. The biology and cultivation of edible mushrooms.
2. Marimuthu, T., Krishnamoorthy, A.S., Sivaprakasam, K. and Jayarajan. R (1991). Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
3. Manjit Singh, Bhuvnesh Vijay, Shwet Kamal and Wakchaure, C.G. (2011). Mushrooms - cultivation, marketing and consumption. Directorate of Mushroom research, ICAR, Chambaghat, Solan, HP.
4. Pathak, V.N., Yadav, N. and Gour, M., 2000. Mushroom production and processing technology, Agrobios Ltd., Jodhpur, India.
5. Reeti Singh and U.C. Singh, (2005). Modern Mushroom cultivation, Agrobios (India) Ltd.
6. Swaminathan, M. (1990) Food and Nutrition. Bappco, The Bangalore Printing and Publishing Co. Ltd., Bangalore.
7. Tewari and Pankaj Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi.



Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Acquire knowledge on mushrooms to differentiate edible from poisonous.	K1
CO2	Understand the mushroom cultivation.	K2
CO3	Apply knowledge on cultivation of the mushroom using techniques.	K3
CO4	Impart interest on preparation of mushroom recipes.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

s.

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
Core Practical – I	Course Code: 20UBO2P01	Course Title: Plant Diversity – I & II (Algae, Fungi, Lichen, Bryophytes, Pteridophytes, Gymnosperms and Paleobotany)		
Semester II	Hours/Week 3	Total Hours 45	Credits 3	Total Marks 100

COURSE OBJECTIVES

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

Algae: Micro preparation and detailed microscopic analysis of vegetative and reproductive parts of the following Algae - *Nostoc*, *Caulerpa*, *Chara*, *Cyclotella*, *Sargassum* and *Gracillaria*. Study the Economic importance of Algae (Spotters - Agar-agar, Carrageenan, SCP (*Spirulina*) – *Chlorellin* (Antibiotic), Fodder (*Sargassum*) – Diatomite.

Fungi: *Albugo*, *Pilobolous*, *Peziza*, *Saccharomyces*, *Puccinia* and *Cercospora* (Spotter - *Penicillium* and *Pleurotus ostreatus*)

Lichen: *Lichen* and its types

Bryophytes: Micro preparation and detailed microscopic analysis of vegetative and reproductive parts the following Bryophytes – *Marchantia*, *Anthoceros* and *Funaria*

Pteridophytes: Study of the Habit, TS of leaf and Stem, Morphology of Reproductive structures of Following Pteridophytes. *Selaginella*, *Equisetum* and *Adiantum*

Gymnosperm: Study of the Habit, TS of leaf and stem, Morphology of Reproductive structures of following gymnosperm genera *Cycas*, *Pinus* and *Gnetum*

Paleobotany: Study the following fossil members, *Rhynia*, *Lepidodendron* and *Williamsonia*, through permanent slides.



***Bonafide record of practical work done should be submitted for the practical examination.**

Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Differentiate the lower forms and advanced Thallophytes and its vegetative and reproductive parts.	K3
CO2	Analyze the internal organization of Cryptogams and Phanerogams.	K4
CO3	Evaluate and assess different fossil plant through permanent slides.	K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S

S - Strong

H - High

M - Medium

L – Low



SRI VIDYA MANDIR ARTS AND SCIENCE COLLEGE (Autonomous)

KATTERI – 636 902

UG MODEL PRACTICAL QUESTION PAPER

End semester Examination Question Paper Pattern

(For the candidates admitted from the academic year 2020-21 onwards)

Core Practical: I (COVERING PLANT DIVERSITY - I & II)

(Algae, Fungi, Lichen, Bryophytes, Pteridophytes, Gymnosperms and Paleobotany)

Time: 3 Hours

Max. Marks: 60 Marks

Practical: 50 Marks

Record : 10 Marks

BREAK UP OF MARKS

1. Take transverse section of A, B, C, D and E Stain and mount in glycerin.
Identify giving a reason. Draw diagrams. Leave the slides for valuation. (20)
2. Draw diagrams and write notes of interest on F, G, H, I & J (15)
3. Name the genus, group and morphology of given part of K, L and M. (9)
(Diagrams not necessary)
4. Identify and write notes on the economic importance of N, O & P. (6)

KEY

(Algae, Fungi, Lichen, Bryophytes, Pteridophytes, Gymnosperms and Paleobotany)

A, B, C, D and E - Sectioning of materials from PD-1 & PD-II.

(A - Algae, B- Fungi, C- Bryophytes, D- Pteridophytes and E- Gymnosperms)

(Thallus, Rachis, and Reproductive part)

(Preparation – 2, Identification -1, and Reason -1) (5x4=20 Marks)

F, G, H, I & J (Slides, spotters, Specimen, Photo cards, etc from PD-1 & PD-II)

(F - Algae, G- Fungi/Lichen, H- Bryophytes, I- Pteridophytes and

J-Gymnosperms/Paleobotany)

(Thallus, Internal structure, Rachis, and Reproductive part)

(Identification -1, Reason -2) (5x3=15 Marks)

K, L, and M - Genus (1), Group (1) and Morphology (1)

(Algae/Fungi/Bryophytes/Pteridophytes/Gymnosperms) (3x3=9 Marks)

N, O, & P = Economic importance

(Algae/Fungi/Lichen/Bryophytes/Pteridophytes/Gymnosperms)

(Identification -1; Reason -1) (3x2=6 Marks)



Program: B.Sc. Botany				
Allied – I B.Sc. Zoology/Chemistry		Course Code: 20UBO1A01	Course Title: Phycology, Mycology and Plant pathology, Bacteria and Virus, Bryophytes, Pteridophytes and Gymnosperms	
Semester I	Hours/Week 6	Total Hours 90	Credits 4	Total Marks 100

Course Objectives

1. To enhance the fundamental knowledge of the plant kingdom.
2. To learn the structure and life cycle patterns of primitive to advanced life forms.
3. To know the economic importance of primitive plants.

UNIT – I

Phycology: General characters, Structure, Reproduction and life cycle of the following Genus: *Oscillatoria*, *Oedogonium*, *Sargasum* and *Gracilaria*. Economic importance of algae.

UNIT – II

Mycology and Plant Pathology: General characters, Structure, Reproduction and Life cycle of the following Genus: *Penicillium*, *Albugo* and *Agaricus*. Economic importance of Fungi.

Bacteria and Virus: A general study of Bacteria and viruses. Economic importance of bacteria.

UNIT – III

Bryophytes: General characters, Structure, Reproduction and Life cycle of *Marchantia* and *Funaria*. Economic importance of Bryophytes.

UNIT – IV

Pteridophytes: General characters, Structure, Reproduction and Life cycle of *Lycopodium* and *Adiantum*. Economic importance of Pteridophytes.

UNIT – V

Gymnosperms: General characters, Structure, Reproduction and Life cycle of *Cycas* and *Gnetum*. Economic importance of Gymnosperms.

**Text Books**

1. Gangulee, Das and Kar. (2001). College Botany Vol II. New central Book agency Pvt. Ltd. Calcutta.
2. Pandey, B.P. (1994). A Text book of Botany - Pteridophyta. Chand & Co. New Delhi.

Reference Books

1. Vashishta, B.R. (1998). The Algae.S. Chand & Co., New Delhi.
2. Vashishta, B.R. (1998). Fungi. S. Chand & Co., New Delhi.
3. Vashista, P.C., Sinha and Anil Kumar. (2008). Text book of Bryophytes. Chand & Co., New Delhi.
4. Vashista, P.C. (1992). Pteridophyta. Chand & Co., New Delhi.
5. Pandey, B.P. (1981). Gymnosperms. Chand & Co., New Delhi.
6. Gilbert M. Smith (1951). Manual of Phycology. New Delhi.

Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Differentiate and identify the plant types.	K3
CO2	Understand the life cycle patterns of cryptogamous and gymnosperms.	K4
CO3	Apply the knowledge of bacteria and virus.	K4
CO4	Explore the economic importance of lower life forms.	K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
Allied – II B.Sc. Zoology/Chemistry		Course Code: 20UBO2A02	Course Title: Cytology, Anatomy, Embryology, Taxonomy of Angiosperms, Plant physiology and Ecology	
Semester I	Hours/Week 6	Total Hours 90	Credits 4	Total Marks 100

Course Objectives

1. To learn the plant cell organelles and its functions.
2. To differentiate the anatomical and embryological features.
3. To acquire knowledge on the classification and nomenclature of angiosperms.
4. To know the physiological and ecological adaptation of plants.

UNIT – I

Cytology: Study of plant cell organelles with emphasis on cell wall, Chloroplast, Mitochondria and Nucleus.

UNIT – II

Anatomy & Embryology: Primary and secondary structure of dicot and monocot leaf, stem and root (Mesophytic only). Embryology - structure of anther, microsporogenesis and male gametophyte. Structure of ovule, megasporogenesis and female gametophyte. Double fertilization.

UNIT – III

Taxonomy of Angiosperms: Bentham and Hooker's classification (outline only). Study of the following families with their economic importance - *Leguminaceae*, *Cucurbitaceae*, *Rubiaceae*, *Asteraceae*, *Euphorbiaceae* and *Arecaceae*. Herbarium techniques.

UNIT – IV

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

**UNIT – V**

Ecology: Structure and functions of ecosystems. Vegetational types of Southern India. Pollution- Air, water and noise. Morphological and anatomical adaptations in Hydrophytes and Xerophytes.

Text Books

1. Gangulee, H.C., Das, K.S. and Dutta, C.T. (1986). College Botany Vol. - I. AIU Publications. New Delhi.
2. Pandey, S.N., Misra, S.P and Trivedi, P.S. (2016). A Textbook of Botany. Volume - I, 13th Edition. Vikas Publishing House.
3. Gangulee and Kar, A.K. (1986). College Botany Vol. - II. AIU Publications. New Delhi.
4. Pandey, S.N., Misra, S.P and Trivedi, P.S. (2016). A Textbook of Botany. Volume - II, 13th Edition. Vikas Publishing House.

Reference Books

1. Pandey, B.P. (1997). Taxonomy of Angiosperms. Chand & Co., New Delhi.
2. Jain, V.K. (1993). Fundamentals of plant physiology. S. Chand & Co. New Delhi
3. Shukla, R.S. and Chandal, P.S. (2000). Plant Ecology and soil science. Chand & Co. Ltd., New Delhi.
4. Bhojwani and Bhatnager. (1977). The embryology of angiosperms. Vikas Publishing House, New Delhi.
5. Pandey, B.P. (1978). Plant Anatomy. Chand and Co, New Delhi.
6. Maheswari, P. (1950). An introduction to the embryology of Angiosperms. McGraw Hill.



Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Gain knowledge on plant cell organelles.	K1
CO2	Understand the anatomical and embryological variations of plant taxa.	K2
CO3	Apply the knowledge using keys and manuals for identifying unknown plants at species level.	K3
CO4	Demonstrate various physiological experiments.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



**SRI VIDYA MANDIR ARTS AND SCIENCE COLLEGE (Autonomous)
KATTERI - 636 902**

UG MODEL PRACTICAL QUESTION PAPER

End semester Examination Question Paper Pattern

(For the candidates admitted from the academic year 2020-2021 onwards)

Time: 3 Hours

Max. Marks: 60 Marks

BREAK UP OF MARKS

Allied Practical: FIRST / SECOND ALLIED COURSE – II

Maximum: 60 Marks

Practical : 50 Marks

Record: 10 Marks

1. Take transverse section of A & B. Stain and mount in Glycerin. Identify giving reasons. Draw diagrams. Submit the slides for valuation. (10 Marks)
2. Refer C & D to their families, giving reasons (Diagrams not necessary) (10 Marks)
3. Identify the plant, family and morphology of the parts used for E, F, G, H and I. (15 Marks)
4. Write critical notes on J, K, L, M, N and O. Draw diagrams. (12 Marks)
5. Physiology Experiment - P (3 Marks)

KEY

1. For A and B – (Slide -2 Identification -1 Reasons – 2) 2 x 5 = 10 Marks
2. For C and D - Any two plants prescribed in the syllabus.
(Reasons 3, Identification -2) 2 x 5 = 10 Marks
3. For E, F, G, H and I - any 5 specimens given in
the practical syllabus. 5 x 3 = 15 Marks
4. Notes 1, Diagram 1 for J, K, L, M, N, O 2 x 6 = 12 Marks
5. P - Physiology Experiment 3 Marks

*** Bonafide record of practical work done should be submitted for the practical examination.**



Program: B.Sc. Botany				
Core – III	Course Code: 20UBO3C03	Course Title: Plant anatomy, Embryology of Angiosperms and Microtechniques		
Semester III	Hours/Week 5	Total Hours 75	Credits 5	Total Marks 100

COURSE OBJECTIVES

1. To inculcate knowledge on the basics of tissues and anatomical features of plants.
2. To understand the key aspects of reproductive systems of flowering plants.
3. To know the methods of plant specimen preparation for histological studies.

UNIT – I

Anatomy of angiosperms: Scope and significance of plant anatomy. Meristem – Origin and Classification. Shoot apex and Root apex – theories (Apical, Histogen and Tunica-carpus theory). Epidermal tissue system: Stomata – types and functions. Trichomes – Types and functions, structure.

UNIT – II

Simple permanent tissues: Parenchyma, Collenchyma, Sclerenchyma (Fibers and Sclereids). Complex tissues: Xylem and Phloem. Annual rings, Heart wood and Sap wood. Primary and secondary structure of Dicot stem and root. Anomalous secondary growth in stems of *Nyctanthes* and *Dracaena*. Structure of Dicot and Monocot leaf. Nodal anatomy – Uni, tri and multilacunar node.

UNIT – III

Embryology of angiosperms: Structure of mature anther and ovule. Microsporangium: Structure and development of anther, Tapetum – structure, types and functions, Pollen morphology - NPC formula, pollen wall features. Megasporangium: Structure, types of ovule, ultrastructure of mature Embryosac (*Polygonum*).

UNIT – IV

A brief account on pollination, Fertilization (double fertilization and triple fusion). Structure, types and functions of endosperm. Structure of a mature dicot embryo (*Capsella bursa-pastoris*), Polyembryony.



UNIT – V

Microtechniques – Detail study of Light Microscope – Brief outline of Killing and fixation – Dehydration (butyl alcohol method), clearing (Xylol) and Infiltration (Paraffin wax method) – Embedding (wax) – Types of sectioning and Microtome (Rotary). Staining – single and double staining (Safranin-Fast Green) – Mounting (DPX).

Text Books

1. Crang, R., Lyons-Sobaski, S and Wise, R. (2018) Plant Anatomy: A Concept-Based Approach to the Structure of Seed Plants. Springer International Publishing.
2. Esau, K. (1985). Anatomy of Seed Plants. 2nd Edn. John Wiley and Sons, New York.
3. Fahn, A. (1982). Plant Anatomy. (3rd edition). Pergamon Press, Oxford.
4. Maheswari, P. (1950). Introduction to the embryology of Angiosperms. Vikas Publishing House, New Delhi.
5. Pandey, B.P. (1978). Plant Anatomy. Chand and Co, New Delhi.
6. Raghavan, V. (1997). Molecular Embryology of Flowering Plants. Cambridge University Press, Cambridge.
7. Bhojwani, S. S. and Bhatnagar, S. P. (1985). Embryology of Angiosperms, Vikas Publishing House, Noida.
8. Singh, Pandey and Jain. (2007). Anatomy of Seed plants, Rastogi Publications. New Delhi
9. Annie Regland. (2000). Developmental Botany -Saras Publication, Kanyakumari.

Reference Books

1. Dwivedi, J.N. (1988). Embryology of Angiosperms. Rastogi & Co., Meerut.
2. Esau, K. (1991). Plant Anatomy. Wiley Eastern Ltd. New Delhi. 7th Edition.
3. Fahn, A (1985). Plant Anatomy. Pergamon Press, Great Britain.



Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Know about the various developmental aspects of the plants.	K1
CO2	Compare and identify the structural differences existing among the vascular plants.	K2
CO3	Imply the embryological and anatomical knowledge to differentiate the plant taxa.	K3
CO4	Familiarize the basic skills on fixation, dehydration, infiltration and staining process of the specimens.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
SBEC – II	Course Code: 20UBO3S02		Course Title: Horticulture	
Semester III	Hours/Week 2	Total Hours 30	Credits 2	Total Marks 100

Course Objectives

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

UNIT – I

Scope and divisions of Horticulture - methods of vegetative propagation - cutting, layering and grafting - organic manures - fertilizers - irrigation.

UNIT – II

Gardening : Types of gardens, Indoor garden, Kitchen garden and Public garden. Important ornamentals - habit and types - garden components - lawn making, glass house, rockery, water garden, hydroponics and aeroponics, terrace gardening, topiary and Terrarium.

UNIT – III

Production technology - Cultivation of vegetables - Brinjal, Tomato and Onion. Cultivation of fruits - Banana, Mango and Apple - growth regulators in horticulture. Plant protection measures for horticulture.

UNIT – IV

Cultivation of flowers - Jasmine, Rose, Orchid, Anthurium. Cultivation of plantation crops - Tea, Coffee and Cardamom - Cultivation of medicinal plants - Periwinkle, Aloe and Gloriosa.

UNIT – V

Extraction of Jasmine concrete and Papain; Bonsai. Flower arrangement - Cut flowers and its importance; methods to prolong cut flowers life - Preservation of fruits and vegetables.

Text Books

1. Chatopadhyaya, S.K. (2018). Commercial Floriculture. Gene Tech Books. New Delhi.
2. Manibhusan Rao. (2012). Textbook of Horticulture. Vishvanathan & Co. Chennai.
3. Trivedi, P. (2015). Home Gardening. Narosa Publication. New Delhi.



Reference Books

1. Bhattacharya. S.K. (2007). Vistas in Horticulture. Gene Tech Books. New Delhi.
2. Choudhury. (2012). Vegetables. Narosa Publication. New Delhi.
3. Gelhot. D. (2017). Organic Farming. J.V. Public. House. Jodhpur.
4. Kumar. N. (2017) An introduction to Horticulture. Narosa Publication. New Delhi.
5. Kumar. N. (2006). Introduction to Spices Plantation Crops Medicinal and Aromatic Plants Plant Breeding. Narosa Pub., New Delhi.
6. Mandal. R.C. (1990). Weed control. J.V. Publi. House. Jodhpur.

Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Obtain knowledge on various horticultural practices.	K1
CO2	Understand solutions to cultivate a wide variety of plants through vegetative propagules.	K2
CO3	Develop bonsai plants using various techniques.	K3
CO4	Preserve food and vegetables using suitable techniques for the commercial uses throughout the year.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
NMEC – I		Course Code: 20UBO3N01	Course Title Mushroom Cultivation Technology	
Semester III	Hours/Week 2	Total Hours 30	Credits 2	Total Marks 100

Course Objectives

1. To acquire knowledge of on the mushroom culture.
2. To understand the importance of mushrooms.
3. To learn the methodology involved in mushroom cultivation.
4. To know the various recipes preparation.

UNIT – I

Introduction to mushroom cultivation: General characters, structure and reproduction of mushrooms – Identification of mushrooms – Types of mushroom – Poisonous mushroom.

UNIT – II

Uses of mushroom: Nutritive, food and Medicinal value.

UNIT– III

Mushroom culture techniques: Mushroom sheds construction – Spawn preparation – Medium preparation – Spawn running – Incubation – Cultivation methods for button & oyster mushrooms – Disease and control measures.

UNIT– IV

Post harvest operations: Harvesting – Storage and preservation – Spoilage of mushrooms – Packing – Marketing.

UNIT – V

Mushroom recipes: Mushroom soup – Sandwich – Gravy – Omelette – Mushroom chilly manchurian and briyani.

**Text Books**

1. Suman, B.C and Sharma, V.P. (2007) Mushroom Cultivation in India. Daya Publishing House. New Delhi.
2. Gogoi, R., Rathaiah, Y and Borah, T.R. (2006). Mushroom Cultivation Technology. Scientific Publishers. Jodhpur, Rajasthan.
3. Kannian, (1980). Text book of Mushroom, Today and Tomorrow publishers, Chennai.
4. Nita bahl, (1988). Hand book of mushrooms, Vol. II, IBH publishers, New Delhi.
5. Subrata Biswas, Datta, M., Ngachan, S.V. (2011) Mushrooms: A Manual For Cultivation. PHI Learning, New Delhi.

Reference Books

1. Chang S.T. and N.A.Hayer, 2002. The biology and cultivation of edible mushrooms.
2. Marimuthu, T., Krishnamoorthy, A.S., Sivaprakasam, K. and Jayarajan. R (1991). Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
3. Manjit Singh, Bhuvnesh Vijay, Shwet Kamal and Wakchaure, C.G. (2011). Mushrooms - cultivation, marketing and consumption. Directorate of Mushroom research, ICAR, Chambaghat, Solan, HP.
4. Pathak, V.N., Yadav, N. and Gour, M., 2000. Mushroom production and processing technology, Agrobios Ltd., Jodhpur, India.
5. Reeti Singh and U.C. Singh, (2005). Modern Mushroom cultivation, Agrobios (India) Ltd.
6. Swaminathan, M. (1990) Food and Nutrition. Bappco, The Bangalore Printing and Publishing Co. Ltd., Bangalore.
7. Tewari and Pankaj Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi.



Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Acquire knowledge on mushrooms to differentiate edible from poisonous.	K1
CO2	Understand the mushroom cultivation.	K2
CO3	Apply knowledge on cultivation of the mushroom using techniques.	K3
CO4	Impart interest on preparation of mushroom recipes.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
Core – IV	Course Code: 20UBO4C04		Course Title: Cell and Molecular Biology	
Semester IV	Hours/Week 4	Total Hours 75	Credits 5	Total Marks 100

Course Objectives

1. To understand the basic knowledge about the cell and its structure.
2. To achieve knowledge on the frontiers of plant cell organelles.
3. To learn about cell genetic property and its function.
4. To know the cell division and its sequence.
5. To understand about gene expression.

UNIT – I

Cell theory. Prokaryotic and Eukaryotic cell. Ultrastructure of plant cell. Structure and organization of plant cell wall. Plasma membrane structure, lipid bilayer, membrane proteins. Plasmodesmata and solid transport between cells.

UNIT – II

Chloroplast – Structure, function and its significance. Mitochondria – Structure and functions; Ribosomes – Origin; Structure and functions; Structure and functions of Golgi apparatus, lysosomes, endoplasmic reticulum and peroxysomes.

UNIT – III

Chromosomes – Morphology, structure of polytene and lampbrush. Nucleic acid – Structure and types of DNA and RNA, Nucleosomes.

UNIT – IV

Cell division and cell cycle – Phases of cell cycle, mitosis and meiosis: significance of various stages of cell division; cytokinesis. DNA replication – semi conservative model; Genetic code – properties; Protein synthesis - transcription and translation in Prokaryotic.

UNIT – V

Regulation of gene expression; Central Dogma of molecular biology, one gene - one polypeptide hypothesis. Post-transcriptional and translational processing. Gene expression in Prokaryotes and Eukaryotes – Operon concept – structure of mRNA gene.

**Text Books**

1. Albert (2014). Molecular Biology of The Cell. Taylor & Francis publications.
2. Rastogi, S.C. (1992). Cell biology, Tata McGraw-Hill, New Delhi.
3. Sundararajan, S. (2000). Cytology, Anmol publication (P) Ltd. New Delhi.
4. Verma P.S. (2004). Cell Biology, Genetics, Molecular Biology, Evolution & Ecology. S.Chand & Co Publication. New Delhi.

References Books

1. De Robertis and De Robertis (1990). Cell and Molecular Biology, Saunders College, Philadelphia, USA.
2. Elliott, W.H. and Elliott, D.C. (2005). Biochemistry and Molecular Biology, 3rd Ed. Oxford University, Oxford.
3. Freifelder, D. (1993). Essentials of Molecular Biology, Jones & Bartlett, Boston.
4. Geoffrey M. Cooper and Robert E. Hansman (2007). The cell - A Molecular approach, sinauer Associates. USA.
5. Gupta, P.K. (1999). A Text – book of Cell and Molecular Biology. Rastogi Publications, Meerut, India.
6. Hopkins, W. (1988). Molecular biology of the gene. Benjamin publishing Company. California.
7. Lee, P.J. (1999). Plant Biochemistry and Molecular Biology, 2nd edition. John Wiley and Sons, New York.
8. Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell, J. (2000). Molecular cell biology (4th Edition). W.H. Freeman and Co. New York, USA.
9. Watson, J.D. (1987). Molecular Biology of Gene. The Benjamin. Gummings publishing Co. inc. California.



Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Recollect the details about Plant cell, organelles, and their functions.	K1
CO2	Know about the Nucleic acids, DNA and RNA structures and its functions.	K2
CO3	Study the cell division and protein synthesis in plant sciences	K3
CO4	Apply the molecular biology techniques using micro organism models.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
SBEC – III	Course Code: 20UBO4S03		Course Title: Plant Tissue Culture	
Semester	Hours/Week	Total Hours	Credits	Total Marks
IV	2	30	2	100

Course Objectives

1. To study the basic and advanced developments in the field of Plant tissue culture.
2. To equip students with theoretical knowledge regarding the techniques and applications of plant tissue culture and Micro propagation.
3. To help students to get a career in Industry/R &D/Academic.

UNIT – I

Plant tissue culture: Introduction and milestones. Laboratory organization. Lab tools required. Media preparation. Sterilization techniques.

UNIT – II

Explant – Selection and sterilization. Types of culture. Micropropagation – Direct and Indirect. Somaclonal variation. Suspension culture.

UNIT – III

Haploid culture – Anther culture, pollen culture and ovary culture. Triploid production. protoplast - Isolation, culture, purification and fusion.

UNIT – IV

Somatic Hybridization. Somatic Embryogenesis. Artificial seed production. Germplasm preservation.

UNIT – V

Application of tissue culture in Horticulture. Transgenic plants. Production of herbicide resistance, pest resistance and salt tolerant plants. Conservation of endangered and rare species. Production of secondary metabolites.

**Text Books**

1. Dubey, R.C. (2001). A text book of biotechnology. S.Chand & Co Publication, New Delhi.
2. Gupta, P.K. (1994). Elements of Biotechnology. Rastogi Publications, Meerut.
3. Ignacimuthu, S.J. (2003). Plant Biotechnology. Oxford & IBH Publishing, New Delhi.
4. John Jothi Prakash, E. (2005). Outlines of Plant Biotechnology. Emkay Publishers, New Delhi.
5. Kalyankumar De (2008). Plant tissue culture. New Central Book Agency, Calcutta.
6. Sathyanarayana, B.N. and Vergheese, D.B. (2007). Plant tissue culture - Practices and new experimental protocols, ILK Publ. New Delhi.

Reference Books

1. Bhojwani, S.S. and Razdan, M.K. (2004). Plant Tissue Culture, Read Elsevier India Pvt. Ltd.
2. Dix, P.J. (1990). Plant cell line and selection. VCH Publ. Cambridge, U.K.
3. Hammond, J.C. McGarvey and Yusibov, V. (2009). Plant Biotechnology, Springer Verlag. New York.
4. Islam, A.S. (1996). Plant tissue culture. Oxford & IBH Publishing Company Pvt. Ltd. New Delhi.
5. Purohit, S.S. (2010). Plant tissue culture, Student edition, Jodhpur.

Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Obtain basic knowledge on plant tissue culture.	K1
CO2	Understand the techniques involved in the plant tissue culture for betterment of crops.	K2
CO3	Produce artificial seeds.	K3
CO4	Apply the knowledge of plant tissue culture on conservation of endangered plants.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create



Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
NMEC – II		Course Code: 20UBO4N02		Course Title : Home Gardening
Semester IV	Hours/Week 2	Total Hours 30	Credits 2	Total Marks 100

Course Objectives

1. To help the students to gain knowledge on planning and maintenance of gardens.
2. To widen their knowledge to create garden of their own interest.
3. To upsurge the student community about gardening as a leisure activity.

UNIT – I

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

UNIT – II

General aspect of terrace garden; culture aspects of vegetables and fruits (mention any three examples in each group).

UNIT – III

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

UNIT – IV

Water gardens – types - formal and informal pools; planting, management and plants for the water garden. Rock garden – establishment, construction, management and suitable plants for rockery.

UNIT – V

Lawn – Definition; Methods of lawn making – From seed, by turfing, turf plastering and dibbling roots, Maintenance of lawn; Plants suitable for planting in lawn, commonly growing grass species.

**Text Books**

1. Kumar, N. 1986. Introduction to Horticulture, Rajalakshmi Publications, Nagercoil, Kanyakumari.
2. Asharam, 2002. Herbal Indian perfumes and cosmetics, Sri Satguru publications, New Delhi, India.

Reference Books

1. Dey, S.C. 2006. Bonsai – An Art of miniature plant culture. Agrobios,
2. Amarnath, V. 2007. Nursery and Landscaping. Agrobios, Jodhpur, India.
3. Sheela, V.L. 2011. Horticulture, MJP Publishers, Triplicane, Chennai.

Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the importance and maintenance of Home Gardening.	K2
CO2	Develop terrace garden tailored to suit individual's taste.	K3
CO3	Apply the knowledge of growing Bonsai as realistic representations.	K4
CO4	Understand the significance of water gardens and propagate variety of aquatic plants.	K4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	H	H
CO2	H	S	H	S	H
CO3	H	H	H	S	H
CO4	S	H	S	S	S

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
Core Practical-II	Course Code: 20UBO4P02		Course Title: Core Course - III & IV (Plant Anatomy, embryology of angiosperms, microtechniques, Cell and Molecular biology)	
Semester IV	Hours/Week 3	Total Hours 45	Credits 3	Total Marks 100

Course Objectives

1. To learn about the special structures associated with the plant anatomy.
2. To know the role of fixatives and slide preparation techniques.
3. To explore the cellular organelles in the plant cell.

Anatomy of Angiosperms

1. Study of simple and complex tissues by using permanent slides.
2. Study of primary structure and sectioning of Dicot stem, root, leaf, Monocot stem, root and leaf.
3. Anomalous secondary structures – *Nyctanthes* and *Dracaena*.
4. Stomatal types: Anomocytic, Anisocytic, Paracytic, Diacytic and Gramineous. (Peel out from leaf).

Embryology of Angiosperms

1. Structure of Anther (Young and Mature from *Datura* or *Cassia* flower)
2. Types of ovules: Anatropous, Orthotropous, Circinotropous, Amphitropous, Campylotropous (Permanent slides)
3. Stages in Microsporogenesis and Megasporengensis (Permanent slides onion flower Bud).
4. Observes the globular, terpedo and Heart shape embryo.
5. Structure of Endosperm. Nuclear (Coconut water), cellular endosperm (Cucumber seed) and Ruminant (fruit of *Arecha catechu*).

Micro-techniques

1. Staining- simple and double staining (Safranin-Fast Green).
2. Mounting (DPX).



Cell and Molecular Biology

1. Observation and study of ultrastructure of cell organelles (chart, slides, models & micrographs).
2. Observation of different stages of mitosis in onion root tip squash preparation.
3. Observation of the Scheme/ Photograph of Structure of DNA, tRNA, and mRNA, Transcription, Translation, 'Lac' operon, 'Trp' operon.

* **Bonafide record of practical work done should be submitted for the practical examination.**

Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Imply the embryological and anatomical knowledge to differentiate the plant taxa.	K3
CO2	Familiarize the basic skills on fixation, dehydration, infiltration and staining process of the specimens.	K4
CO3	Distinguish the structure of plant cell organelles and their functions.	K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	M	H	H
CO2	H	M	H	S	M
CO3	S	H	M	H	H

S - Strong

H - High

M - Medium

L – Low



SRI VIDYA MANDIR ARTS AND SCIENCE COLLEGE (Autonomous)

KATTERI – 636 902

UG MODEL PRACTICAL QUESTION PAPER

End semester Examination Question Paper Pattern

(For the candidates admitted from the academic year 2020-21 onwards)

Core Practical: II (Plant anatomy, embryology of angiosperms, microtechniques,

Cell and molecular biology)

Time: 3 Hours

Max. Marks: 60 Marks

Practical: 50 Marks

Record : 10 Marks

BREAK UP OF MARKS

1. Take transverse sections of A, B & C Stain and mount in glycerin. Identify giving Reasons. Draw diagrams. Leave the slides for valuation (8x3 = 24 Marks)
2. Dissect and mount any one of the stages of the given material D. (Notes not necessary) (5 marks)
3. Make acetocarmine preparation of E (Squash) any one stage. Draw diagram (9 Marks)
4. Write notes on F, G, H, I, J, and K (6 x 2 = 12 Marks)

KEY

A , B, & C - Angiosperm – Anatomy – Vegetative part.

(Preparation 2, Identification 2, Diagram 2, Reason 2) (8X3=24 marks)

D - Embryo – Dicot – Tridax - (preparation 3, diagram 2) 5 Marks

E - Onion root tip - (Preparation -7 marks, Diagram -2 marks) 9 Marks

F, G, H, I, J & K Permanent slides

(Anatomy, Embryology, Microtechnique, Cell and Molecular Biology)

(Identification -1 marks, Reason -1) 12 Marks



Program: B.Sc. Botany				
Core – V	Course Code: 20UBO5C05		Course Title: Plant Morphology, Taxonomy of Angiosperms and Economic Botany	
Semester V	Hours/Week 5	Total Hours 75	Credits 5	Total Marks 100

Course Objectives

1. To study the morphological features of vegetative, inflorescence and fruits.
2. To study the botanical nomenclature and the various systems of Classifications.
3. To impart knowledge on the Systematics of the families and its economic importance.
4. To familiarize the students with plants having immense economic importance.
5. To acquire scientific knowledge on preparation of valuable economic plant products.

UNIT – I

Morphology of angiosperms: Parts of a plant body – Root types and Modification. Stem – Types- Aerial and underground Stem modification - leaf morphology (types, stipules, venation, phyllotaxy) – structure of a flower- floral diagram and floral formula - inflorescence and its types - fruits and its types.

UNIT – II

Systems of classification: Introduction-types of classification-artificial (Brief account of Linnaeus classification), natural –Bentham and Hooker (Detailed account) and Phylogenetic (Brief account Engler and Prantl)- Angiosperm Phylogeny Group system 2006 (APG IV) (Introduction only). Plant nomenclature-binomial, ICN-Herbarium techniques-BSI.

UNIT – III

Families of angiosperm: Detailed study of families: Study the following families of Bentham and Hooker's System with special reference to their morphological and floral characters. Special attention should be given to common and economically important plants within the families - Annonaceae, Capparidaceae, Rutaceae, Caesalpinaceae, Myrtaceae, Cucurbitaceae, Rubiaceae and Apiaceae.



UNIT – IV

Taxonomical families: Detailed study of families: Study the following families of Bentham and Hooker's System with special reference to their morphological and floral characters. Special attention should be given to common and economically important plants within the families - Asteraceae, Apocynaceae, Asclepiadaceae, Verbenaceae, Solanaceae, Lamiaceae, Euphorbiaceae, Orchidaceae and Poaceae.

UNIT – V

Economic Botany: A detailed study with reference to distribution, method of cultivation and the extraction method of following economically important products. Food (Paddy); Pulses (Soy bean); Nuts (Groundnut); Sugar (Sugarcane); Fiber (Cotton); Spices (Cardamom); Timber (Teak); Fumitories and Masticatories (Tobacco). Beverages-Tea and Coffee.

Text Books

1. Annie Ragland and Kumaresan. (2013). Angiosperms. Saras Publication, Nagrcoil.
2. Ashok Bendra and Ashok Kumar. (1980). Economic botany. Rastogi publications, Meerut.
3. Gurcharan Singh. (1999). Plants Systematics – Theory and practice. Oxford and IBH Publishing Co. (P) Ltd. New Delhi.
4. Heywood, V.H. (1967). Plant Taxonomy, Edward Arnold, London.
5. Jeffery, C. (1982). An introduction to Plant Taxonomy, J & A Churchill Ltd., London.
6. Lawrence, G.H.M. (1995). The Taxonomy of vascular Plants (Vol I-IV) ,Central Book, Dept., Allahabad.
7. Mathew, K.M. (1983). The Flora of Tamil Nadu Carnatic, The Rapinat Herbarium, Trichy.
8. Pandey, B.P. (2005). Economic Botany.S.Chand & Company Pvt. Ltd., New Delhi.
9. Pandey, B.P. (1997). Taxonomy of Angiosperms , S. Chand & Co., New Delhi.
10. Sambamoorthy, A.V. and Subramanyam. N.S. (1989). A text book of Economic Botany. Wilay Easters, New Delhi.
11. Sharma, O.P. (1996). Plant Taxonomy. TATA McGraw Hill, New Delhi.
12. Singh, V. and Jain, K.K. (1989). Taxonomy of Angiosperms – Rastogi, Meerut.
13. Sivaraajan,V.V. (1989). Introduction to Principle of Plant Taxonomy, Oxford and IBH, New Delhi.
14. Vashista, P.C. (1990). Taxonomy of Angiosperms – S.Chand & Co., New Delhi.

**Reference Books**

1. Davis , P.H. and Heywood, V.M. (1965). Principles of Angiosperm Taxonomy, Oliver and Boyd Edinburgh.
2. Gamble, J.S. and Fisher, L.E.F. (1967). The Flora of The presidency of madras (Vol-III) BSI, Calcutta.
3. Heywood, V.H. (1967). Plant Taxonomy. London: Edward Arnold.
4. Hill, A.F. (1982). Economic Botany: Mc Graw Hill, New York.
5. Jain, S.K. and Rao R.R. (1976). A hand book of field and herbarium technique. Today and tomorrow's Publishers, New Delhi.
6. Jeffery, C. (1968) An Introduction to Plant Taxonomy, J and A Churchill. London.
7. Lawrence, G.H.M. (1982). Taxonomy of Vascular plants. Oxford & IBH Publishing company (P) Ltd, New Delhi.
8. Naik V.N. (1984) Taxonomy of angiosperms. Tata Mc Graw- Hill Publishing Company, New Delhi.
9. Narayanaswamy R.V and Rao ,K.N (1976) . Outline of botany . S .Viswanthan printer and publisher, Chennai
10. Pandey B.P. (2011). College Botany. Vol.III. S.Chand & Company Pvt. Ltd., New Delhi.
11. Sambamurthy, A..S.S. (2005). Taxonomy of Angiosperms, I.K. International Pvt. Ltd, New Delhi.
12. Simpson, M.G. (2006). Plant systematics, Elsevier Academic Press, USA.
13. Sivarajan, V. (1999). Principles of plant taxonomy. Oxford and IBH.
14. Subramaniam, N.S. (1995). Modern Plant taxonomy. Vikas publishing house, New Delhi.
15. Takhtajan, A.L. (1969). Flowering Plants – Origin and dispersal – Oliver & Boyed.
16. Verma, V. (2009). Text book of Economic botany. Ane Books Pvt. Ltd., New Delhi.



Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Develop the knowledge in plant taxon.	K1
CO2	Understand the Binomial names of angiosperm plants.	K2
CO3	Impart the knowledge of economic values of higher flowering plants.	K2
CO4	Apply herbarium techniques for preparation of herbarium specimens.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
Core – VI	Course Code: 20UBO5C06		Course Title: Genetics, Plant Breeding and Evolution	
Semester V	Hours/Week 5	Total Hours 75	Credits 5	Total Marks 100

Course Objectives

1. To understand the significance of hereditary and evolution.
2. To enable students to think analytically to solve genetic problems.
3. To provide a basic knowledge of plant breeding methods and crop improvement programmes.
4. To understand the principles and mechanism of evolution.

UNIT – I

Genetics – Scope of genetics, Mendel’s experiments, Mendel’s laws of inheritance, monohybrid and dihybrid cross. Gene Interaction - Incomplete dominance, Codominance, Collaborator genes, Epistasis, Complementary genes, Duplicate genes and Lethal genes.

UNIT – II

Multiple alleles. Linkage - Complete and incomplete, Crossing over - mechanism, kinds & controlling factors, Cytoplasmic inheritance in plants - male sterility in maize.

UNIT – III

Gene action: Introduction, One gene one enzyme hypothesis, one cistron one polypeptide hypothesis – Modern concept of genes - cistron, muton and recon. Genetic code, Mutation – spontaneous and induced, causes and consequences. Mutagens – types and their effects, molecular mechanism of mutation.

UNIT – IV

Plant Breeding: Introduction and Objectives of Plant breeding, breeding methods - mass selection, pureline selection and clonal selection. Hybridization, Heterosis, National and international organizations for crop improvement, Achievements in crop improvement - Sugarcane and Cotton.



UNIT – V

Evolution: Introduction – Germplasm theory – Lamarckism - Neo-Lamarckism – Darwinism - mutation theory of de vries - Natural selection - variation – speciation - species concept - Isolation mechanisms - Hardy-Weinberg law.

Text Books

1. Arumugam and Meyyan, R.P. (2015). Genetics and Evolution, Saras Publication, Nagercoil, India.
2. Gupta, P.K. (2000). Genetics, Rastogi Publishers, Meerut, India.
3. Gupta, P.K. and Swaminathan, M.S. (2000). Cytology, genetics and Evolution. Rastogi Publication, Meerut, India.
4. Gupta, P.K. (2004). Elements of genetics. FNA 2nd Edition. Rastogi Publication, Meerut, India.
5. Meyyan, R.P. (2015). Genetic and Evolution, Saras Publication, Nagarcoil, India.
6. Verma P.S. (2004). Cell Biology, Genetics, Molecular Biology, Evolution & Ecology. S Chand & Co Publication. New Delhi.

References Books

1. Allard. (1960). Principles of plant breeding. John Wiley & Sons, New York.
2. Chaudhari, H.K. (2005). Elementary principles of plant breeding (25th Ed.). Oxford & IBH Publishing Co. (P) Ltd., New Delhi.
3. Gardner, E.J., Snustad, P. and Dobzonsky, D. (1995). Principles of Genetics. TATA Mc Graw Hill Company Ltd. New Delhi.
4. Shukla, R.S. and Chandel, P.S. (1996). Cytogenetic, Evolution and Plant Breeding, S. Chand & Co., New Delhi.
5. Singh, B.D. (2000). Plant Breeding-Principles and Methods. Kalyani Publishers, New Delhi.
6. Sinott, E.W., Dunn, L.C. and Dobshansky, J. (1985). Principles of genetics 5th Edn, McGraw Hill Publishing Co., N.Y., Toronto, London.
7. Veerbala Rastogi. (1994). Text book of Genetics. National Press, Meerut, India.
8. Verma, P.S. and Agarwal, V.K. (2009). Genetics, S. Chand & Co., Pvt. Ltd., New Delhi.



Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Know the basic principles of inheritance in plants.	K1
CO2	Understand the inheritance of linked genes and recombination of genes.	K2
CO3	Implement the plant breeding techniques for crop improvement.	K3
CO4	Analyze the theories of evolution.	K4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
Core – VII	Course Code: 20UBO5C07	Course Title: Bioinstrumentation and Biostatistics		
Semester V	Hours/Week 5	Total Hours 75	Credits 5	Total Marks 100

Course Objectives

1. To determine cell size and morphology using microscopy.
2. To make students understand the quantification of Plant pigments.
3. To provide an understanding of extraction and separation techniques.
4. To acquire knowledge on basic arithmetics and biostatistical methods.

UNIT – I

Principle, working mechanism and application of Microscopy: light and electron, Centrifugation; Autoclave and Laminar air flow chamber. Micrometry- Microtomes – Sledge and Rotary microtome.

UNIT – II

Quantitative techniques: Principle, working mechanism and applications: pH meter, Colorimetry, UV-Visible spectrophotometry and Flame photometry.

UNIT – III

Separation techniques: Paper chromatography (PC), Thin layer chromatography (TLC), Column chromatography (CC), High performance liquid chromatography (HPLC) and Gas chromatography (GC).

UNIT – IV

Principle, working mechanism and applications: Agarose gel electrophoresis (AGE), Polyacrylamide gel electrophoresis (PAGE), Blotting techniques – Southern, Northern and Western Blotting.

UNIT – V

Biostatistics – Data, Types and methods of collection of Data, Sampling techniques, Frequency distribution. Presentation of Data – Tabulation – Parts of Table, Types of table, Graphic representation of data- Histogram. Measures of central tendency; Arithmetic Mean,



Median and Mode. Measures of dispersion – Standard Deviation and standard error. Test of significance – Chi-Square test - Goodness of fit.

Text Books

1. Khan, I.A. and Khannum, A. (1994). Fundamentals of Biostatistics, Vikas Pub., Hyderabad.
2. Marimuthu, R. (2008). Microscopy and Microtechnique. MJP Publishers, Chennai
3. Palanivelu, P. (2013). Analytical Biochemistry and Separation techniques, 20th century publications, Palkalai nagar, Madurai.
4. Patki, L.R., Bhalchandra, B.L and Jeevaji, I.H. (1987). An introduction to Microtechnique, S.Chand and company (Pvt) ltd, New Delhi.
5. Sharma, B.K. (2005). Instrumental Methods of Chemical analysis. 24th Revised Edition, Goel Publishing House, Meerut.
6. Sundar Rao P.S.S and Richard J(2011) introduction to Biostatistics and research methods, PHI learning private Ltd., New Delhi.
7. Veerakumari, L. (2009). Bioinstrumentation. MJP Publishers, New Delhi, India.
8. Wilson, K. and Walker, J. (1994). Principle and techniques of practical biochemistry, 4th ed) Cambridge university press, Cambridge.

Reference Books

1. Cooper, T.G. (1991). The Tools of Bio - chemistry, John Wiley & sons, London.
2. Dey, P.M. and Harborne, J.B. (2000). Plant Biochemistry, Harcourt Asia Pvt. Ltd. Academic Press. (Indian Edition, 2000).
3. Rickwood, D. and Hames, B.D. Gel Electrophoresis of Nucleic acids-A Practical approach. Handbook of Biomedical Instrumentation – R.S. Khandpur, Tata McGraw Hill.
4. Holme and Peck. (1998). Analytical Biochemistry, 3rd Edition, Pearson Education Ltd, Essex, England.
5. Johansen, D.A. (1940). Plant Microtechnique, TATA McGraw Hill Book Co., Ins., New Delhi.
6. Peter Gray (1964). Hand book of Basic Microtechnique. McGraw hill publication, New York.
7. Plummer, D.T. (2003). An introduction to practical Biochemistry. 3rd Edn. Tata McGraw Hill Publishing Company Ltd. New Delhi.



8. Skoog and Leary. (1992). Principles of Instrumental analysis, 4th Edition. Saunder's College Publishing, New York.
9. Wilson, K. and Walker, J. (2000). Principles and Techniques of Practical Biochemistry, 5th Edition, Cambridge University Press, Cambridge.
10. Zar, J.H. (1984). Biostatistics Analysis, Prentice Hall International, England Cliffs, New Jersey.

Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Students are trained to remember each and every topics by comparative studies.	K1
CO2	Recognize the importance of instrumentation usage in biological science.	K2
CO3	Understand the role of mathematics in solving biological problems.	K2
CO4	Extract and characterize bioactive compounds using analytical techniques.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
Elective – I	Course Code: 20UBO5E01		Course Title: Plant Biotechnology	
Semester V	Hours/Week 5	Total Hours 75	Credits 5	Total Marks 100

Course Objectives

1. To study the fundamental principles of biotechnology.
2. To study the role of Biotechnology in food, agriculture and pharmaceutical industries.
3. To understand the applied aspects of biotechnology.
4. To familiarize students with the applications of biotechnology.

UNIT – I

Biotechnology – History, definition, scope, significance. Recombinant DNA technology – Enzymes. Cloning vectors – Plasmid, Cosmids, Bacteriophages, Phasmids, BAC, YAC, Shuttle vector. Transposons, Applications of Genetic Engineering.

UNIT – II

Gene transfer in plants-Aims, strategies for development of transgenic plants-Direct gene transfer methods-Biolistics – Electroporation, lipofection, Microinjection. Vector mediated gene transfer in higher plants – Agrobacterium mediated gene transfer – T DNA, *Ti* Plasmid and *Ri* plasmid derived vector system.

UNIT – III

Techniques and application of biotechnology – Polymerase chain reaction- Principle, Enzymes, types - Real time PCR and Application –DNA Sequencing – Sanger's method. Molecular analysis of gene – molecular marker – RAPD –RFLP– Bar coding plants.

UNIT – IV

Genes of agronomic interest and transgenic crops: Golden rice, Bt cotton and Bt brinjal Terminator seed technology- antisense RNA (Flavr Savr) and RNAi technology – Disease resistance, herbicide resistance, enhancement of shelf life of flowers and fruits. Medical biotechnology – Insulin, Monoclonal antibodies and Hybridoma techniques.

**UNIT – V**

Environmental Biotechnology: Biodiversity and conservation. Waste management - Solid waste – waste water, Biogas, Bioremediation. Industrial biotechnology – Bioethanol, pharmaceutical product. Food biotechnology –SCP. Improved food and food products.

Text Books

1. Dubey, R.C. (2004). A text book of Biotechnology 3rd Edition , S.Chand & Company Ltd, New Delhi.
2. Gupta, PK. (2004). Elements of Biotechnology”, 1st edition Rastogi publications – Meerut, India.
3. Kumaresan, V. (2009). Biotechnology”, Saras Publications, Nagercoil.
4. Purohit, S.S. (2005). Biotechnology Fundamentals & Applications” 3rd Edition.
5. Razdan, M.K. (2008). Introduction to plant tissue culture” ,2nd edition Oxford & IBH publishing Co. Pvt. Ltd., New Delhi.
6. Sathyanarayana BN and Vergheese DB (2007). Plant tissue culture - Practices and new experimental protocols, ILK Publ. New Delhi.

Reference Books

1. Brown, T.A. (2006). Gene cloning and DNA analysis; Blackwell scientific publishers.
2. Prime Rose, S.B., Twyman, R.M. and Old, R.W. (2001). Principle of gene manipulation; an Introduction to genetic engineering. 6th Ed. Blackwell Oxford.
3. Smith, J.E. (2005). Biotechnology, Cambridge university press, UK.
4. Wilson, K. and walker, J. (2008). Principle and techniques of Biochemistry and molecular Biology. Cambridge university Press.



Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Obtain basic knowledge on plant biotechnology.	K1
CO2	Understand the concept of totipotency, micropropagation and haploid production.	K2
CO3	Knowledge the gene transfer methods for betterment of crops.	K3
CO4	Analyze and describe the role of plant biotechnology on the human life.	K4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
SBEC – IV	Course Code: 20UBO5S04	Course Title: Medico-Ethno Botany		
Semester V	Hours/Week 2	Total Hours 30	Credits 2	Total Marks 100

Course Objectives

1. To understand the different Indian systems of medicine.
2. To learn the classification of natural drugs.
3. To study collection, cultivation and preparation of natural drugs.
4. To understand drugs obtained from various parts of the plants.
5. To study the process of drug adulteration and quality control of drugs.

UNIT – I

History, scope and importance of medicinal plants. Traditional medicinal systems: ayurveda, siddha, unani and naturopathy. Definition of drug classification of natural drugs - alphabetical, morphological, taxonomical, chemical and pharmacological.

UNIT – II

Ethnobotany – definition, scope and objectives; Major Ethnic tribes of South India and their ethno botanical and ethnobiological heritage. Ethnobotany and conservation of plants with special reference to India. Mythology and conservation of ecosystems (sacred groves).

UNIT – III

Cultivation, collection and preparation of natural drugs macroscopic (physical and organoleptic characters), therapeutic and pharmaceutical characterization of the following medicinal plants: *Adathoda vasica*, *Aloe vera*, *Centella asiatica*, *Piper nigrum*, *Allium sativum*, *Curcuma longa*, *Ocimum sanctum* and *Catharanthus roseus*.

UNIT – IV

Drugs from leaves (*Eucalyptus*), flower (*Eugenia*), fruits and seeds (*Coriander*), roots (*Withania*), underground stem (*Ginger*), bark (*Cinchona*) and wood (*Ephedra*). Cultivation and utilization of selected medicinal plants *Bacopa monnieri*, *Cassia senna*, *Gloriosa superba*, *Phyllanthus amarus* and *Rauwolfia serpentina*.

**UNIT – V**

Drug adulteration and types. Drug evaluation: physical, chemical and biological. Quality control of herbal drugs. Role of NMPB, AYUSH and CDRI.

Text Books

1. Arumugam, K.R. and Murugesu, N. (1990). Text book of Pharmacognosy. Sathya Publishers, Chinnalapatti (Tamilnadu) 624 201.
2. Gokhale, S.B., Kokate, C.K. and Purohit, A.P. (2003). Pharmacognosy. Nirali Prakashan, Pune.
3. Iwu, M.M. and Wootton, J. (2002). Ethnomedicine and Drug Discovery. Elsevier Science.
4. Ramawat K.G. 2009. (2009) Herbal Drugs: Ethnomedicine to Modern Medicine. Springer-Verlag Berlin Heidelberg.

References Books

1. Bhattacharjee, S.K. (2004). Hand Book of Medicinal plants. Pointer Publishers, Jaipur.
2. Harbourne, J.B. (1998). Phytochemical methods: A Guide to Modern Techniques of Plant Analysis (3rd edition). Chapman and Hill Co., New York.
3. Jain, (2001). Medicinal plants. National Book Trust, New Delhi.
4. John Jothi Prakash, E. (2003). Medicinal Botany and Pharmacognosy. JPR Publication, Vallioor, Tirunelveli.
5. Joshi, S.G. (2001). Medicinal plants. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Prajapathi, Purohit, Sharma and Kumar. (2003). A Hand book of Medicinal plants. Agrobios Publications, Jodhpur.
7. Purohit and Vyas, (2004). Medicinal Plants Cultivation. Agrobios Publications, Jodhpur.



Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Gain knowledge of traditional Indian Systems of Medicine.	K1
CO2	Understand the ethnic heritage tribes.	K2
CO3	Carry out research on organoleptic studies of medicinal plants.	K3
CO4	Analyze the drug adulteration and quality control of drugs.	K4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
SBEC – V	Course Code: 20UBO5S05		Course Title: Seed Technology	
Semester	Hours/Week	Total Hours	Credits	Total Marks
V	2	30	2	100

Course Objectives

1. To study the structure of angiospermic seeds.
2. To analyze various products produced by the seeds.
3. To examine the germination capacity of the seeds.

UNIT – I

Floral biology. Seed formation. Seed morphology and structural details of Dicot (Castor) and Monocot (Paddy) seeds. Albuminous (endospermic) and ex-albuminous (non-endospermic).

UNIT – II

Seed sampling – Methods of sampling – Seed Purity – Seed Germination – Methods of Seed Germination using paper, Sand or soil – Standard Germination Test. Seed dormancy.

UNIT – III

Seed viability – Topographical tetrazolium or TZ test embryo excision method. Seed moisture Importance – methods of moisture determination basic methods.

UNIT – IV

Seed certification – objectives – fundamental concepts of seed certification – sources and classes of seed: Breeder's seed, certified seed. Seed analysis – Tagging of seedlings – field standards.

UNIT – V

Certified seed production of the following: Paddy, groundnut, and cotton. Seed inspection, seed legislation and seed law enforcement (quarantine).

Text Books

1. Agarwal, R.L. (2017). Seed Technology. 2nd Edition. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
2. Bewley, J.D. and Black, M. (1978). Seed Biology Vol. I & II Academic press, New York.



References Books

1. Bewley, J.D. and Black, M. (1985). (Eds.) Seeds; Physiology of development and germination Plenum Press: New York.
2. Khan, A.A. (1975) (Ed.). The Physiology and Biochemistry of seed Dormancy and germination. North-Holland Publishing Company: Amsterdam- New York- Oxford.
3. Kowslowsky. (1972) Seed Biology, Vol. I, Vol. II and Vol. III. Academic Press, New York.
4. Mehta S.L. Lodha, M.L. and Sane P.V. (1993). (Eds.) Recent advances in Plant Biochemistry. Publication and information division ICAR, New Delhi.
5. Murray, D.R. (1984). (Ed.) Seed physiology. Vol. I & II Academic Press: Sydney - New York- London.
6. Remington, J. S. (1993). Seed testing. Printwell, Jaipur.

Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Learn the chemical and physical properties of seeds.	K1
CO2	Understand the factors responsible for seed germination.	K2
CO3	Apply the various methods of processing of seeds for storage. Implement knowledge to break the seed dormancy and to enhance the plant growth.	K3
CO4	Implement the acquired knowledge to break the seed dormancy to enhance the plant growth.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create



Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
Core – VIII	Course Code: 20UBO6C08	Course Title: Plant Physiology, Biochemistry & Biophysics		
Semester VI	Hours/Week 5	Total Hours 75	Credits 5	Total Marks 100

COURSE OBJECTIVES

1. To understand the metabolic activities of plants.
2. To understand the role of enzymes in various metabolic activities of plants.
3. To know the application of the laws of physics in biological phenomena.

UNIT – I

Plant - Water relationship: structure and properties and significance of water - osmotic and non-osmotic uptake of water. Ascent of sap-cohesion theory: root pressure, transpiration, physiology of stomatal action, Translocation of solutes and assimilates. Mass flow, Membrane permeability mineral uptake: Passive and active. Role of major and Minor elements, mineral deficiency symptoms.

UNIT – II

Photosynthesis: Absorption spectrum, Action spectrum, role of pigments, enhancement effect, photosystems I & II, Photophosphorylation, Carbon Assimilation: Calvin cycle, Hatch & Slack pathway, CAM pathway. Photorespiration. Respiration: Aerobic and anaerobic. Glycolysis, Krebs's Cycle and oxidative phosphorylation, energetics of respiration.

UNIT – III

Plant Growth regulatory substances; auxins, gibberellins, cytokinins, ethylene and abscisic acid - their chemical nature, physiological effects and function. Role of hormones in flowering, senescence and abscission- Photoperiodism, vernalization and seed dormancy.

UNIT – IV

Biochemistry: Structure, classification and functions of carbohydrates, protein and lipids. Enzymes - Nature and properties. Mechanism of enzyme action-factors affecting Enzyme action, substrate concentration – inhibitors, cofactors. Secondary metabolites.



UNIT – V

Biophysics-physical forces and chemical bonds, biological effect of ionizing radiations, basic principles of spectroscopy, Laws of Thermodynamics and explanation - Energy transductions in biological systems. Redox potential, Redox couples, ATP bioenergetics.

Text Books

1. Annie and Arumugam, N. (2000). Biochemistry & Biophysics. Saras Publications, Nagercoil, Tamilnadu.
2. Bajracharya, D. (1999). Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.
3. Casey, E.J. (1969). Biophysics-Concepts and Mechanisms. Van Nostrand Reinhold Co. & Affiliated East West Press (P) Ltd., New Delhi.
4. Conn, E.E., Stump, F., Bruening, G. and Doi, R.H. (2005). Outlines of Biochemistry 5th Ed, Wiley & Sons Pvt . Ltd. New York.
5. Day, P.M. and Harborne, J.B. (2000). Plant Biochemistry. Harcourt Asia (P) Ltd., India & Academic Press, Singapore.
6. Devlin, R.M. (1974). Plant Physiology, Affiliated East West Press Pvt. Ltd. New Delhi.
7. Dulsy Fatima, R.P. et. al. (1994). Elements of Biochemistry. Saras Publications, Nagercoil, Tamilnadu.
8. Jain, J.L. (1998). Fundamentals of Biochemistry. S. Chand & Co., New Delhi.
9. Jain, J.L. et al. (2008). Fundamentals of Biochemistry, Chand, New Delhi.
10. Jain, V.K. (2007). Fundamentals of plant physiology. S. Chand & Company Ltd, New Delhi.
11. Lehninger, A.L. (1984). Biochemistry (2nd Edition). Kalyani Publishers, Ludhiana, New Delhi.
12. Narayanan, P. (2000). Essentials of Biophysics. New Age International Publishers (P) Ltd., New Delhi, Bangalore, Calcutta, Chennai, Guwahati, Hyderabad, Lucknow, Mumbai.
13. Narayanan, P. (2000). Essentials of Biophysics. New Age International Publishers (P) Ltd., New Delhi, Bangalore, Calcutta, Chennai, Guwahati, Hyderabad, Lucknow, Mumbai.
14. Nobel, P.S. (1970). Introduction to Biophysical Plant Physiology. W. H. Freeman and Company, San Francisco.
15. Noggle, G.R. and Fritz, G.J. (1976). Introductory Plant Physiology, Prentice-Hall, India.
16. Pandey, S.N. (1991). Plant Physiology. Vikas Publishing House (P) Ltd., New Delhi.



17. Pandey, S.N. and Sinha, B.K. (2001). Plant Physiology. Third revised edition, Vikas publishing House Pvt. Ltd, New Delhi
18. Periyasamy, K. (1978). Cell Iyakka Viyal (Cell Physiology). Tamilnadu text Book Society, Chennai.
19. Plummer, D.T. (1988). An Introduction to Practical Biochemistry (3rd Edn.,). Tata McGraw Hill Publishing Co., Ltd., New Delhi.
20. Rastogi, S.C. (2003). Outlines of Biochemistry , CBS Publishers & Distributors , New Delhi.
21. Salisbury, F.B. and Ross, C.W. (1999). Plant Physiology. CBS Publishers and Printers, New Delhi.
22. Saraswathy and Rangamannar (1973). Thaavara Valarchithai Martram (Metabolism & Biosynthesis). Tamilnadu Text Book society, Chennai.
23. Satyanaryana, U. and Chakrapani, U. (2006). Biochemistry, Books and Allied (P) Ltd. Kolkata, India.
24. Srivastava, H.S. (1990). Elements of Biochemistry. Rastogi Publications, Meerut, India.
25. Verma, V. (2008). Text book of plant Physiology, Ane's student edition, New Delhi

Reference Books

1. Beevers, L. (1976). Nitrogen metabolism in plants. William & Sons Ltd. London.
2. Bidwell, R.G.S. (1979). Plant Physiology, Mac Millan Publishing Company. New Delhi.
3. Bray, C.M. (1983). Nitrogen Metabolism in Plants, Longman.
4. Jain, V.K. (1990). Fundamentals of Plant Physiology. S. Chand & Co., New Delhi.
5. Jayaraman, J. (1981). Laboratory Manual of Biochemistry. Wiley Eastern Ltd., New Delhi.
6. Kramer, P.J. (1969). Plant and soil water relationship, A Modern Synthesis. McGraw-Hill Book Company, New York, USA.
7. Levitt. (1972). Responses of plants to environmental stress, Academic press, New York.
8. Noggle, R. and Fritz. (1989). Introductory Plant Physiology. Prentice Hall of India.
9. Salil Bose, S. (1982). Elementary Biophysics. Vijaya Printers, Madurai.
10. Salisbury, F.B. and Ross, C.W. (1986). Plant Physiology. Third edition, CBS Publishers and Distributors, New Delhi.
11. Stryer, L. (1989). Biochemistry. W.H. Freeman & Co., New York, San Francisco.
12. Taiz, L. and Zeiger, E. (1991). Plant physiology. The Benjamin/Cummings Publishing company, Inc., California, New York.



13. Wilson, K. and Walker, J. (1994). Principles and Techniques of Practical Biochemistry (4th Edition). Cambridge University Press, U.K.
14. Caret *et al.* (1993). Inorganic, Organic and Biological Chemistry, WMC Brown Pub. USA.
15. Nelson, D.L. and Cox, M.M. (2005). Lehninger Principle of Biochemistry, W.H. freeman and Company, New York.
16. Zuley, G.L., (1998). Biochemistry, Wm. C .Brown Publishers USA.

Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Acquire knowledge on water and phyto hormones and its relationship in plants.	K1
CO2	Understand the properties and nature of macromolecules.	K2
CO3	Acquire knowledge on the photosynthesis and respiration of plants.	K3
CO4	Explore the application of biospherical techniques.	K4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
Core – IX	Course Code: 20UBO6C09		Course Title: Plant Ecology, Phytogeography and Resource Conservation	
Semester VI	Hours/Week 5	Total Hours 75	Credits 5	Total Marks 100

COURSE OBJECTIVES

1. To understand the principles of Environment.
2. To acquire basic knowledge about community succession.
3. To study the vegetation and distribution of plants in India.
4. To ensure knowledge on resource conservation.

UNIT – I

Principles of Ecology. Climatic factors - role and importance of light, temperature, wind and rainfall on the growth of plants. Edaphic factors, Biotic factors.

UNIT – II

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

UNIT – III

Ecosystem - Basic structure and functions: Pollution - causes and possible control measures of air, water, soil, noise and radioactive pollutions. Plants - indicator of pollution. Disaster Management.

UNIT – IV

Phytogeography: Principle of Phytogeography. Origin of cultivated plants. Vegetation of India. Continental drift. Age and area hypothesis, endemism, discontinuous distribution of plants.

UNIT – V

Resource conservation: Types of resources, conservation of soil, water, agriculture resources, range, forest and freshwater bodies. Case study - Project Tiger and Biosphere reserves - Nilgiris Biosphere Reserve (NBR).



Text Books

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

Reference Books

1. Ambasht, R.S. (1992). Text book of Plant Ecology, Students and Friends & Co. Varanashi.
2. Richard, S. Ostfeld and William H. Schlesinger. (2011). The year in Ecology and conservation Biology, Willey - Blackwell Publications. New York.
3. Schimper, A.F. (1960). Plant geography. Lubrecht & Cramer Ltd., New York.

Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Know the various types of ecosystems.	K1
CO2	Understand the role of community succession.	K2
CO3	Know the impact of afforestation.	K3
CO4	Apply the knowledge on conservation of plants and forest.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
Core – X	Course Code: 20UBO6C10		Course Title: Microbiology and Plant Pathology	
Semester VI	Hours/Week 5	Total Hours 75	Credits 5	Total Marks 100

Course Objectives

1. To understand microbes characteristics.
2. To acquire basic knowledge about virology.
3. To study about the microbes in food industry and laboratory techniques.
4. To identify the fungal diseases in the cash crops.

UNIT – I

Introduction to microbiology - Historical account, Scope of microbiology, Whittaker's five-kingdom classification. Bacterial morphology, ultrastructure, reproduction - conjugation, transformation and transduction.

UNIT – II

General characters of viruses, classification of plant viruses. Viral replication - Lytic and lysogenic cycles. Morphology of Bacteriophage (T_2 and T_4).

UNIT – III

Sterilization techniques: Physical and Chemical, Culture techniques- Pure culture techniques; Pour plate method, Streak plate, Spread plate method.

Food microbiology - Milk and milk products - physical and chemical composition, pasteurization, Microbial flora of fresh food, microbial examination of poisoning (Botulism). Fermentation - Aerobic and anaerobic fermentation (outline)

UNIT – IV

Plant Pathology: Introduction; Classification of plant diseases based on causal organisms. Symptoms, causative organisms, life cycle and control measures of following fungal diseases of plants: Tikka disease of groundnut and Red rot of sugarcane.



UNIT – V

Symptoms, causative organisms, life cycle and control measures of Virus - Tobacco Mosaic disease and Bunchy top of banana; Bacteria - Citrus canker and Rice bacterial blight disease.

Text Books

1. Rangaswamy, G. and Mahadevan, A. (1999). Diseases of Crop plants in India (4th edition). Prentice Hall of India Pvt. Ltd., New Delhi.
2. Scheigel, H.S. (1986). General Microbiology, (6th edition). Cambridge University press, London.
3. Sambamurthy. A.V.S.S. (2009). A text book of Plant Pathology. I.K. International Publishing House Pvt. Ltd, New Delhi.

Reference Books

1. Alexopoulos, C.J., Mims, C.W. and Blackwel, M. (1996). Introductory Mycology. John Wiley & Sons Inc. New York.
2. Aneja, K.K. (1996). Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom Cultivation, Wishwa Prakashan, New Delhi.
3. Clifton, A. (1958). Introduction of bacteria. Mc Graw Hill Book Co., New York.
4. Dubey and Mageshwari (2013). Text Book of Microbiology. S.Chand & Co. Ltd. New Delhi.
5. Mandahar, C.L. (1978). Introduction to plant viruses. Chand & Co. Ltd, New Delhi
6. Pelczar, M.J (Jr), Chan, E.C.S and Krieg, N. R (1986). Morphology. Tata Mc Graw Hill Publishing Company Ltd, New Delhi.
7. Purohit, S.S. (1999). Microbiology Fundamentals and Applications, (6th Edition). Agrobios (India), Jodhpur.



Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Know basic knowledge of microorganisms.	K1
CO2	Understand the infection of virus in plant community.	K2
CO3	Apply the knowledge on the food industry for commercial purpose.	K3
CO4	Implement the disease management techniques in the fields.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
Elective – II	Course Code: 20UBO6E02		Course Title: Forestry	
Semester	Hours/Week	Total Hours	Credits	Total Marks
VI	5	75	5	100

Course Objectives

1. To understand the value of wealth of forests of India.
2. To develop an understanding of biodiversity, conservation and agroforestry.
3. To realize the role of people in conserving forests.

UNIT – I

Forest Types: Major Forest types in India with special reference to Tamil Nadu - Forest Centers of Biodiversity - Biodiversity Hotspots.

UNIT – II

Protection Forestry: Conservation- *in- situ* and *ex- situ*;- National Forest Policy, Forest Conservation Act - National Sanctuaries, National Parks and Biosphere Reserves - Role of People: Chipko Movement, Saalumarada Thimmakka and Hugo Wood.

UNIT – III

Commercial Forestry: Forests as Sources of Timber - Nonwood Forest Products: fodder, food, oil, fiber, paper and medicine.

UNIT – IV

Social Forestry: Agroforestry- Afforestation and Reforestation Programmes - Ecological Benefits - Deforestation: Causes and Consequences - Plantation Forestry.

UNIT – V

Silviculture: Artificial and Natural Regeneration of some important Forest Plants: Teak and Casuarina Forest Education and Management.

Text Books

1. Bridger Blackeney. (2013). Handbook of Forestry. Agrotech Press. New Delhi.
2. Pathak, P.S. and Ram Newaj. (2012). Agroforestry: Potentials and Opportunities. India



Agrobios.

- Uthappa, A.R. and Sangram Bhanudas Chavan (2015). Competitive Forestry, New Vishal Publications, 1st Ed. New Delhi.

Reference Books

- Bruce Alan. (2005). Forest products biotechnology. Taylor & Francois Ltd., London.
- Kumar, U. and Asija, M.J. (2011). Biodiversity Principles and Conservation India: Agrobios. India.
- Manikandan, K. and Prabhu, S. (2017) Indian Forestry A Breakthrough Approach To Forest Services. Jain Brothers, New Delhi.
- Powell, and Baden B.H. (2004). Manual of Forest Law. New Delhi:Biotech.
- Vyas, G.P.D. (2006). Community Forestry. Jodhpur: Agrobios.

Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Gain the knowledge on types of forests and their distribution in India.	K1
CO2	Become familiar with national sanctuaries, parks and biospheres.	K2
CO3	Discover the variety of non-wood forest products.	K3
CO4	Determine the causes and consequences of deforestation.	K4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
Elective – II	Course Code: 20UBO6E03		Course Title: Food and Nutrition	
Semester VI	Hours/Week 5	Total Hours 75	Credits 5	Total Marks 100

Course Objectives

1. To learn the importance of different kinds of foods.
2. To develop knowledge on nutritive values of the foods.
3. To awareness about the food adulterations.
4. To practice Indian traditional healthy recipes.
5. To live a healthy life by knowing the importance of good nutrition.

UNIT – I

Introduction to Nutrition - food as a source of nutrients, functions of foods, definition of nutrients, adequate, optimum and good nutrition, malnutrition. Nutritional supplements.

UNIT - II

BMI. Inter relationship between nutrition and health, Good health definition and parameters. Necessity for physical activities.

UNIT – III

Preparation of diet chart for infant, adolescent, adult, senior people, pregnant women, lactating mother.

UNIT - IV

Diets for gastro intestinal disorders, renal disorders, liver disorders, obesity, cardio vascular disorders and Diabetes mellitus.

UNIT - V

Preparation of Indian Traditional food items (Five varieties: Adai, Pongal, Porridge, Sathu Maavu and Idli - Nine cereals to be used either singly or in combination for the recipes along with their nutritional values).

Text Books

1. Swaminathan, M. (2006). Hand book of food and nutrients. The Bangalore printing &



Publishing Co Ltd, India

- Sharma. A. (2005). Textbook of Food Science and Technology 3rd edition. CBS Publication. New Delhi.
- Srilakshmi. B. (2015). Food Science. New Age International Private Limited. New Delhi.

Reference Books

- Mahtab s. Bamji, N. Pralhad Rao and Vinodini Reddy (2003). Text book of Human nutrition Second Edition, Oxford & IBH Publishing Co. Pvt, New Delhi.
- Sumati R Mudambi (2001). Fundamentals of foods and nutritions , New age International publishers, New Delhi.
- Sunetra. R. (2012). Food Science and Nutrition. Oxford University Press. New Delhi.

Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Recognize relationship between nutrition and health.	K1
CO2	Understand different nutritive values of cereals, pulses, vegetables and fruits.	K2
CO3	Apply the acquired knowledge on preparation of healthy diet chart for different age groups.	K3
CO4	Know diets which prevent various diseases and disorders.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	H	H	M	H	M
CO2	H	M	H	S	M
CO3	S	H	M	H	H
CO4	H	H	S	M	S

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
SBEC – VI	Course Code: 20UBO6S06		Course Title: Algal Biotechnology	
Semester	Hours/Week	Total Hours	Credits	Total Marks
VI	2	30	2	100

COURSE OBJECTIVES

1. To know the algal biotechnological application.
2. To study the uses and chemical composition of algae.
3. To analyze the algal large scale production techniques.
4. To know the algal research centers in India.

UNIT – I

Introduction to algal biotechnology: Resource potential of algae; commercial utility of algae. Algae as a source of food and feed; Algae as a source of pigments, fine chemicals, fuel and bio-fertilizers. Distribution of economically important algae in India.

UNIT – II

Uses of the following algae: *Spirulina*, *Scenedesmus*, *Dunaliella*, *Gracilaria*, *Gelidium*, *Gelidiella*, *Turbinaria*, *Caulerpa* and *Ulva* - Chemical composition in algae.

UNIT – III

Algal growth curve; Culture media; indoor cultivation methods and scaling up. Measurement of algal growth. Large-scale cultivation of algae. Harvesting algae. Drying.

UNIT – IV

Liquid seaweed fertilizer: Method of preparation and application. Biodiesel from algae: algae producing biodiesel; Cultivation and extraction methods. Phycoremediation. Role of algae in nanobiotechnology. Algal immobilization and its applications; Blue-green algal bio-fertilizer.

UNIT – V

Algal culture collection centers in India and abroad and their importance; Centers pursuing algal research in India and their field of interest.

Text Books

1. Barsanti, Laura and Paolo Gualtieri (2005). *Algae-Anatomy, Biochemistry and Biotechnology*. Taylor & Francis, London, New York. Becker, E.W. 1994.



2. Trivedi, P.C. (2001). Algal Biotechnology. Pointer publishers, Jaipur, India.

Reference Books

1. Bold, H.C. and M.J.Wynne. (1979). Introduction to Algae. New Delhi: Prentice Hall of India.
2. Chandramohan, D. (2007). Prospects of Biodiesel from marine microorganisms. Proceedings of the National Workshop on Biodiesel, organized by School of Energy, Environment & Natural Resources, Madurai Kamaraj University, Madurai and Ahimsa Agri division, Chennai.
3. Chapman, V.J. and Chapman, D.J. (1973). The Algae. London: Macmillan.
4. Venkataraman, L.V. and E.W. Becker (1985). Biotechnology and Utilization of Algae – The Indian Experience. Dept. Science and Technology, New Delhi and Central Food Research Institute, Mysore, India.

Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Apply the primitive forms in the biotechnology field.	K1
CO2	Create awareness on uses of marine algae.	K2
CO3	Gain knowledge on seaweed liquid fertilizers and Phycoremediation process.	K3
CO4	Apply knowledge on cultivation of various algae.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
SBEC – VII	Course Code: 20UBO6S07		Course Title: Nursery and Gardening	
Semester VI	Hours/Week	Total Hours	Credits	Total Marks
	2	30	2	100

Course Objectives

1. To provide information on the fundamentals of nursery and gardening.
2. To know the importance of seeds and seed banks.
3. To study the various types of propagation.
4. To learn the raising of seeds and transplantation.

UNIT – I

Nursery: definition, objectives and scope and building up of infrastructure for nursery, planning and seasonal activities - Planting - direct seeding and transplants.

UNIT – II

Seed: Structure and types - Seed dormancy; causes and methods of breaking dormancy - Seed storage: Seed banks, factors affecting seed viability, genetic erosion - Seed production technology - seed testing and certification.

UNIT – III

Vegetative propagation: Air-layering, cutting, selection of cutting, collecting season, treatment of cutting, rooting medium and planting of cuttings - Hardening of plants - greenhouse - mist chamber, shed root, shade house and glass house.

UNIT – IV

Gardening: definition, objectives and scope - different types of gardening - landscape and home gardening - parks and its components - plant materials and design - computer applications in landscaping - Gardening operations: soil laying, manuring, watering, management of pests and diseases and harvesting.

UNIT – V

Sowing/raising of seeds and seedlings - Transplanting of seedlings - Study of cultivation of different vegetables: cabbage, brinjal, lady's finger, onion, garlic, tomatoes, and carrots - Storage and marketing procedures.



Text Books

1. Chatopadhyaya, S.K. (2018). Commercial Floriculture. Gene Tech Books. New Delhi.
2. Manibhusan Rao. (2012). Textbook of Horticulture. Vishvanathan & Co. Chennai.
3. Trivedi, P. (2015). Home Gardening. Narosa Publication. New Delhi.

Reference Books

1. Bose T.K. and Mukherjee, D. (1972). Gardening in India, Oxford & IBH Publishing Co., New Delhi.
2. Sandhu, M.K., (1989). Plant Propagation, Wile Eastern Ltd., Bangalore, Madras.
3. Kumar, N., (1997). Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.
4. Edmond Musser and Andres, Fundamentals of Horticulture, McGraw Hill Book Co., New Delhi.
5. Agrawal, P.K. (1993). Hand Book of Seed Technology, Dept. of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi.
6. Janick Jules. (1979). Horticultural Science. (3rd Ed.), W.H. Freeman and Co., San Francisco, USA.

Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Knowledge on basics of nursery and gardening.	K1
CO2	Understand and implement knowledge of seeds.	K2
CO3	Practice various types of gardening.	K3
CO4	Practice and gets benefited through gardening in daily life.	K4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

**Mapping of COs with POs**

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Botany				
Core Practical – III (Courses - V, VI & VII)		Course Code: 20UBOP603	Course Title: Plant Morphology of Angiosperms, Taxonomy, Economic Botany, Genetics, Plant Breeding, Evolution, Bio-Instrumentation and Biostatistics	
Semester VI	Hours/Week 3	Total Hours 45	Credits 2	Total Marks 100

Course Objectives

1. To know the morphological, taxonomical and economic values of the plants.
2. To study the cellular details, genetic constitution and plant breeding techniques.
3. To insist basic knowledge of the instruments.

Taxonomy of angiosperms & economic botany

- Describe the plant parts with suitable plants- Technical term habit, habitat form, types of leaves, with leaf shape, margin, texture, modification of the leaf.
- Study the types and modification of root and stem with suitable example. Identify the following inflorescence and fruits:
- Inflorescence - Simple raceme, Spike, Corymb, Head, simple cyme, Cyathium and Hypanthodium.
- Fruits - Simple: Berry, Drupe, Pepo, hesperidium. (Indehiscent) – Nut. Dry- Legume, capsule (loculicidal). Aggregate.
- Floral formula from floral description.
- Identify the families mentioned in the syllabus by noting their vegetative and floral Characters.
- Students must describe the floral parts, draw the L.S., floral diagram and write the floral formula of at least one flower from each family.
- Study the products of plants mentioned in the syllabus of economic botany with Special reference to the morphology, botanical name and family.
- Prepare herbarium of 20 plants with field notes (internal assessment).
- Field Visit.



Genetics, Plant Breeding & Evolution

1. Simple problems in genetics (Monohybrid and Dihybrid cross, Incomplete dominance, Codominance, Collaborator genes, Epistasis, Complementary genes, Duplicate genes and Lethal genes).
2. Selection, mass selection and clonal propagation methods.
3. Emasculation technique.
4. Lamarckism - Neo-Lamarckism – Darwinism.

Bio-Instrumentation & Biostatistics

1. Separation of pigments by Thin Layer Chromatography.
2. Demonstrate the Preparation of specimen and sectioning using microtome
3. Study of blotting techniques: Southern, Northern and Western, Colorimetry, UV – Visible spectrophotometry, Soxhlet apparatus, Centrifugation, Agarose gel electrophoresis and PCR.
4. Simple problems in mean, median, mode in Biostatistics.

***Bonafide record of practical work done should be submitted to the practical examination.**

Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Apply knowledge on identification and understanding external morphology of plants.	K3
CO2	Observe the sequential changes in the internal structure of plants by sectioning through microtechniques.	K4
CO3	Identify the sex linked disease among the population.	K4
CO4	Operate various bioinstruments.	K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create



Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S - Strong

H - High

M - Medium

L – Low



SRI VIDYA MANDIR ARTS AND SCIENCE COLLEGE (Autonomous)

KATTERI - 636 902

UG MODEL PRACTICAL QUESTION PAPER

End semester Examination Question Paper Pattern

(For the candidates admitted from the academic year 2020-21 onwards)

Time: 3 Hours

Max. Marks: 60 Marks

BREAK UP OF MARKS

**Core Practical:III Plant Morphology, Taxonomy of Angiosperms,
Economic Botany, Genetics, Plant breeding, Evolution
Bio-Instrumentation and Biostatistics**

Maximum: 60 Marks

Practical : 50 Marks

Record: 5 Marks

Herbarium: 5 Marks

1. Refer A and B, to their respective families. Point out the characters on which the identification is based at each level. (Diagrams not necessary) (2 x 4=8 Marks)
2. Describe C in Technical terms. Draw diagrams of the floral parts only. Construct the floral Diagram. Give the floral formula (5 Marks)
3. Construct the chromosome map with the data provided D (6 Marks)
4. Solve the given genetic problem E and F (2 x 3=6 Marks)
5. Write the name of the genus, species, family and the morphology of the useful parts of G, H, and I (3 x 4 = 12 Marks)
6. Work out the problems 'J' related to Biostatistics (5 Marks)
7. Identify and write notes on K, L, M and N (4 x 2= 8 marks)

KEY

A & B - Taxonomy Families

(2 x 4 = 8 marks)

C -Plant with flowers.

(Preparation -1 marks, Floral diagram – 2 marks, Floral formula -2 marks)

D-Chromosome map

(6 marks)



E & F-Genetic problems

(2 x 3 =6 Marks)

G, H & I -Morphological parts:

(Genus -1mark, Species -1 marks, family-1mark, Morphology -1 mark) (12 Marks)

J - Biostatistics Problem (Steps -2; Results- 2)

(4 Marks)

K, L, M & N- Genetics, Plant breeding, Evolution, Bioinstruments,

Identification 1 mark, Reason -1 mark

(4 x 2= 8 marks)



Program: B.Sc. Botany				
Core Practical – IV (Courses - VIII, IX & X)	Course Code: 20UBOP604	Course Title: Plant physiology, Biochemistry, Biophysics, Plant Ecology, Phytogeography, Resource Conservation, Microbiology and Plant Pathology		
Semester VI	Hours/Week 3	Total Hours 45	Credits 2	Total Marks 100

Course Objectives

1. To acquire skills on plant physiology.
2. To learn the plant biomolecules
3. To learn the metabolic process of the plants.

Plant physiology, Biochemistry and Biophysics

1. Effect of the osmotic pressure of the cell sap by plasmolytic method.
2. Effect of temperature on Membrane permeability.
3. Effect of chemical on Membrane permeability.
4. Separation of leaf pigments by paper chromatography.
5. Measurement of the rate of Photosynthesis under various CO₂ concentration.
6. Effect of Light intensity on O₂ evolution during photosynthesis.
7. Rate of respiration in flower buds/germinated seeds using simple respiroscope.
8. Effect of light intensity on transpiration. Determining the rate of transpiration using Ganong's potometer.
9. Quantitative estimation of Carbohydrates and Proteins.
10. Qualitative analysis of Lipids.

Plant Ecology, Phytogeography and Resource Conservation

1. Study of morphological and anatomical adaptations of hydrophytes, xerophytes, halophytes and epiphytes using representative samples.
2. Determination of the frequency and density constituent of plant species in a terrestrial community through quadrat and transect (line and belt).
3. Enumerate 25 trees/shrubs (campus flora) with botanical name, family and vernacular name.
4. Phytogeographical regions of India.



Microbiology and Plant Pathology

1. A study of Rhizosphere and mycorrhizae.
2. Preparation of culture media for bacteria, fungi and actinomycetes.
3. Estimation of bacteria, fungi and actinomycetes (plate count) from soil and water by serial dilution method.
4. Preparation of agar streak and agar slants, sterilization and inoculation.
5. Identification of gram staining bacteria using milk or curd.
6. Observation of microbes using the hanging - drop method.

Plant Pathology: Study of the following plant diseases with special reference to the symptoms, causal organism and disease cycle and control measures of

1. TMV
2. Bunchy top of Banana
3. Citrus canker
4. Rice bacterial blight

* **Bonafide record of practical work done should be submitted for the practical examination.**

Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Demonstrate various physiological experiments.	K3
CO2	Apply the principles of reagents to estimate the macromolecular contents of the plant samples.	K4
CO3	Analyze the carbohydrate, protein and lipid molecules.	K4
CO4	Examine various plant diseases and its causative agents.	K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create



Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	S	M
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SRI VIDYA MANDIR ARTS AND SCIENCE COLLEGE (Autonomous)

KATTERI - 636 902

UG MODEL PRACTICAL QUESTION PAPER

End semester Examination Question Paper Pattern

(For the candidates admitted from the academic year 2020-21 onwards)

Time: 3 Hours

Max. Marks: 60 Marks

BREAK UP OF MARKS

Core Practical: IV – Plant physiology, Biochemistry, Biophysics, Plant Ecology, Phytogeography, Resource conservation
Microbiology and Plant pathology

Maximum: 60 Marks

Practical: 50 Marks

Record: 10 Marks

1. Write Procedure, apparatus required for the experiment A. Give the inference from the experiment and leave the setup for valuation (12 Marks)
2. Based on morphological and anatomical character assign B to their probable habitat. Draw labeled sketches. Submit the slide for valuation. (6 marks)
3. Analyse the plant communities present in the constructed Quadrat/Line Transect/Belt transect C by Quantitative method. Present the data and give the inference (10 marks)
4. Write the procedure for the Gram Staining and identify the type of bacteria present in the given sample D. (8 Marks)
5. E - Write down the procedure for Preparing a medium/culture/ inoculation Techniques/Hanging drop Method. (4 Marks)
6. F- Draw and comment on the setup (4 marks)
7. G- Identify the disease, the causative organism, symptom and its control measure (6 Marks)

**Key**

- A - Physiology / Biochemistry A (Requirements-4, Procedure-4, Result-4) (12 Marks)
- B - Hydrophyte / Xerophyte (Identification -1, Slide-2, Diagram -1, Notes-2) (6 Marks)
- C - Quadrat / Line transect / Belt transect-
(Identification-2, Procedure-2, tabalutaion – 2, Graph-2, Result-2) (10 Marks)
- D - Gram staining (8 Marks)
- E- Culture methods/ inoculation techniques/ Hanging drop method (4 Marks)
- F- Plant physiology setup (4 Marks)
- G - Any disease in the syllabus
Name disease – 1 marks, Causative organism – 1 marks, Symptom – 1 marks,
Control measure – 1 marks, Diagram – 2 marks (6 marks)