

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

Institutional Learning Outcomes

Stella Maris College, an autonomous Catholic institution of higher education, is committed to the highest standards of academic excellence based on sound values and principles, where students are strengthened with whole person education to lead purposeful lives in service to the community and the nation.

The Institutional Learning Outcomes (ILOs) of Stella Maris College (SMC) reflect the broader mission and purpose of the institution. They are the overarching set of learning outcomes that all students, regardless of discipline, must achieve at graduation. All programme and course learning outcomes are mapped to the institutional outcomes, thus reflecting an overall alignment of values, knowledge and skills expected at programme completion. ILOs are designed to help guide individual departments and disciplines in the development of their programme learning outcomes.

The ILOs of SMC are formed by two components:

1. **Core commitments:** Knowledge and scholarship, values and principles, responsible citizenship, service to community
2. **Institutional values:** Quest for truth, spirit of selfless service, empowerment

Upon graduation, students of Stella Maris College will

- Display mastery of knowledge and skills in their core discipline (**Knowledge and Scholarship**)
- Exhibit in all actions and attitudes a commitment to truth and integrity in all contexts, both personal and professional (**Values and Principles**)
- Demonstrate knowledge about their role in society at local and global levels, and actively work for social and environmental justice (**Responsible Citizenship**)
- Engage in the process of self-discovery through a life-long process of learning (**Quest for truth**)
- Demonstrate readiness to serve those who are in need (**Spirit of selfless service**)
- Be able to function effectively and with confidence in personal and professional contexts (**Empowerment**)

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Programme Learning Outcomes/Intended Programme Learning Outcomes

Graduates of a Bachelor's Degree will have a broad and coherent body of knowledge in their disciplines, with a deep understanding of the underlying principles and concepts in one or more disciplines as a basis for independent lifelong learning.

At the end of an undergraduate programme students will be able to

- Describe and define critical concepts in their discipline
- Explain and discuss concepts and ideas pertaining to their discipline
- Demonstrate a broad understanding of their discipline
- Demonstrate communication skills to present a clear, coherent and independent exposition of knowledge and ideas
- Demonstrate understanding of the interconnections of knowledge within and across disciplines
- Apply knowledge, theories, methods, and practices in their chosen field of study to address real-world challenges and opportunities
- Demonstrate proficiency in experimental techniques and methods of analysis appropriate for their area of specialisation
- Generate and analyse data using appropriate quantitative tools
- Construct and test hypotheses
- Demonstrate cognitive and technical skills to synthesise knowledge in interrelated disciplines
- Demonstrate critical thinking and judgement in identifying and solving problems with intellectual independence
- Demonstrate the skills needed to be able to function successfully in their field
- Show responsibility and understanding of local and global issues
- Demonstrate through their actions and speech that they are agents of social justice and change
- Practice the discipline's code of ethics in their academic, professional and personal lives
- Practice the values of democracy and principles of human rights
- Show self-awareness and emotional maturity
- Demonstrate career and leadership readiness
- Demonstrate intercultural, interracial, interclass, inter-caste, and ethical competency
- Exhibit the ability to work in teams
- Exhibit a strong sense of professionalism in a range of contexts
- Demonstrate sensitivity and readiness to share their knowledge, experience, and capabilities with the marginalised and oppressed in their communities

STELLA MARIS COLLEGE (AUTONOMOUS), CEHNNAI – 600 086

DEPARTMENT OF BOTANY

PROGRAMME DESCRIPTION

The B. Sc. Programme in Plant Biology and Plant Biotechnology offers a comprehensive blend of classical and contemporary branches in botany and biotechnology.

The first year focuses on the study of the lower groups of plants and on the basics of biotechnology. The second year deals with an in-depth study of branches like taxonomy, anatomy and phytotherapy. The final year includes the study of genetics, ecology, cell and molecular biology, microbiology, physiology and applied biotechnology.

Regular practical sessions with tests and examinations are held at designated times.

On completion of the programme, the student will have a thorough knowledge of the subject in both theory and applications through practical work, which in turn will provide a platform for a promising career as well as higher studies in botany and biotechnology.

PROGRAMME SPECIFIC LEARNING OUTCOMES

On completion of this programme, students will be able to

- describe the structure and reproduction of the different forms of plant life from lower to higher
- compare the life-cycles of different groups of plants
- calculate the quantitative parameters of plant community life
- define technical terms in all branches of botany
- assign a given plant to its respective family
- solve problems in genetics
- construct the floral formula and floral diagram of a flower
- draw neat, labelled scientific diagrams wherever required
- identify any plant or specimen, type of gene interaction or spotter in botany
- spot- at-sight plants or specimens
- evaluate processes in botany
- analyze a family history chart
- master the technique of isolating microorganisms
- understand the biosynthesis of nucleic acids
- comprehend the stages in cell division
- carry out research in plant biotechnology

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI 600 086

B.Sc. DEGREE : BRANCH V.A.-PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

COURSES OF STUDY

(Effective from the academic year 2019-2020)

CHOICE BASED CREDIT SYSTEM

C-Credit, L-Lecture Hours, T-Tutorial Hours, P- Practical Hours, Ex-Exam Hours, CA- Continous Assessment Marks, ES-End Semester Marks, M-Maximum Marks										
Subject Code	Title of Course	C	L	T	P	Ex	CA	ES	M	
SEMESTER-I										
19BT/MC/AF14	Algae, Fungi and Lichens	4	4	1	0	3	50	50	100	
19BT/MC/P112	Algae, Fungi and Lichens-Practical	2	0	0	3	3	50	50	100	
19BT/SS/HC13	Life Skills:Health, Energy and Computer Basics	3	3	0	0	-	50	-	100	
Allied Core Offerd to the Department of Zoology										
19BT/AC/GB14	General Botany I	4	4	0	0	3	50	50	100	
19BT/AC/P111	General Botany I-Practical	1	0	0	2	3	50	50	100	
CD / ET / SC	Value Education	2	2	0	0	-	50	-	100	
	Life Skills:Personality Development (EL)	3	3	0	0	-	50	-	100	
SEMESTER-II										
19BT/MC/BP24	Bryophytes, Pteridophytes and Gymnosperms	4	4	1	0	3	50	50	100	
19BT/MC/P222	Bryophytes,Pteridophytes and Gymnosperms-Practical	2	0	0	3	3	50	50	100	
19BT/MC/BB23	Basics of Applied Biotechnology	3	3	1	0	3	50	50	100	
19BT/GC/ES12	Environmental Studies	2	2	0	0	-	50	-	100	
Allied Core Offerd to the Department of Zoology										
19BT/AC/GB24	General Botany II	4	4	0	0	3	50	50	100	
19BT/AC/P221	General Botany II-Practical	1	0	0	2	3	50	50	100	
	Basic Tamil I / General Elective I	2	2	0	0	-	50	-	100	
SEMESTER-III										
19BT/MC/TE34	Taxonomy of Angiosperms and Economic Botany	4	4	1	0	3	50	50	100	
19BT/MC/PE33	Phytotherapy and Ethnobotany	3	3	1	0	3	50	50	100	
19BT/MC/P332	Taxonomy of Angiosperms and Economic Botany-Practical	2	0	0	3	3	50	50	100	
	Basic Tamil II / General Elective II	2	2	0	0	-	50	-	100	
CD / ET / SC	Value Education	2	2	0	0	-	50	-	100	
SEMESTER-IV										
19BT/MC/AE44	Anatomy and Embryology of Angiosperms	4	4	1	0	3	50	50	100	
19BT/MC/P442	Anatomy and Embryology of Angiosperms-Practical	2	0	0	3	3	50	50	100	
	Major Elective I									
19BT/SS/PS13	Life Skills:Personal and Social	3	3	0	0	-	50	-	100	
SEMESTER-V										
19BT/MC/CM54	Cell and Molecular Biology	4	4	1	0	3	50	50	100	
19BT/MC/MB54	Microbiology	4	4	1	0	3	50	50	100	
19BT/MC/EE54	Ecology and Environmental Biotechnology	4	4	0	0	3	50	50	100	

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COURSES OF STUDY

(Effective from the academic year 2019-2020)

CHOICE BASED CREDIT SYSTEM

C-Credit, L-Lecture Hours, T-Tutorial Hours, P- Practical Hours, Ex-Exam Hours, CA- Continous Assessment Marks, ES-End Semester Marks, M-Maximum Marks									
Subject Code	Title of Course	C	L	T	P	Ex	CA	ES	M
19BT/MC/P553	Cell and Molecular Biology, Microbiology, Ecology and Environmental Biotechnology-Practical	3	0	0	6	3	50	50	100
Inter Disciplinary Core Courses (BT and CH) to students of Botany and Chemistry									
19ID/IC/BA55	Bioanalytical Techniques	5	5	1	0	3	50	50	100
	General Elective III	2	2	0	0	-	50	-	100
	SAP / SL	2	2	0	0	-	50	-	100
SEMESTER-VI									
19BT/MC/PP64	Plant Physiology	4	4	0	0	3	50	50	100
19BT/MC/PB64	Plant Biotechnology	4	4	1	0	3	50	50	100
19BT/MC/GP64	Genetics, Plant Breeding and Evolution	4	4	1	0	3	50	50	100
19BT/MC/P663	Plant Physiology, Plant Biotechnology and Genetics, Plant Breeding and Evolution- Practical	3	0	0	6	3	50	50	100
19VE/SS/HL63	Life Skills:An Approach to a Holistic Way of Life	3	3	0	0	-	50	-	100
	Major Elective II								
	General Elective IV	2	2	0	0	-	50	-	100
Major Elective Courses									
19BT/ME/FN45	Fruit Preservation and Nutrition	5	5	0	0	3	50	50	100
19BT/ME/PR45	Project	5	0	0	5	-	50	50	100
19BT/ME/HC45	Horticulture	5	5	0	0	3	50	50	100
19BT/ME/BI45	Introduction to Bioinformatics	5	5	0	0	3	50	50	100
19BT/ME/BT45	Biotechniques	5	5	0	0	3	50	50	100
General Elective Courses									
19BT/GE/HT22	Herbal Therapy	2	2	0	0	-	50	-	100
19BT/GE/FP22	Fruit Preservation	2	2	0	0	-	50	-	100
19BT/GE/FH22	Fundamentals of Horticulture	2	2	0	0	-	50	-	100
19BT/GE/WM22	Waste Mangement	2	2	0	0	-	50	-	100
19BT/GE/FR22	Floriculture	2	2	0	0	-	50	-	100
Independent Elective Courses									
19BT/UI/AR23	Agriculture	3	0	0	0	3	-	100	100
19BT/UI/FR23	Forestry	3	0	0	0	3	-	100	100

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B.Sc. DEGREE: BRANCH V. A. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

ALGAE, FUNGI AND LICHENS

CODE:19BT/MC/AF14

CREDITS:4

L T P:4 1 0

TOTAL TEACHING HOURS:65

OBJECTIVES OF THE COURSE

- To enable students to understand the diverse assemblage of lower plants
- To understand the life cycle patterns of Algae, Fungi and Lichens
- To enrich the knowledge on the importance of lower plants
- To study the economic importance of Algae, Fungi and Lichens

COURSE LEARNING OUTCOMES

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

- understand diversification of algal and fungal forms
- gain knowledge on structure and reproduction of certain algal and fungal forms
- identify diseased infected plants and its causal organisms
- appreciate the economic and ecological importance of lichens

ALGAE

Unit 1 (13 Hours)

1.1 Classification of Algae (F.E. Fritsch, 1935)

1.2 Characteristics of Algal Classes

Detailed study of the Thallus Organisation, Reproduction and Life Cycle Pattern of the following forms (no development):

1.3 Myxophyceae - *Nostoc*, *Oscillatoria*

1.4 Chlorophyceae - *Volvox*, *Caulerpa*, *Cladophora* and *Chara*

Unit 2 (13 Hours)

2.1 Bacillariophyceae - *Navicula*

2.2 Phaeophyceae - *Sargassum*

2.3 Rhodophyceae - *Gracilaria*

2.4 Economic importance of Algae

FUNGI

Unit 3 (13 Hours)

3.1 Classification of Fungi (Alexopoulos and Mims, 1979)

3.2 Characteristics of major Fungal classes

Detailed Study of the Thallus Organisation, Reproduction and Life Cycle Pattern of the following forms (no development):

3.3 Chytridiomycetes - *Synchytrium*

- 3.4 Plasmodiophoromycetes - *Plasmodiophora*
3.5 Oomycetes - *Albugo*

Unit 4 (13 Hours)

- 4.1 Ascomycetes - *Peziza*
4.2 Basidiomycetes - *Puccinia, Agaricus*
4.3 Deuteromycetes - *Cercospora*
4.4 Economic importance of Fungi

LICHENS

Unit 5 (13 Hours)

- 5.1 General characteristics of Lichens
5.2 Types: Foliose, Crustose and Fruticose
5.3 Structure, Reproduction and Function
5.4 Ecological and Economic importance of Lichens

BOOKS FOR STUDY

- Sharma, O.P. *Text book of Algae*. New Delhi: Tata McGraw - Hill, 1986.
Sharma, O.P. *Text book of Fungi*. New Delhi: Tata McGraw – Hill, 1986.

BOOKS FOR REFERENCE

- Alexopoulos, C. J. *Introductory Mycology*. New York: John Wiley, 1962.
Bhattacharya, Gopal. *Textbook of Mycology*. Agrotech., 2013.
Bold, H. C. and M.J.Wynne. *Introduction to Algae*. New Delhi: Prentice Hall of India, 1979.
Bold, H.C. *Morphology of Plants*. New York: Harper & Row, 1973.
Chapman, V. J. and D. J. Chapman. *The Algae*. London: Macmillan, 1973.
Dube, H.C. *A Text Book of Fungi, Bacteria and Viruses*. New Delhi: Vikas, 1985.
Ingold, C. T. *Biology of Fungi*. London: Hutchinson Educational, 1993.
Misra, A. and A. Agarwal. *Lichens- A Preliminary Text*. London: Oxford and IBH, 1978.
Morris, I. *An Introduction to Algae*. London: Hutchinson University Library, 1967.
Sharma, P.D. *Fungi and Allied Organism*. New Delhi: Narosa, 2005.
Smith, G.M. *Manual of Phycology*. New York: McGraw-Hill, 1955.
Vashista Sinha B.R and V.P. Singh. *Botany for Degree students, Algae* 9th revised ed. New Delhi: S.Chand, 2002.

JOURNALS

- Algal Research (Elsevier)
Algal Research (Science direct)
International Journal on Algae
Fungal Biology
Fungal Diversity

WEB RESOURCES

- www.journals.elsevier.com
www.sciencedirect.com
www.springer.com

PATTERN OF ASSESSMENT

Continuous Assessment Test:	Total Marks: 50	Duration: 90 minutes
Section A – Objective questions	9 x 1 = 9 marks	
Very Short Answers	3 x 3 = 9 marks (3 out of 4 in 50 words each)	
Section B – 2 x 6 = 12 marks (2 out of 3 questions to be answered in 200 words each)		
Section C – 1 x 20 = 20 marks (1 out of 2 questions to be answered in 1000 words each)		

Other Components: **Total Marks: 50**
Seminars/Quiz/Assignments etc. (any 2)

End Semester Examination:	Total Marks: 100	Duration: 3 hours
Section A – Objective questions 18 x 1 = 18 marks		
Choose the correct answer	5 x 1 = 5 marks	
Fill in the blanks	5 x 1 = 5 marks	
Match the following	5 x 1 = 5 marks	
True or False	3 x 1 = 3 marks	
Very Short Answers	6 x 3 = 18 marks (6 out of 9 in 50 words each)	
Section B – 4 x 6 = 24 marks (4 out of 6 questions to be answered in 200 words each)		
Section C – 2 x 20 = 40 marks (2 out of 4 questions to be answered in 1000 words each)		

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B.Sc. DEGREE: BRANCH V. A. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

ALGAE, FUNGI AND LICHENS - PRACTICAL

CODE:19BT/MC/P112

CREDITS:2

L T P:0 0 3

TOTAL HOURS:39

ALGAE

Forms mentioned in the syllabus

1. Myxophyceae - *Nostoc, Oscillatoria*
2. Chlorophyceae - *Volvox, Caulerpa, Cladophora* and *Chara*
3. Bacillariophyceae - *Navicula*
4. Phaeophyceae - *Sargassum*
5. Rhodophyceae - *Gracilaria*

Field Trip for Algal collection

Herbarium - Algal specimens (minimum 3 sheets) to be submitted at the time of examination

FUNGI

Forms mentioned in the syllabus

1. Chytridiomycetes - *Synchytrium*
2. Plasmodiophoromycetes - *Plasmodiophora*
3. Oomycetes - *Albugo*
4. Ascomycetes - *Peziza*
5. Basidiomycetes - *Puccinia, Agaricus*
6. Deuteromycetes - *Cercospora*

Herbarium – Fungal infected plants (minimum 2 sheets) to be submitted at the time of examination

LICHENS

A general study of various types of Lichens – Crustose, Foliose and Fruticose

PATTERN OF ASSESSMENT

Continuous Assessment Test:

Total Marks: 50

Duration: 90 minutes

Two Tests (2 x 20) = 40 Marks

Record = 10 Marks

End Semester Examination:

Total Marks: 50

Duration: 3 hours

1. Sectioning, Drawing, Identification with reasons (1 alga, 1 fungus) 2 x 7 = 14
2. Spotters (4) (Identification, Diagram, Notes) 4 x 4 = 16
3. Algal Mixture (2 forms out of 3, Identification, Diagram) 5
4. Spot at sight (Class, Family, Genus and Morphology) 5 x 2 = 10
5. Herbarium (Algae – 3, Fungi – 2) 5

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

**Soft Skills Course Offered to students of
B.A. / B.Sc. / B.Com. / B.B.A. / B.V.A. / B.S.W. / B.C.A. Degree Programme**

SYLLABUS

(Effective from the academic year 2019 – 2020)

LIFE SKILLS – HEALTH, ENERGY AND COMPUTER BASICS

CODE: 19BT/SS/HC13

CREDITS: 3

L T P: 3 0 0

TOTAL TEACHING HOURS: 39

OBJECTIVES OF THE COURSE

- To sensitise students to the fact that good health lies in nature
- To create an awareness about energy obtained from different components of food and to plan for a balanced diet
- To enable students to understand the significance of energy conservation and strategies for conserving energy
- To provide a basic knowledge of computer fundamentals and Email configuration

COURSE LEARNING OUTCOMES

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

- identify the importance of a few plants and their health benefits
- recognise the causes and symptoms of common disorders
- calculate food energy values and follow the Recommended Dietary Allowances (RDA) and appreciate the need for them.
- conserve energy and use it responsibly
- understand computer configuration for purchase of personal computer and E mail setting

Unit 1

(13 Hours)

Food and Health

1.1 Traditional food and their health benefits

1.1.1 **Six tastes** – Natural guide map towards proper nutrition

1.1.2 Nutritional value and significance of Navadhanya (Sesame seed, Bengal gram, Horse gram, Green gram, Paddy seeds, White beans, Wheat, black gram and Chick pea) and Greens (Vallarai, Thuthuvalai, Manathakkali, Pulichakeerai, Agathi Keerai, Murungai Keerai, Karuveppilai, Puthina and Kothamalli)

1.2 Causes, symptoms and home remedies for the following ailments

Common cold, Anaemia, Hypothyroidism, Obesity, Diabetes, Mellitus, Polycystic Ovarian Syndrome, Ulcer, Wheezing and Hypertension

Unit 2 **(13 Hours)**

Food and energy balance

- 2.1 Units of Energy, Components of Total Energy Requirement – Basal Metabolic Rate, energy requirements for (work) physical activity and Thermic effect of food
- 2.2 Factors affecting Basal Metabolic Rate and Thermic Effect of food
- 2.3 Recommended Dietary Allowances and Balanced Diet, Food Energy Values- Calculation

Unit 3 **(13 Hours)**

3.1 Energy conservation

3.1.1 Needs for Energy Conservation – Power consumption of domestic appliances – Electrical Energy Audit – Strategies for Energy Conservation - Modern lighting systems– Light emitting diode (LED), Compact fluorescent lamps (CFL), Green indicators and Inverter, Green building - Home lighting using Solar cell - Solar water heaters- Water and waste management - Biogas plant

3.1.2 Safety Practices in using electronic gadgets and electricity at home – Precautions - Shock- Use of testers to identify leakage

3.2 Computer fundamentals

3.2.1 Essentials of Purchasing a Personal Computer - Fundamentals of Networks – Local Area Network, Internet, Networking in real-time scenario- Computer Hacking – Computer Forensics Fundamentals – Cyber Laws - Secure Browsing

3.2.2 Configuring Email

Configure Email Settings – Attachments – Compression – Organizing Emails – Manage Folders - Auto Reply - Electronic Business Card - Email Filters- Manage Junk Mail - Calendar - Plan Meetings, Appointments - Scheduling Emails

3.2.3 Emerging Trends in IT - 3D Printing, Cloud Storage, Augmented Reality, Artificial Intelligence, Internet of Things (IoT)

BOOKS FOR REFERENCE

Achaya K. T. *The Illustrated Foods of India*. Oxford Publications, 2009.

Guyton, A.C. *Text Book of Medical Physiology*. (12th ed.). Philadelphia: W.B. Saunders & Co., 2011.

Joe Benton, *Computer Hacking: A Beginner's Guide to Computer Hacking, How to Hack, Internet Skills, Hacking Techniques, and More!*, Createspace Independent Pub, 2015.

John Vacca, *Computer Forensics: Computer Crime Scene Investigation*, Laxmi Publications 2015.

Pradeep Sinha, Priti Sinha, *Computer Fundamentals 6th Edition*, BPB Publications, 2003.

Srilakshmi, B. *Nutrition Science* (4th Revised Edition), New Delhi: New Age International (P) Ltd., 2014.

Suzanne Le Quesne *Nutrition: A Practical Approach*, Cornwall: Thomson, 2003.

Therapeutic Index – Siddha, 1st edition, SKM Siddha and Ayurveda, 2010.

Trevor Linsley, *Basic electrical installation work*. Newnes rint of Elsevier 2011.

PATTERN OF ASSESSMENT

Continuous Assessment:

Total Marks: 50

Two to three Task based components

Task based classroom activities

Case studies

Group discussions

Group presentation

Role play

No End Semester Examination

No CA test

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

Allied Core Course Offered by the Department of Botany for
B.Sc. (Advanced Zoology and Biotechnology) Degree Programme

SYLLABUS

(Effective from the academic year 2019–2020)

GENERAL BOTANY – I

CODE:19BT/AC/GB14

CREDITS:4

L T P:4 0 0

TOTAL TEACHING HOURS:52

OBJECTIVES OF THE COURSE

- To understand the structural details of the lower groups in the plant kingdom
- To learn the characteristic features of a few botanical families and to know their economic importance
- To provide an understanding on Plant Pathology
- To study the agricultural practices in India

COURSE LEARNING OUTCOMES

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

- understand the structure and reproduction of certain algal forms
- gain knowledge on structure and reproduction of certain fungal forms
- identify the infected plants and their causal organism
- understand different plant diseases
- describe the plants in technical terms and assign them to their respective families
- dissect the floral parts of plants
- gain knowledge on various aspects of agriculture

Unit 1 (10 Hours)

Algology

- 1.1 Salient features of the characteristic features of Algae
1.2 A detailed study of the Life Cycle of the following Algae
(no development)
a. *Nostoc* b. *Chara* c. *Sargassum*

Unit 2 (10 Hours)

Mycology

- 2.1 Salient features of the characteristic features of Fungi
2.2 A detailed study of the Life Cycle of the following Fungi
(no development)
a. *Rhizopus* b. *Aspergillus* c. *Polyporus*

Unit 3 (8 Hours)

Plant Pathology

- 3.1 A study of the causal organism, symptoms and control measures of the following plant diseases: Citrus Canker, Tikka Disease of Groundnut, Red Rot of Sugarcane

Unit 4 **(16 Hours)**

Taxonomy

4.1 A general outline of Bentham and Hooker's Classification

4.2 A study of the salient features of the following families and their economic

Importance:

- | | |
|------------------|------------------|
| a. Annonaceae | b. Cucurbitaceae |
| c. Apocynaceae | d. Lamiaceae |
| e. Euphorbiaceae | f. Poaceae |

Unit 5 **(8 Hours)**

Agriculture

5.1 Classification of Soil

5.2 Organic Gardening

5.3 Biofertilizer

5.4 Vertical Farming

BOOK FOR STUDY

Rao, K. N. and R.V.Narayanaswamy. *Ancillary Botany*. Madras: S.Vishwanathan, 1986.

BOOKS FOR REFERENCE

Bhattacharya Gopal, *Textbook of Mycology*. Agrotech, 2013.

Bhattacharyya.P and Purohit.S.S. *Organic Farming Biocontrol and Biopesticide technology*. Agrobios India, 2012.

Chopra, G.L., *A Text book of Fungi*, Meerut, India: S.Nagin & Co. Pandey B.P., *College Botany*. Vol. I Fungi & Pathology. 1997.

Pandey, B.P. *Text Book of Botany Algae*, New Delhi: S.Chand, 2000.

Pandey, B. P., *Taxonomy of Angiosperm*, S. Chand & Company, 2015

Sharma, O.P., *Text Book of Algae*, New Delhi: Tata McGraw Hill, 1992.

Sharma,O.P. *Text book of Fungi*, New Delhi: Tata McGraw – Hill, 1986.

Sharma, O. P., *Plant Taxonomy*, McGraw Hill Education, 2017

Shrivastava A.K. *Agriculture Science and Technology*., Agrotech., 2013.

Vashista B.R., Sinha P and Singh V., New Delhi: *Botany for Degree students*, Algae, S.Chand, 2002.

Vashista B.R. New Delhi: *Botany for Degree Students – Fungi*, S.Chand. 1982.

JOURNALS

International Journal of Algae

Fungal Biology

Journal of Botany

Natural Areas Journal

WEB RESOURCES

www.springer.com/life+science

PATTERN OF ASSESSMENT

Continuous Assessment Test:

Total Marks: 50

Duration: 90 minutes

Section A – Objective questions

9 x 1 = 9 marks

Very Short Answers

3 x 3 = 9 marks (3 out of 4 in 50 words each)

Section B – 2 x 6 = 12 marks (2 out of 3 questions to be answered in 200 words each)

Section C – 1x 20 = 20 marks (1 out of 2 questions to be answered in 1000 words each)

Other Components:

Seminars/Quiz/Assignments etc. (any 2)

Total Marks: 50**End Semester Examination:****Total Marks: 100****Duration: 3 hours****Section A** – Objective questions $18 \times 1 = 18$ marksChoose the correct answer $5 \times 1 = 5$ marksFill in the blanks $5 \times 1 = 5$ marksMatch the following $5 \times 1 = 5$ marksTrue or False $3 \times 1 = 3$ marksVery Short Answers $6 \times 3 = 18$ marks (6 out of 9 in 50 words each)**Section B** – $4 \times 6 = 24$ marks (4 out of 6 questions to be answered in 200 words each)**Section C** – $2 \times 20 = 40$ marks (2 out of 4 questions to be answered in 1000 words each)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

**Allied Core Course Offered by the Department of Botany for
B.Sc. (Advanced Zoology and Biotechnology) Degree Programme**

SYLLABUS

(Effective from the academic year 2019–2020)

GENERAL BOTANY - I – PRACTICAL

CODE: 19BT/AC/P111

CREDITS:1

L T P: 0 0 2

TOTAL HOURS: 26

ALGOLOGY AND MYCOLOGY

Identification, Observation and Sketching of Types Included in the Syllabus

PLANT PATHOLOGY

Identification, Observation and Sketching of Types Included in the Syllabus

TAXONOMY

Derivation (Assign the plants to their respective families)

Description in Technical Terms of Plants belonging to the Families mentioned in the Syllabus

Dissection of Flowers, Observation and Sketching of Floral Parts, Construction of Floral Diagram and Floral Formula

PATTERN OF ASSESSMENT

Continuous Assessment Test:

Total Marks: 50

Duration: 90 minutes

Two Tests (2 x 20) = 40 Marks

Record = 10 Marks

End Semester Examination:

Total Marks: 50

Duration: 3 hours

- | | |
|---|-------------|
| 1. Derivation (Assign the plant to its respective families) | 1 x 10 = 10 |
| 2. Description of the flower in technical terms | 1 x 10 = 10 |
| 3. Algae and Fungi - Spotters (5) | 5 x 5 = 25 |
| 4. Pathology specimen | 1 x 5 = 5 |

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V. A. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS

CODE:19BT/MC/BP24

CREDITS:4

L T P:4 1 0

TOTAL TEACHING HOURS:65

OBJECTIVES OF THE COURSE

- To learn the classification, structure and organization of lower vascular plants
- To trace the transition of lower vascular plants
- To understand their reproduction and life cycle pattern
- To study the primitive and advanced features of living and fossil forms

COURSE LEARNING OUTCOMES

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

- identify the forms studied in the field
- appreciate their ecological importance
- understand the plant diversity and importance of conservation
- understand the chronological events while studying fossils
- understand the process of fossilization

Unit 1 (13 Hours)

Bryophytes

- 1.1 Classification of of Bryophyta (Proskauer, 1957)
- 1.2 Characteristic features of classes
- 1.3 A Detailed Study of the Thallus Structure, Anatomy and Reproduction of the following (no development): Hepaticopsida – *Marchantia* and Bryopsida – *Polytrichum*

Unit 2 (13 Hours)

Pteridophytes

- 2.1 Classification of Pteridophyta (Reimers, 1954)
- 2.2 Characteristic features of classes
- 2.3 A Detailed Study of the Plant Body, Anatomy and Reproduction of the following: (no development): Lycopsidea – *Lycopodium* and Pteropsida – *Marsilea*

Unit 3 (13 Hours)

Gymnosperms

- 3.1 Classification of Gymnospermae (Bierhorst, 1971)
- 3.2 Characteristic features of classes
- 3.3 A Detailed Study of the Plant Body, Anatomy and Reproduction of the following (no development): Cycadopsida – *Cycas*, Coniferopsida – *Pinus* and Gnetopsida – *Gnetum*

Unit 4 (13 Hours)

Fossils

- 4.1 Geological Time Scale
- 4.2 Types of Fossilization: Compression, Impression, Incrustation, Petrification and Compaction
- 4.3. Fossil forms - Pteridophyta: *Lepidodendron*, *Stigmaria*, *Lepidostrobus* and *Lepidocarpon*
Gymnosperms: *Williamsonia*

Unit 5 (13 Hours)

- 5.1 Life Cycle Patterns in Bryophytes, Pteridophytes and Gymnosperms
- 5.2 Stellar Evolution
- 5.3 Heterospory and Seed Habit
- 5.4 Ecological and Economic importance

BOOK FOR STUDY

Pandey, S.N., P.S. Trivedi and A. Misra. *A Textbook of Botany Vol II- Bryophytes, Pteridophytes and Gymnosperms*. New Delhi: Vikas, 1999.

BOOKS FOR REFERENCE

BRYOPHYTES

- Prem Puri, *Bryophytes –Morphology, Growth and Differentiation* Delhi: Atma Ram, 1981.
- Smith, G.M. *Cryptogamic Botany Vol II*. London: McGraw Hill, 1995.
- Srivastava, H.N. *Bryophytes*. India: Pradeep, 2007.
- Watson, E.V. *The Structure and Life of Bryophytes*. London: Hutchinson University Library 1968.
- Vashista, P.C., *Botany for Degree Students Vol. IV*, New Delhi: S.Chand, 2016.

PTERIDOPHYTES

- Arnold, C.A., *An Introduction to Palaeobotany*, McGraw Hill, 1947.
- Eames, A.J. *Morphology of Vascular Plants*. New Delhi: Tata McGraw Hill, 1999.
- Smith, G.M. *Cryptogamic Botany, -Vol.II*. London: McGraw Hill, 1999.
- Sporne, K.R. *Morphology of Pteridophytes*. New Delhi: B.I, 1980.
- Sharma, O.P. *Pteridophyta*, McGraw Hill, 2012.
- Sukla & Mishra, S.P., *Essentials of Palaeobotany*, Vikas, 1982.

GYMNOSPERMS

- Chamberlain, C.J. *Gymnosperms - Structure and Evolution*. New Delhi: CBS, 1980.
- Coulter, J.M. and C.J. Chamberlain. *Morphology of Gymnosperms*. Allahabad: Central Book Depot, 1960.
- Srivastava, H.N. *Gymnosperms*. India: Pradeep, 2004.
- Vashista, P.C., *Botany for Degree Students*. Vol. V (Gymnosperms) New Delhi: S.Chand, 1976.
- Sporne, K.R., *Morphology of Gymnosperms*. B.I, 1976.

WEB RESOURCES

BRYOPHYTES

www.cpbr.gov.au/bryophyte

www.britannica.com

www.csun.edu

www.scilinks.org

blogs.ubc.ca

PTERIDOPHYTES

www.uwgb.edu

www.hardyferns.org

GYMNOSPERMS

www.conifers.org

Wikipedia.org/wiki/gymnosperms

www.exploringnature.org

JOURNALS

BRYOPHYTES

Annals of Botany

Systematic Botany

Journal of Bryology

Journal of Botany

PTERIDOPHYTES

A Journal of Botanical Nomenclature

Current Biology

American Journal of Plant Sciences

Natural Areas Journals

The British Fern Gazette

American Fern Journal

GYMNOSPERMS

Journal of Botany

Canadian Journal of Botany

Nordic Journal of Botany

PATTERN OF ASSESSMENT

Continuous Assessment Test:

Section A – Objective questions

Very Short Answers

Section B – 2 x 6 = 12 marks (2 out of 3 questions to be answered in 200 words each)

Section C – 1x 20 = 20 marks (1 out of 2 questions to be answered in 1000 words each)

Total Marks: 50

Duration: 90 minutes

9 x 1 = 9 marks

3 x 3 = 9 marks (3 out of 4 in 50 words each)

Other Components:

Seminars/Quiz/Assignments etc. (any 2)

Total Marks: 50

End Semester Examination:

Section A – Objective questions 18 x 1 = 18 marks

Choose the correct answer

5 x 1 = 5 marks

Total Marks: 100

Duration: 3 hours

Fill in the blanks

5 x 1 = 5 marks

Match the following

5 x 1 = 5 marks

True or False

3 x 1 = 3 marks

Very Short Answers

6 x 3 = 18 marks (6 out of 9 in 50 words each)

Section B – 4 x 6 = 24 marks (4 out of 6 questions to be answered in 200 words each)

Section C – 2x 20 = 40 marks (2 out of 4 questions to be answered in 1000 words each)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V. A. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS - PRACTICAL

CODE:19BT/MC/P222

CREDITS:2

L T P:0 0 3

TOTAL HOURS:39

BRYOPHYTES

Forms mentioned in the syllabus

1. Hepaticopsida - *Marchantia*
2. Bryopsida - *Polytrichum*

PTERIDOPHYTES

1. Lycopsidea - *Lycopodium*
2. Pteropsida - *Marsilea*

GYMNOSPERMS

1. Cycadopsida – *Cycas*
2. Coniferopsida – *Pinus*
3. Gnetopsida - *Gnetum*

FOSSILS

Forms mentioned in the syllabus

1. Pteridophytes – *Lepidodendron*, *Stigmaria*, *Lepidostrobus* and *Lepidocarpon*
2. Gymnosperms - *Williamsonia*

PATTERN OF ASSESSMENT

Continuous Assessment Test:

Total Marks: 50

Duration: 90 minutes

Two Tests (2 x 20 = 40 Marks)

Record

10 Marks

End-Semester Examination:

Total Marks: 50

Duration: 3 hours

1 Sectioning, Drawing, Identification with reasons

3 x 8 = 24

2 Spotters (4) Drawing, Identification with reasons

4 x 5 = 20

3 Spot at sight (3) Division, Class, Genus and Morphology

3 x 2 = 6

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V. A. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

BASICS OF APPLIED BIOTECHNOLOGY

CODE:19BT/MC/BB23

CREDITS:3

L T P:31 0

TOTAL HOURS:52

OBJECTIVES OF THE COURSE

- To understand the applied aspects of biotechnology
- To study the fundamental principles of biotechnology
- To familiarize students with the applications of biotechnology

COURSE LEARNING OUTCOMES

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

- demonstrate understanding of fundamental vocabulary and concepts of biotechnology
- understand the role of microorganisms in industry
- apply scientific knowledge to cultivation of novel and health foods
- analyze the role of microbes in industry
- acquire practical skills in the art of diary food preparation
- gain a basic understanding of plant tissue techniques

Unit 1

Introduction

(11 Hours)

- 1.1 Introduction and Scope of Biotechnology
- 1.2 Single Cell Protein-Spirulina
- 1.3 Algal Biofertilizers
- 1.4 Principles of Plant Tissue Culture

Unit 2

Mushroom Production Technology

(11 Hours)

- 2.1 Edible Mushrooms -*Pleurotus sp.*, *Agaricus sp.* and *Volvariella sp.*
- 2.2 Poisonous mushrooms of India - *Amanita sps.*
- 2.3 Nutritive value
- 2.4 Cultivation of Oyster Mushroom

Unit 3

Dairy Technology

(10 Hours)

- 3.1 Manufacture of Cheese
- 3.2 Types of Cheese: Cheddar, Camembert and Roquefort
- 3.3 Manufacture of Yoghurt

Unit 4 (10 Hours)
Food Biotechnology
4.1 Role of Yeast in Bread- Making
4.2 Genetically Modified Food - Bt brinjal
4.3 Estimation of Rate of Fermentation using Yeast (Practical)

Unit 5 (10 Hours)
Fermentation Technology
5.1 Types of Fermentors
5.2 Penicillin Production
5.3 Citric Acid Production

BOOK FOR STUDY

Ignacimuthu, S.J. *Biotechnology –An Introduction*. 2nd edition New Delhi: Narosa Publishing House Pvt. Ltd., 2015.

BOOKS FOR REFERENCE

Dubey, R.C. *A Text book of Biotechnology*. New Delhi: S.Chand, 2015
Gupta, P.K., *Elements of Biotechnology*. Meerut, Rastogi Publication, 2010.
Ignacimuthu, S. *Basic Biotechnology*. New Delhi :Tata-McGraw, Hill, 1996.
Jha Timir Baran and Biswajit Ghosh *Plant Tissue Culture: Basic and Applied*, Kolkata Platinum Publishers 2016
Kamal Nayan Joshi. *Biotechnology*. Manglam, Delhi. 2013.
Patel, A.H. *Industrial Microbiology*. New Delhi: Macmillan, 2015.
Prakash Anand, *Plant Biotechnology* New Delhi, SBW Publishers, 2014
Satyanarayana, U. *Biotechnology*. Kolkata Books and Allied (P) ltd. 2015
Reddy, S. M., *Basic Fermentation Technology*, Chennai, New Age International Publishers, 2017
Reddy, S. M., *Basic Food Science and Technology*, Chennai, New Age International Publishers, 2015.

JOURNALS

Algae Biotechnology
Journal of Industrial Microbiology and Biotechnology
World Journal of Microbiology & Biotechnology
Central European Journal of Biology
Journal of Applied Biotechnology
Bioprocess and Biosystems Engineering

WEB RESOURCES

www.ibab.ac.in
www.springer.com

PATTERN OF ASSESSMENT

Continuous Assessment Test:	Total Marks: 50	Duration: 90 minutes
Section A – Objective questions	9 x 1 = 9 marks	
Very Short Answers	3 x 3 = 9 marks (3 out of 4 in 50 words each)	
Section B – 2 x 6 = 12 marks (2 out of 3 questions to be answered in 200 words each)		
Section C – 1x 20 = 20 marks (1 out of 2 questions to be answered in 1000 words each)		

Other Components:**Total Marks: 50**

Seminars/Quiz/Assignments etc. (any 2)

End Semester Examination:**Total Marks: 100****Duration: 3 hours****Section A** – Objective questions $18 \times 1 = 18$ marksChoose the correct answer $5 \times 1 = 5$ marksFill in the blanks $5 \times 1 = 5$ marksMatch the following $5 \times 1 = 5$ marksTrue or False $3 \times 1 = 3$ marksVery Short Answers $6 \times 3 = 18$ marks (6 out of 9 in 50 words each)**Section B** – $4 \times 6 = 24$ marks (4 out of 6 questions to be answered in 200 words each)**Section C** – $2 \times 20 = 40$ marks (2 out of 4 questions to be answered in 1000 words each)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

**General Core Course Offered to students of
B.A. / B.Sc. / B.Com. / B.B.A. / B.V.A. / B.S.W. / B.C.A. Degree Programme**

SYLLABUS

(Effective from the academic year 2019-2020)

ENVIRONMENTAL STUDIES

CODE:19BT/GC/ES12

CREDITS:2

L T P:2 0 0

TOTAL TEACHING HOURS:26

OBJECTIVES OF THE COURSE

- To help students to gain the fundamental knowledge of the environment
- To create in students an awareness of current environmental issues
- To inculcate in students an eco-sensitive, eco-conscious and eco-friendly attitude

COURSE LEARNING OUTCOMES

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

- Articulate the interdisciplinary context of environmental issues
- Adopt sustainable alternatives that integrate science, humanities and social perspectives
- Appreciate the importance of biodiversity and a balanced ecosystem
- Calculate one's carbon footprint

Unit 1 (10 Hours)

- 1.1 Introduction: The multidisciplinary nature of environmental studies;
Environmental Ethics-Role of the Individual in protecting the environment
- 1.2 Natural Resources: renewable (forests and water)and non-renewable (minerals)-
energy resources: renewable and non-renewable sources, impact of over-
exploitation
- 1.3 Ecosystems: terrestrial (forest, grassland and desert) and aquatic (ponds, oceans
and estuaries); structure and function
- 1.4 Biodiversity: India as a mega-diversity nation; threats to biodiversity; *in-situ* and
ex-situ conservation of biodiversity
- 1.5 Solid Waste Management, Source Segregation and Rain Water Harvesting

Unit 2 (10 Hours)

- 2.1 Environmental Pollution: Air, Water, Noise and Plastic Pollution: causes, effects
and control measures -Impact of over-population on pollution and health –
carbon footprint
- 2.2 The Environmental Dimension of Sustainable Development: The United Nations
Sustainable Development Goals of the 2030 Agenda

- 2.3 Climate Change and Environmental Disasters: Natural Disasters: floods, earthquakes, cyclones, tsunamis and landslides; man-made disasters: Bhopal Gas Tragedy and Chernobyl Nuclear Disaster
- 2.4 Environmental Movements: Chipko, Silent Valley and Narmada Bachao Andolan International Agreements: Montreal Protocol, Kyoto Protocol and Climate Change Conferences
- 2.5 An Overview of Environmental Laws in India: Environmental (Protection) Act 1986, Biological Act, 2002, National Green Tribunal Act, 2010, Coastal Regulation Zone Notification, 2011

Unit 3 (6 Hours)

- 3.1 A study of the eco-friendly initiatives on campus
- 3.2 A critical review of an environmental documentary film
- 3.3 Ecofeminism and the contributions of Indian Women Environmentalists
- 3.4 The highlights of Environmental Encyclical-*Laudato si*-On Care for our Common Home
- 3.5 Environmental Calendar

BOOK FOR STUDY

Bharucha, Erach. *Textbook of Environmental Studies for Undergraduate Courses*, (2nd ed.) Universities Press, 2013.

BOOKS FOR REFERENCE

Bhattacharya, K.S. Arunima Sharma, *Comprehensive Environmental Studies* Narosa Publishing House Pvt.. Ltd., New Delhi, 2015.

Saha, T.K., *Ecology and Environmental Biology* Books and Allied (P) Ltd., Kolkata 2016.

Sharma, J.P. *Environmental Studies (for undergraduate classes)* 3rd edition, University Science Press, 2016.

JOURNALS

Journal of Environmental Studies and Sciences

Journal of Environmental Studies

WEB RESOURCES

www.emn.com

www.nationalgeographic.com

PATTERN OF ASSESSMENT

Continuous Assessment Test: Total Marks: 25 Duration: 60 minutes

Section A-10 x 1 = 10 Marks (All questions to be answered) Multiple Choice Questions

Section B - 3 x 5 = 15 Marks (3 out of 6 to be answered in 150 words each)

Other Component: Total Marks: 25

Any **one** of the following for 25 marks

Quiz/Scrap Book/Assignment / Poster Making/Case Study/Project/Survey/Model-Making

No End Semester Examination

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

**Allied Core Course Offered by the Department of Botany for
B.Sc. (Advanced Zoology and Biotechnology) Degree Programme**

SYLLABUS

(Effective from the academic year 2019–2020)

GENERAL BOTANY – II

CODE:19BT/AC/GB24

CREDITS:4

L T P:4 0 0

TOTAL TEACHING HOURS:52

OBJECTIVES OF THE COURSE

- To study the structure, organization, reproduction and life cycle of lower plants
- To enable students to understand the physiological activities occurring in plants
- To study the complex tissue organization in plants
- To enable the students to enrich their knowledge on horticulture

COURSE LEARNING OUTCOMES

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

- understand the plant diversity
- find out the interrelationship of cells and tissues of the plant body
- learn the metabolic events such as Photosynthesis
- understand the practical applications of plant growth regulators
- gain the skill in fundamental practices of vegetative propagation of plants
- become an entrepreneur in cut flowers and bonsai

Unit 1 (16 Hours)

Bryophyta , Pteridophyta and Gymnosperms

- 1.1 Salient features of Bryophyta ,Pteridophyta and Gymnospermae
- 1.2 A detailed Study of the Life Cycle (no development) of *Funaria*
- 1.3 A detailed Study of the Life-Cycle (no development) of *Lycopodium*
- 1.4 A detailed Study of the Life-Cycle (no development) of *Cycas*

Unit 2 (12 Hours)

Anatomy

- 2.1 Primary Structure of Dicot Stem and Root
- 2.2 Primary Structure of Monocot Stem and Root
- 2.3 Leaf: Isobilateral and Dorsiventral
- 2.4 Stomatal types

Unit 3 (7 Hours)

Physiology - I

- 3.1 Photosynthesis - Light Reaction and Dark Reaction.
- 3.2 Mineral Nutrition in plants

Unit 4 (7 Hours)
Physiology - II

- 4.1 Plant Growth Regulators - Auxins, Cytokinins, Gibberellins, ABA and Ethylene- Practical Applications
- 4.2 Photoperiodism
- 4.3 Vernalisation

Unit 5 (10 Hours)
Horticulture

- 5.1 Bonsai Technique
- 5.2 Cut Flowers, Importance and Methods to Prolong Vase Life
- 5.3 Flower Arrangement - Fresh and Dry
- 5.4 Vegetative propagation methods: Cutting, Layering and Grafting

BOOK FOR STUDY

Rao, K. N., and R.V. Narayanaswamy, *Outlines of Botany*. Madras: S.Viswanathan, 1986.

BOOKS FOR REFERENCE

- Janick, J. *Horticultural Science*. New Delhi: Surgeet.1982.
Kumar, N. *Introduction to Horticulture*. Nagercoil: Rohini, 1980.
Pandey, B.P. *College Botany*, Vol II New Delhi: S.Chand, 2015.
Sheela, V. L. *Horticulture*, Chennai: MJP, 2011
Singh, V., Pande P.C and Jain D.K: *Anatomy of Seed Plants*. India: Rastogi, 1996
Sinha,R.K. *Modern Plant Physiology*. New Delhi: Narosa, 2014.
Verma. V. *Text Book of Plant Physiology*. New Delhi: Emkay, 1989.
Verma, S.K. *Plant Physiology and Biochemistry*. New Delhi: S Chand, 2000.
Vidyarthi, R.D. *Text Book of Botany*. New Delhi: S.Chand, 1992.

WEB RESOURCES

PTERIDOPHYTA

www.uwgb.edu
www.hardyferns.org

GYMNOSPERMS

www.conifers.org
Wikipedia.org/wiki/gymnosperms
www.exploringnature.org

PHYSIOLOGY

www.journals.elsevier.com
www.springer.com
www.academicjournals.org

JOURNALS

Journal of Plant Physiology (Elsevier)
Journal of Plant Physiology (Science Direct)
International Journal of Plant Physiology and Biochemistry

PATTERN OF ASSESSMENT

Continuous Assessment Test:	Total Marks: 50	Duration: 90 minutes
Section A – Objective questions	9 x 1 = 9 marks	
Very Short Answers	3 x 3 = 9 marks (3 out of 4 in 50 words each)	
Section B – 2 x 6 = 12 marks (2 out of 3 questions to be answered in 200 words each)		
Section C – 1 x 20 = 20 marks (1 out of 2 questions to be answered in 1000 words each)		

Other Components: **Total Marks: 50**
Seminars/Quiz/Assignments etc. (any 2)

End Semester Examination:	Total Marks: 100	Duration: 3 hours
Section A – Objective questions 18 x 1 = 18 marks		
Choose the correct answer	5 x 1 = 5 marks	
Fill in the blanks	5 x 1 = 5 marks	
Match the following	5 x 1 = 5 marks	
True or False	3 x 1 = 3 marks	
Very Short Answers	6 x 3 = 18 marks (6 out of 9 in 50 words each)	
Section B – 4 x 6 = 24 marks (4 out of 6 questions to be answered in 200 words each)		
Section C – 2 x 20 = 40 marks (2 out of 4 questions to be answered in 1000 words each)		

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

**Allied Core Course Offered by the Department of Botany for
B.Sc. (Advanced Zoology and Biotechnology) Degree Programme**

SYLLABUS

(Effective from the academic year 2019–2020)

GENERAL BOTANY–II PRACTICAL

CODE:19BT/AC/P221

CREDITS:1

L T P:0 0 2

TOTAL HOURS:26

BRYOPHYTA

Identification, Observation and Sketching of Type Included in the Syllabus

PTERIDOPHYTA AND GYMNOSPERMS

Preparation of suitable sections of forms included in the Syllabus and their Interpretation

ANATOMY

Preparation of suitable sections of Angiosperm material included in the Syllabus and their Interpretation

PHYSIOLOGY

Physiology Experiments included in the Syllabus – Demonstration

PATTERN OF ASSESSMENT

Continuous Assessment Test:

Total Marks: 50

Duration: 90 minutes

Two Tests (2 x 20) = 40 Marks

Record = 10 Marks

End Semester Examination:

Total Marks: 50

Duration: 3 hours

1. Pteridophyta and Gymnosperm
Sectioning & Identification, Diagram, Reasons (1) 10
2. Anatomy – Sectioning & Identification, Diagram, Reason (1) 10
3. Physiology – Comment on set up 10
4. Spotters (5) Identification, Diagram, Reasons (4 x 5) 20
(Bryophyta – 1, Pteridophyta – 1, Gymnosperm – 1, Stomatal type – 1,)

STELLA MARISCOLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V. A. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY

CODE:19BT/MC/TE34

CREDITS:4

L T P:4 1 0

TOTAL TEACHING HOURS:65

OBJECTIVES OF THE COURSE

- To study plant morphology using terminologies that are necessary to identify the taxa authentically
- To understand the vegetative and reproductive features of a few families of angiosperms
- To prepare taxonomical keys with the help of vegetative and floral characters
- To learn some of the economically important plants of India

COURSE LEARNING OUTCOMES

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

- describe the plants in technical terms
- understand the importance of herbarium
- dissect the floral parts of plants
- identify the plants and assign them to their respective families
- understand the processing and uses of economically important plants

Unit 1 (13 Hours)

Classification and Plant Morphology

- 1.1 Overview of Plant Morphology - Habit, Roots, Stems, Leaves, Inflorescence, Flowers and Fruits
- 1.2 Phenetic (Linnaean, Bentham and Hooker) and Phylogenetic (Angiosperm Phylogeny Group IV (APG IV) Systems of Classification
- 1.3 Introduction to Chemotaxonomy, Numerical taxonomy and Molecular taxonomy

Unit 2 (13 Hours)

Nomenclature and Herbaria

- 2.1 Plant Nomenclature: Binomial and Polynomial, ICBN – Typification, Effective and Valid Publication, Author Citation; Important Botanical Garden – Kew Gardens, London
- 2.2 Herbarium Techniques: Collection, Pressing, Drying, Poisoning, Mounting and Preservation of Plant Specimens; Important Herbaria – BSI, Coimbatore; Rapinat Herbarium, Trichy; Flora of Presidency, Chennai.
- 2.3 Taxonomic Keys (Intended and Bracketed keys) and their uses

Unit 3 (13 Hours)

A Detailed Study of the Salient Features and Economic Importance of the following:

- 3.1 Polypetalae - Annonaceae, Rutaceae, Fabaceae (including the subfamilies) and Cucurbitaceae
- 3.2 Gamopetalae - Rubiaceae, Apocynaceae and Asclepiadaceae

Unit 4 (13 Hours)

A Detailed Study of the Salient Features and Economic Importance of the following:

- 4.1 Gamopetalae -, Solanaceae, Acanthaceae and Lamiaceae
- 4.2 Monochlamydeae – Amaranthaceae and Euphorbiaceae
- 4.3 Monocotyledones - Orchidaceae and Poaceae

Unit 5 (13 Hours)

Economic Botany

- 5.1 A Brief Study of the Morphology, Processing and Uses of the following: Beverages (Tea), Sugar (Sugarcane), Oil (Groundnut)
- 5.2 Botanical name, Common name, Family, Morphology of useful part and Uses of Cereals(wheat, rice and oats), Millets (sorghum, foxtail and finger millet) fibre yielding plants (cotton, jute and hemp) and dye yielding plants (*Indigofera tinctoria*, *Acacia catechu* and *Haematoxylum campechianum*)
- 5.3 Botanical name, Common name, Family, Morphology of useful part and Uses of Oil yielding plants(mustard, sesame and coconut) Medicinal plants (*Asparagus racemosus*, *Catharanthus roseus* and *Withania somnifera*) spices and condiments (pepper, coriander and bay leaves) Fumitories and Masticatories (Tobacco, Areca Nut and Betel Leaf)

BOOKS FOR STUDY

- Singh. V and D.K. Jain. *Taxonomy of Angiosperms*. Meerut: Rastogi, 1989
Verma.V. *A Text Book of Economic Botany*. London:Cambridge University, 1989.

BOOKS FOR REFERENCE

- Antony V. T., *Biodiversity of Flowering Plants*. Sonali, 2011.
David J. Mabberly, *Mabberley's Plant – A portable dictionary of plants, their classification and uses*: Cambridge University Press, 2018.
Gamble,J.S. *Flora of the Presidency of Madras.*, Vol. II,. New Delhi: Jayyed, 1956.
Hill, A.F. *Economic Botany*. New York: Tata McGraw-Hill,1969.
Jeffrey, C. *An Introduction to Plant Taxonomy*, London: Cambridge University, 1982.
John Gonsalves, *A Textbook of Economic Botany and Ethnobotany*, International Scientific Publishing Academy, New Delhi: 2016.
Lawrence, George.H.M., *Taxonomy of Vascular Plants.*, New Delhi: Oxford IBH, 1987.
Maiti R K., *Introduction to Modern Economic Botany*. Agrobios, 2009.
Pandey, B. P., *Taxonomy of Angiosperm*, S. Chand & Company, 2015.
Rendle, A.B. *Classification of Flowering Plants*, Vol.I & II. London: Cambridge University, 1980.
Sharma, O. P., *Plant Taxonomy*, McGraw Hill Education, 2017.

JOURNAL

Angiosperm Phylogeny Group. [An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG II. *Botanical Journal of the Linnean Society* 141\(4\): 399-436. doi: 10.1046/j.1095-8339.2003.t01-1-00158. 2003.](#)

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**
Section A – Objective questions 9 x 1 = 9 marks
Very Short Answers 3 x 3 = 9 marks (3 out of 4 in 50 words each)
Section B – 2 x 6 = 12 marks (2 out of 3 questions to be answered in 200 words each)
Section C – 1 x 20 = 20 marks (1 out of 2 questions to be answered in 1000 words each)

Other Components: **Total Marks: 50**
Seminars/Quiz/Assignments etc. (any 2)

End Semester Examination: **Total Marks: 100** **Duration: 3 hours**
Section A – Objective questions 18 x 1 = 18 marks
Choose the correct answer 5 x 1 = 5 marks
Fill in the blanks 5 x 1 = 5 marks
Match the following 5 x 1 = 5 marks
True or False 3 x 1 = 3 marks
Very Short Answers 6 x 3 = 18 marks (6 out of 9 in 50 words each)

Section B – 4 x 6 = 24 marks (4 out of 6 questions to be answered in 200 words each)
Section C – 2 x 20 = 40 marks (2 out of 4 questions to be answered in 1000 words each)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V(A). PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

PHYTOTHERAPY AND ETHNOBOTANY

CODE:19BT/MC/PE33

CREDITS:3

L T P:3 1 0

TOTAL TEACHING HOURS:52

OBJECTIVES OF THE COURSE

- To create an awareness about indigenous medicinal systems and tribal traditional practices
- To provide an overview of the plant derived natural products for their occurrence, sources and basic chemistry
- To learn the therapeutic property of plants through preparation of herbal medicines
- To provide an overview of ethnobotany, methods of herbal preparation, tribal medicine and their importance in present day drug research.

COURSE LEARNING OUTCOMES

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

- describe the plants in technical terms, identify and assign them to their respective families.
- make herbal drug preparations
- understand the vast traditional knowledge of herbal plants
- carry out research on organoleptic studies of medicinal plants.
- understand the processing and therapeutic uses of medicinally important plants.

Unit 1 (11 Hours)

Origin of Herbs in Health Care

1.1 Basic Principles of Ayurveda and Siddha: Panchamahabhutas, Tridhoshha Concept, Malas, Agni, Prakruti

1.2 Drug Preparation: Ashwam, Arishtam, Taila, Churnam, Leghyam, Bhasmam, Infusion and Decoction, Poulitice: Salves, Compresses, Mouthwash

1.3 Adulteration, Detection and Standardization of Herbal Drugs

1.4 Validation of Herbal Drugs and Good Manufacturing Practices

Unit 2 (11 Hours)

Organoleptic Study

Vernacular Name, Binomial, Family, Active Principle and Medicinal Uses of the following:

2.1 Roots and Underground Stem : *Rauwolfia serpentine* and *Zingiber officinalis*,

2.2 Leaves and Bark: *Aloe vera* and *Cinnamomun zeylanicum*

2.3 Flowers and Fruits: *Hibiscus rosa-sinensis* and *Piper longum*

2.4 Seeds and Whole Plant: *Trigonella foenum – graceum* and *Azadirachta indica*.

Unit 3 (10 Hours)

Ethnobotany

3.1 Ethnobotany : Definition and Scope

3.2 Methodologies of Ethnobotanical Research: Field Work, Literature, Herbaria and Musea

3.3 Ethnobotany as a lead to Modern Drug Discovery: Memory plus, Pankajakasturi Chooranam

3.4 Bioprospection

Unit 4 (10 Hours)
Ethnobotany and Biodiversity

4.1 Role of Ethnobotany in Conservation of Biodiversity

4.2 Ex- situ Conservation & In- situ Conservation

4.3 Ethnobotanical Studies of Irula Tribes

4.4 Traditional knowledge (TK) in relation to Intellectual Property Rights and Biopiracy

Unit 5 (10 Hours)
Ayurveda and Beauty

5.1 Role of Dhatu in Physical Beauty and Daily Routine to Enhance Beauty

5.2 Essential Oils & Aroma Therapy

5.3 Preparation of the following (Practical) Ayurveda / Siddha Medicines for Common Ailments: Infusion and Decoction, Mouth wash and Herbal Tooth Powder, Tailam, Churnam, Leghyam, Preparation of Herbal Tea and Soups

5.4 Facial and Hair Care using Herbal Products (Demonstration)

BOOKS FOR REFERENCE

Anil Kumar. *Handbook on Medicinal Plants*. New Delhi. 2016.

Das, S.N. *Medicinal Plants for Health and Wealth*. New Delhi: Agrotech. 2006.

Dash, V.B. *Ayurvedic Treatment for Common Diseases*. New Delhi: Konark, 1978.

Dash, V.B. *Fundamental of Ayurvedic Medicine*. New Delhi: Konark, 1989.

Dastur, J.F. *Medicinal plants of India and Pakistan*. New Delhi: D.B.Taraporewala, 1988.

Dananjay J Deshpande., *Handbook of Medicinal Herbs*. Agrobios, 2010.

Duke, J.A. *Handbook on Medicinal Herbs*. London: CRC, 2002.

Froog, S. *Medicinal Plants - Field and Laboratory Manual*. New York: International Book 2005.

Grewal, R.C. *Medicinal Plants*. Cambridge: Harvard University, 2000.

Hanson, B.A. *Understanding Medicinal Plants, their chemistry and therapeutic action*. New York: The Haworth, 2005.

ICMR. *Quality Standards of Indian Medicinal Plants*. (Vols.I, II, III, & IV).New Delhi.: ICMR, 2006.

Jaibala, S. and G.Balakrishnan. *A Hand Book of Common Remedies based on Siddha System of Indian Medicine*. Madras. St.Louis Institute, 1975.

Jain, S.K. *Contribution to Ethnobotany*. India: Scientific, 1997.

John Gonsalves. *A Text book of Economic Botany and Ethnobotany*. New Delhi: 2016.

Kapoor, L.D. *Handbook of Ayurvedic Medicinal Plants*.,India: CRC.,2001.

Prajapati, N.D. and S.S.Purohit. *Agro's Color Atlas of Medicinal Plants*. Jodhpur: Agrobios, 2006.

Rastogi, R.P. *Compendium of Indian Medicinal Plants*. Vols. I, II, III and IV. New Delhi: Central Drug Research Institute Publication and Information Directorate, 1988.
Reddy, K.J., B.Bahadur, B.Bhadriah and M.L.N.Rao. *Advances in Medicinal Plants*., Delhi: Universities, 2007.
Roseline A., *Pharmacognosy*_ Chennai:MJP, 2011.
Saha, N.N. *Herbal Remedies*. New Delhi: Universal, 1981.
Trivedi, P.C. *Medicinal Plants: Ethnobotanical Approach*_ Jodhpur: Agrobios, 2006.

WEB RESOURCES

www.ethnobiology.ch
www.ncbi.nlm.nih.gov

JOURNALS

International Journal of Phytotherapy & Ethnobotany
Journal of Pharmacognosy & Phytotherapy

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**
Section A – Objective questions 9 x 1 = 9 marks
Very Short Answers 3 x 3 = 9 marks (3 out of 4 in 50 words each)
Section B – 2 x 6 = 12 marks (2 out of 3 questions to be answered in 200 words each)
Section C – 1 x 20 = 20 marks (1 out of 2 questions to be answered in 1000 words each)

Other Components: **Total Marks: 50**
Seminars/Quiz/Assignments etc. (any 2)

End Semester Examination: **Total Marks: 100** **Duration: 3 hours**
Section A – Objective questions 18 x 1 = 18 marks
Choose the correct answer 5 x 1 = 5 marks
Fill in the blanks 5 x 1 = 5 marks
Match the following 5 x 1 = 5 marks
True or False 3 x 1 = 3 marks
Very Short Answers 6 x 3 = 18 marks (6 out of 9 in 50 words each)
Section B – 4 x 6 = 24 marks (4 out of 6 questions to be answered in 200 words each)
Section C – 2 x 20 = 40 marks (2 out of 4 questions to be answered in 1000 words each)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V. A. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY - PRACTICAL

CODE:19BT/MC/P332

CREDITS:2

L T P:0 0 3

TOTAL HOURS:39

TAXONOMY OF ANGIOSPERMS

Laboratory sessions will consist of working with fresh materials to illustrate descriptive terminology, derivation of family and salient features of plant families; floral analysis

A plant collection of 10 plants belonging to at least 10 different families – Herbarium to be submitted for the End semester examination

Use of dichotomous key in the identification of the given specimens

Field Trip

ECONOMIC BOTANY

Economically important products of plants included in the syllabus

PATTERN OF ASSESSMENT

Continuous Assessment Test:

Total Marks: 50

Duration: 90 minutes

Two Tests (2 x 20 = 40 Marks)

Record 10 Marks

End-Semester Examination:

Total Marks: 50

Duration: 3 hours

- | | |
|--------------------------------------|-------------|
| 1. Derivation | 2 x 5 = 10 |
| 2. Description, Drawing & Dissection | 1 x 10 = 10 |
| 3. Key Preparation | 8 |
| 4. Spot at sight | 12 |
| 5. Herbarium | 10 |

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI- 600 086

B.Sc. DEGREE: BRANCH V(A). PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS

CODE:19BT/MC/AE44

CREDITS:4

L T P:4 1 0

TOTAL TEACHING HOURS:65

OBJECTIVES OF THE COURSE

- To provide background of facts, terminology and internal structure of common plants
- To study the complex tissue organization of plant bodies
- To provide an understanding of reproduction in angiosperms

COURSE LEARNING OUTCOMES

On successful completion, students will be able to

- understand the structure and importance of meristems in plant tissue organization
- find out the interrelationships of cells and tissues
- differentiate simple and complex tissue
- understand the internal structure, origin, differentiation and function.
- understand the importance of reproductive biology of Angiospermic plants

Unit 1

(13 Hours)

Meristems and Simple Tissues

- 1.1 Meristem: Classification, Organization of Shoot Apex (Apical cell theory, Histogen theory, Mantle core theory, Tunica corpus theory and Anneau initial and Meristeme d'attente theory) and Root Apex (Apical cell theory, Histogen theory, Korper- Kappe theory, Concept of quiescent centre)
- 1.2 Lateral meristem: Vascular Cambium - Structure and Formation
- 1.3 Cork Cambium: Periderm: Phellem, Phellogen and Phelloderm, Development, Location, Morphology of Bark, Commercial Bark, Protective Tissues of Monocot and Lenticels
- 1.4 Simple tissues – Parenchyma, Collenchyma and Sclerenchyma (structure, types and functions)

Unit 2

(13 Hours)

Complex Tissues and Secretory Tissues

- 2.1 Secondary Xylem - Vessels, Tracheids, Wood Parenchyma and Rays, Sap Wood, Heartwood, Reaction wood, Tyloses, Annual Rings, Dendrochronology.
- 2.2 Secondary phloem - Sieve Tubes, Companion Cells, Phloem Parenchyma and Fibres
- 2.3 Secretory tissues –Glandular trichome, Hydathodes, Nectaries, Resin ducts and Laticifers

Unit 3 (13 Hours)

Primary and Secondary Structures

- 3.1 Primary structure of Monocot (stem and root) and Dicot (stem and root)
- 3.2 Secondary structure of dicot stem and root
- 3.3 Anomalous Growth: Primary (*Peperomia*, *Nyctanthus*, and *Boerhaavia*) and Secondary (*Aristolochia*, *Bignonia*, *Bougainvillea* and *Leptadenia*) structures in Dicots
- 3.4 Primary Thickening Meristem in Monocots and Anomalous Secondary Thickening in Monocot Stem - *Dracaena*

Unit 4 (13 Hours)

Leaf

- 4.1 Epidermis – Stomatal – Types
- 4.2 Epidermal hairs
- 4.3 Nodal anatomy – Unilacunar, Trilacunar and Multilacunar nodes
- 4.4 Leaf - Dorsiventral (mango), Isobilateral (Grass) and Centric (Onion), Leaf Abscission

Unit 5 (13 Hours)

Embryology

- 5.1 Microsporangium: Structure of anther, Microsporogenesis - Male Gametophyte
- 5.2 Megasporangium: Structure and types of ovules, Megasporogenesis - Female Gametophyte – Monosporic (*Polygonum*), Bisporic (*Allium*) and Tetrasporic (*Peperomia*)
- 5.3 Double Fertilization, Apomixis and Polyembryony
- 5.4 Endosperm - Types and Functions; Ruminant Endosperm
- 5.5 Embryo - Development of Dicot Embryo – *Capsella bursa pastoris*.

BOOKS FOR STUDY

Bhojwani, S.S and S.P. Bhatnagar. *Embryology of Angiosperms*. New Delhi:Vikas, 2015.
Singh, V., P.C. Pande and D.K. Jain. *Anatomy of Seed Plants*. Meerut, India: Rastogi, 1987.

BOOKS FOR REFERENCE

Cutter, E.G., *Plant Anatomy*. London: Part I, The English Language Book Society and Edward Arnold, 1978.
Esau K. *Anatomy of Seed Plants*. New York: Wiley Eastern, 1972.
Fahn, A. *Plant Anatomy*. London: Oxford Pergamon, 1986.
Emily L. Gregory, *Elements of Plant Anatomy*. Forgotten Books, London: 2017.

PATTERN OF ASSESSMENT

Continuous Assessment Test:	Total Marks: 50	Duration: 90 minutes
Section A – Objective questions	9 x 1 = 9 marks	
Very Short Answers	3 x 3 = 9 marks (3 out of 4 in 50 words each)	
Section B – 2 x 6 = 12 marks (2 out of 3 questions to be answered in 200 words each)		
Section C – 1x 20 = 20 marks (1 out of 2 questions to be answered in 1000 words each)		

Other Components:

Seminars/Quiz/Assignments etc. (any 2)

Total Marks: 50**End Semester Examination:****Total Marks: 100****Duration: 3 hours****Section A** – Objective questions 18 x 1 = 18 marks

Choose the correct answer 5 x 1 = 5 marks

Fill in the blanks 5 x 1 = 5 marks

Match the following 5 x 1 = 5 marks

True or False 3 x 1 = 3 marks

Very Short Answers 6 x 3 = 18 marks (6 out of 9 in 50 words each)

Section B – 4 x 6 = 24 marks (4 out of 6 questions to be answered in 200 words each)**Section C** – 2 x 20 = 40 marks (2 out of 4 questions to be answered in 1000 words each)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V. A. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS - PRACTICAL

CODE:19BT/MC/P442

CREDITS:2

L T P:0 0 3

TOTAL HOURS:39

ANATOMY OF ANGIOSPERMS

A study of the anatomy of the following (any 2 specimens in each category for stem and root):

1. Primary structure: Dicot stem
 Dicot root
 Monocot stem
 Monocot root
2. Secondary structure: Dicot Stem
 Dicot Root
3. Leaf: Dorsiventral - Mango
 Isobilateral - Grass
 Centric - *Allium*
4. Stomatal types in Dicots and Monocots
5. Anomalous Structure:
 Nyctanthus
 Boerhaavia
 Bignonia
 Bougainvillea
 Dracaena
6. Nodal Anatomy: Unilacunar, Trilacunar and Multilacunar nodes (diagrammatic sketch only)
7. Ergastic Substances: Druses, Raphides and Cystoliths

EMBRYOLOGY OF ANGIOSPERMS

A study of the following:

1. T.S of young anther and mature anther
2. Pollen morphology
3. Binucleate and tetranucleate embryo sacs
4. Stages of Dicot embryo development
5. L.S. of mature monocot embryo
6. Endosperm - nuclear, cellular and ruminant
7. Embryo dissection - *Tridax*

PATTERN OF ASSESSMENT

Continuous Assessment Test:

Two Tests (2 X 20 = 40 Marks)

Record 10 Marks

Total Marks: 50

Duration: 90 minutes

End-Semester Examination:

Sectioning, Drawing, Identification with reasons 3 x 8 = 24

Embryo Dissection 6 x 1 = 6

Spotters (2 Anatomy, 2 Embryology) 4 x 5 = 20

Total Marks: 50

Duration: 3 hours

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

**Soft Skills Course Offered to students of
B.A. / B.Sc. / B.Com. / B.B.A. / B.V.A. / B.S.W. / B.C.A. Degree Programme**

**SYLLABUS
(Effective from the academic year 2019 - 2020)**

LIFE SKILLS: PERSONAL AND SOCIAL

CODE: 19BT/SS/PS13

CREDITS: 3

L T P: 3 0 0

TOTAL TEACHING HOURS: 39

OBJECTIVES OF THE COURSE

- To enable students to understand the working of Indian Governance and laws
- To empower students as citizens by teaching them how to use the RTI, the PIL and the FIR
- To provide students an insight into the strengths and virtues essential to improve wellbeing
- To bring about awareness of societal dynamics
- To create awareness, impart knowledge and hone skills necessary to make sound financial decisions

COURSE LEARNING OUTCOMES

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

- demonstrate knowledge of the working of the government
- file RTIs, PILs and FIRs
- improve their quality of life
- exhibit social consciousness
- exhibit prudent behaviour in managing personal finance

Unit 1 (13 Hours)

Legal Literacy

- 1.1 Structure of Government- Central and State, Urban and Rural
- 1.2 Laws pertaining to Women (CEDAW) and Children (POCSO)
- 1.3 Right to Information Act 2005, drafting and filing an RTI
- 1.4 Introduction to PIL, Landmark PIL cases -Vishaka Vs. State of Rajasthan, Hussainara Khatoon Vs. State of Bihar, MC Mehta Vs. Union of India
- 1.5 Importance of FIR and lodging an FIR

Unit 2 (13 Hours)

2.1 Understanding Self

- 2.1.1 Psychological wellbeing - meaning, components and barriers
- 2.1.2 Gratitude- meaning, nature and expression
- 2.1.3 Resilience- meaning, nature, benefits and simple techniques for building resilience.

2.2 Understanding Society

- 2.2.1 Concepts of class, caste, gender, disability, race, culture, religion, ethnicity, context and language
- 2.2.2 Importance of societal analysis
- 2.2.3 Social indicators of development – HDI, GDI, Poverty Index, Hunger Index
- 2.2.4 Issues and challenges for social change in India

Unit 3

(13 Hours)

Personal Financial Planning

- 3.1 Meaning, Need and Importance of Personal Financial Planning
- 3.2 Core concepts in Financial Planning – Budget, Savings and Investment
- 3.3 Converting non-essential expenditure into Savings and Investment
 - 3.3.1 Forms of Savings – Deposits, Insurance
 - 3.3.2 Types of Investments – Securities, Real Estate and Gold
- 3.4 Digital transformation in Finance
 - 3.4.1 De-Mat Account
 - 3.4.2 Net Banking and Mobile Banking

BOOKS FOR REFERENCE

Agarwal, R.C. Constitutional Development and National Movement of India. New Delhi: S. Chand, 1988.

Ahuja Ram. Social Problems in India. Rawat Publications. 3rd Edition, 2014

Allan, R. Modern Politics and Government. New York: Palgrave MacMillan, 2000.

Baumgardner, S., & Crothers, M. Positive Psychology. Chennai: Pearson. 1st Edition, 2015.

Grenville-Cleave, B. *Positive Psychology A practical Guide*. United Kingdom: Icon Books Ltd, 2012.

Pandey, J.N. Constitutional Law of India. Allahabad: Central Law Agency, 2014.

Weiner, M. The Indian Paradox. New Delhi: Sage , 1989.

PATTERN OF ASSESSMENT

Continuous Assessment:

Total Marks: 50

- Two to three Task based components
- Task based classroom activities
- Case studies
- Group discussions
- Group presentation
- Role play

No End Semester Examination

No CA test

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V(A). PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

CELL AND MOLECULAR BIOLOGY

CODE:19BT/MC/CM54

CREDITS:4

L T P:4 1 0

TOTAL TEACHING HOURS:65

OBJECTIVES OF THE COURSE

- To provide an overview of the cellular and molecular aspects of the plant cell
- To analyse the structure and function of the cell
- To understand the concept of gene and gene expression
- To learn about the latest concept of prokaryotic and eukaryotic DNA structure and expression

COURSE LEARNING OUTCOMES

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

- apply the gained knowledge in plant molecular biology and agriculture
- do plant genome research
- correlate cell morphology with function
- understand biosynthesis of nucleic acids and cell division
- analyze Molecular processes

Unit 1 (13 Hours)

Introduction

- 1.1 Cell Theory: A brief study of the relationship of Cytology with other Biological sciences
- 1.2 Cell Membrane: Chemical Composition, Molecular Organization, Molecular Models and Biogenesis
- 1.3 Cell Organelles-Structure, Chemical Composition, Function and Biogenesis of the following: Endoplasmic Reticulum, Golgi Apparatus, Mitochondria, Chloroplast, Microbodies-Peroxisomes, Glyoxysomes

Unit 2 (13 Hours)

Nucleus

- 2.1 Nucleus: Nuclear Membrane, Nucleolus, Nucleoplasm
- 2.2 DNA Structure- Chemistry of Double Helix – Types of DNA (A,B,Z), Chargaff's rule, T_m value, Histones – Nonhistones
- 2.3 Chromosomes - Structure and Chemistry, Molecular organization
- 2.4 Cell Cycle - Mitosis and Meiosis

Unit 3 (13 Hours)

DNA Replication

- 3.1 Central dogma, DNA polymerases
- 3.2 Modes of DNA replication – Semiconservative, Conservative and Dispersive
- 3.3 DNA Replication - Initiation, Replication forks, Leading Strand and Lagging Strand Synthesis; Proteins involved in Replication
- 3.4 DNA Repair: DNA damage, Direct Repair – Photoreactivation

Unit 4 (13 Hours)

Transcription and Translation

- 4.1 RNA polymerases
- 4.2 Transcription of Prokaryotic Genes: Initiation, Elongation and Termination
- 4.3 Molecular Structure of Three Classes of RNA (mRNA, rRNA, tRNA)
- 4.4 Genetic code, Ribosomes, Mechanism of prokaryotic translation – Initiation, Elongation and Termination

Unit 5 (13 Hours)

Gene Regulation

- 5.1 Prokaryotic Regulation: Operon Concept – lac operon and trp operon
- 5.2 Epigenetics and DNA methylation
- 5.3 Eukaryotic Regulation: Genetic Imprinting
- 5.4 Model plant in research: *Arabidopsis thaliana*

BOOK FOR STUDY

Verma P.S and K.Agarwal . *Cytology*, New Delhi: Chand, 1988.

BOOKS FOR REFERENCE

- Benjamin, L. *Genes IX*, New York: Oxford University, 2014.
- Bruce Alberts. *Essentials of Cell Biology*. New York: Garland Science, 2008.
- Chhazllani V. K., *Plant Cell Biology*. Delhi: Manglam, 2011.
- David P. Clark. *Molecular Biology*. New York: Elsevier, 2005.
- De Robertis, E.D.P, and De Robertis. E.M.F. *Cell and Molecular Biology*, (6th ed.) Philadelphia: W.B.Saunders College, 2007.
- Freifelder, D. *Molecular Biology*. (2nd ed.). Boston: Jones and Barlett, 1987.
- Geoffrey, M.Cooper and Robert, E.Hausman. *The Cell*. (4th ed.), USA :ASM, 2007.
- Karp.G. *Cell and Molecular Biology*.New York: John Wiley, 2007.
- Morris M. D. *Molecular Biotechnology* CBS New Delhi, 2016.
- Polard.F.D.,W.C.Earnshaw and J.L.Schwartz. *Cell Biology*.Philadelphia: Saunders, 2008.
- Preeti Mehta. *Understanding Molecular Biology* Narosa, 2016.
- Wolfe, S.L. *Molecular and Cellular Biology*.USA: Wadsworth, 1999.

JOURNALS

- Journal of Molecular Biology
- European Journal of Cell Biology
- International Journal of Cell Biology

WEB RESOURCES

www.ncsu.edu/imse/1/cellbiology.htm

www.nature.com/ncb

www.cellbio.com

www.gvsu.edu/cmb

cellmolbio.bsd.uchicago.edu

PATTERN OF ASSESSMENT

Continuous Assessment Test:	Total Marks: 50	Duration: 90 minutes
Section A – Objective questions	9 x 1 = 9 marks	
Very Short Answers	3 x 3 = 9 marks (3 out of 4 in 50 words each)	
Section B – 2 x 6 = 12 marks (2 out of 3 questions to be answered in 200 words each)		
Section C – 1 x 20 = 20 marks (1 out of 2 questions to be answered in 1000 words each)		

Other Components: **Total Marks: 50**
Seminars/Quiz/Assignments etc. (any 2)

End Semester Examination:	Total Marks: 100	Duration: 3 hours
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STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V (A). PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

MICROBIOLOGY

CODE:19BT/MC/MB54

CREDITS:4

L T P:4 1 0

TOTAL TEACHING HOURS:65

OBJECTIVE OF THE COURSE

- To provide an understanding of microorganisms around us
- To learn their contributions to everyday processes
- To understand the disease cycle of microorganisms
- To analyze the impact of microbes on plants and animals

COURSE LEARNING OUTCOMES

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

- appreciate the importance of microbes in soil, water and air
- master the technique of isolating microorganisms
- identify the disease cycle of viruses
- pursue higher studies and research in microbiology
- get employment in Microbiological laboratories

Unit 1

(13 Hours)

History of Microbiology

- 1.1 Germ Theory of Disease, Koch's Postulates, Whittaker's Five Kingdom Theory and Three Domain Concept of Carl Woese
- 1.2 Vaccination – Vaccina, BCG, MMR, DPT
- 1.3 Classification (Bergey's Manual), Outlines of major groups only
- 1.4 Bacterial Morphology: Cell Wall, Capsule, Flagella, Fimbriae, Nucleus, Plasmids Endospore and Storage Granules

Unit 2

(13 Hours)

Bacteria

- 2.1 Growth: kinetics, Growth Curve, Factors Affecting Growth
- 2.2 Nutritional Types and Types of Media
- 2.3 Control of Microorganisms: Physical Agents - Temperature (high and low), Dessication, Filtration and Radiation, Chemical – Halogens, Alcohols, Preservatives – Natural (Salt & Sugar) Chemical (Sorbates, Benzoate, Sulfur dioxide)
- 2.4 Genetic Recombination: Conjugation, Transformation and Transduction

Unit 3 (13 Hours)
Viruses

- 3.1 General Properties of Viruses, Cultivation, Purification and Assay (Plaque Formation)
- 3.2 Structure: Virion Size, Helical Capsid, Icosahedral Capsid and Viral Envelope
- 3.3 Replication: Bacteriophages (Lytic and Lysogenic Cycles), Plant Virus (Tobacco Mosaic Virus) and Animal Virus (Herpes Simplex Virus and Retro Virus)
- 3.4 Prions, Viroids and Virusoids

Unit 4 (13 Hours)
Soil Microbiology

- 4.1 Role of Bacteria, Fungi and Actinomycetes in Composting
- 4.2 Biogeochemical Cycle: Nitrogen, Phosphorous and Carbon
- 4.3 Applications of VAM in Forestry and Agriculture
- 4.4 Causal organisms, Symptoms and Control measures of Root gall disease, Fusarium Wilt, Bunchy top of Banana and Little leaf of Brinjal

Unit 5 (13 Hours)
Microbiology of Water and Air

- 5.1 Microbiology of Domestic Water and Sewage
- 5.2 Purification of Drinking Water, Sewage Treatment and Disposal
- 5.3 Distribution and Sources of Air Borne Organisms
- 5.4 Enumeration of Microorganisms in Air - Sampling Techniques

BOOK FOR STUDY

Powar, C.B., and H.F.Daginawala. *General Microbiology* - Vol. II, Mumbai: Himalaya, 2010.

BOOKS FOR REFERENCE

- Ananthanarayanan and J.Paniker, *Textbook of Microbiology*, 10th ed, 2018.
Gerard J.Tortora,B.R.Funke and C.L.Case, *Microbiology*. 11th ed, 2016.
Hogg, S. *Essentials Microbiology*. England: John Wiley, 2010.
Joanne M Willey., *Microbiology*.MC Graw- Hill, 2011.
Kathleen P.Talaro and Berry Chess, *Foundations in Microbiology*. McGraw-Hill, 2012.
Maier, R.M., I.L. Pepper and C.P. Gerba. *Environmental Microbiology*. U.S.A: Academic, 2006.
Parry,J.Thelma, Pawsey and K.Rosa. *Principles of Microbiology*. London: Hutchinson, 1984.
Pelczar, J.Michael, (Jr.), D.Reid, Roger, E.C.S.Chan and Kreig, *Microbiology*. New Delhi: Tata McGraw – Hill, 1993.
Panda S.C., *Principles and Practices of Water Management*. Agrobios, 2011.
Patwardhan, A.D., *Industrial Waste Water Treatment*. 12th ed, 2017.
Presscot, L.M., P.H. John and D.A. Klein, *Microbiology*. U.S.A.: W.M. Brown, 2005.
Subbarao, N.S., *Soil Microbiology*. 5th ed, 2017.

WEB RESOURCES

www.abou.com/generalmicrobiology

JOURNALS

Folia Microbiologia

Microbiology

Indian Journal of Microbiology

Plant Microbes Symbiosis: Applied Facets

International Microbiology

Journal of Industrial Microbiology and Biotechnology

PATTERN OF ASSESSMENT

Continuous Assessment Test:

Total Marks: 50

Duration: 90 minutes

Section A – Objective questions

9 x 1 = 9 marks

Very Short Answers

3 x 3 = 9 marks (3 out of 4 in 50 words each)

Section B – 2 x 6 = 12 marks (2 out of 3 questions to be answered in 200 words each)

Section C – 1 x 20 = 20 marks (1 out of 2 questions to be answered in 1000 words each)

Other Components:

Total Marks: 50

Seminars/Quiz/Assignments etc. (any 2)

End Semester Examination:

Total Marks: 100

Duration: 3 hours

Section A – Objective questions 18 x 1 = 18 marks

Choose the correct answer

5 x 1 = 5 marks

Fill in the blanks

5 x 1 = 5 marks

Match the following

5 x 1 = 5 marks

True or False

3 x 1 = 3 marks

Very Short Answers

6 x 3 = 18 marks (6 out of 9 in 50 words each)

Section B – 4 x 6 = 24 marks (4 out of 6 questions to be answered in 200 words each)

Section C – 2 x 20 = 40 marks (2 out of 4 questions to be answered in 1000 words each)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V. A. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

ECOLOGY AND ENVIRONMENTAL BIOTECHNOLOGY

CODE:19BT/MC/EE54

CREDITS:4

L T P:4 0 0

TOTAL TEACHING HOURS:52

OBJECTIVES OF THE COURSE

- To create awareness on ecological issues
- To study the health hazards caused by toxic chemicals released in the environment
- To provide an understanding of the use of biological organisms as agents of monitoring toxicity

COURSE LEARNING OUTCOMES

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

- learn techniques for gathering data in the field
- understand the toxicity of xenobiotics
- apply practical techniques in monitoring pollution
- develop a basic understanding of the risk of pollutants and their impact on the ecosystem
- appreciate plant biodiversity
- gain an understanding of Geographic Information System

Unit 1 (10 Hours)

Plant Communities

- 1.1 Qualitative Analysis - Floristic Composition, Stratification, Periodicity, Life forms - Raunkaier's Biological Spectrum
- 1.2 Quantitative analysis: Density, Cover, Abundance, Frequency, Index of Dominance, Index of Similarity between 2 samples, Shannon's Index of General Diversity
- 1.3 Sampling of Population - Quadrat, Transect, Loop and Point method

Unit 2 (10 Hours)

Ecosystem

- 2.1 Terrestrial Ecosystems
- 2.2 Aquatic Ecosystems
- 2.3 Ecological Adaptations- Hydrophytes, Xerophytes and Halophytes

Unit 3 (10 Hours)

Environmental Toxicology

- 3.1 Biomagnification
- 3.2 Bioaccumulation
- 3.3 Biotransformation - DDT

Unit 4
Biomonitoring (11 Hours)
4.1 Bioindicators
4.2 Bioleaching
4.3 Phytoremediation

Unit 5
General Topics (11 Hours)
5.1 Environmental Impact Assessment (EIA)
5.2 Environmental Quality Monitoring of Air and Water
5.3 Environmental Risk Assessment

BOOK FOR STUDY

Sharma P. D. *Environmental Biology and Toxicology*. India: Rastogi Publications, 2013.

BOOKS FOR REFERENCE

Arumugam, N., *Ecology and Toxicology*. Saras Publication. 2010.

Bharucha, Erach. *Textbook of Environmental Studies for Undergraduate Courses*, (2nd edition) Universities Press, 2013.

Bhatia S.C., *Environmental Ecology*. Agrotech. 2013..

Bhatta Basudeb, *Remote Sensing and GIS*, 2nd Revised Edition, Oxford University Press. 2012.

Bhattacharya, K.S., Arunima Sharma, *Comprehensive Environmental Studies* Narosa Publishing House Pvt. Ltd., New Delhi: 2015.

Kumaresan, V and N. Arumugam. *Plant Ecology and Phytogeography*. Saras Publication. 2012.

Kumaresan, V and N. Arumugam. *Environment and Pollution*, Saras Publication, 2016.

Saha, T.K., *Ecology and Environmental Biology*, Kolkata: Books and Allied (P) Ltd., 2016.

Verma, P.S., *Environmental Biology and Principles of Ecology*. India: S.Chand, 2000.

JOURNALS

International Journal of Organic Evolution

Journal of Human Evolution

Ecology and Evolution Journal

Molecular Biology and Evolution

Journal of Plant Systematics and Evolution

Journal of Botany

Genetic Resources and Crop Evolution

WEB RESOURCES

www.eattheweeds.com

openfarmtech.org

greenpeace.org

wwf.org

foe.co.uk- Friends of the Earth

PATTERN OF ASSESSMENT

Continuous Assessment Test:

Section A – Objective questions

Very Short Answers

Total Marks: 50

9 x 1 = 9 marks

3 x 3 = 9 marks (3 out of 4 in 50 words each)

Duration: 90 minutes

Section B – 2 x 6 = 12 marks (2 out of 3 questions to be answered in 200 words each)

Section C – 1x 20 = 20 marks (1 out of 2 questions to be answered in 1000 words each)

Other Components:

Total Marks: 50

Seminars/Quiz/Assignments etc. (any 2)

End Semester Examination:

Total Marks: 100

Duration: 3 hours

Section A – Objective questions 18 x 1 = 18 marks

Choose the correct answer 5 x 1 = 5 marks

Fill in the blanks 5 x 1 = 5 marks

Match the following 5 x 1 = 5 marks

True or False 3 x 1 = 3 marks

Very Short Answers 6 x 3 = 18 marks (6 out of 9 in 50 words each)

Section B – 4 x 6 = 24 marks (4 out of 6 questions to be answered in 200 words each)

Section C – 2x 20 = 40 marks (2 out of 4 questions to be answered in 1000 words each)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V(A). PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

CELL AND MOLECULAR BIOLOGY, MICROBIOLOGY, ECOLOGY AND ENVIRONMENTAL BIOTECHNOLOGY - PRACTICAL

CODE:19BT/MC/P553

CREDITS:3

L T P:0 0 6

TOTAL HOURS:78

CELL AND MOLECULAR BIOLOGY

(26 Hours)

1. Squash Techniques
2. Extraction of DNA from Onion Cells
3. Demonstrations: Plasmid DNA - Electrophoresis, Restriction Enzyme
4. Identification of Various Cell Organelles through Photomicrographs

MICROBIOLOGY

(26 Hours)

1. Demonstration of the working and use of Autoclave, Hot Air Oven, Water Bath and Laminar Air Flow
2. Inoculation Techniques to Isolate Bacteria: Slant, Pour Plate, Streak Plate, Stab and Spread plate
3. Preparation of Nutrient Media and Broth
4. Gram Staining
5. Antimicrobial Property using Antibiotic Discs / Turmeric

Demonstration Experiments:

1. Effect of Temperature and pH on Bacterial Growth (Qualitative)
2. Isolation of Bacteria and Fungi from Soil on Various Media: Enrichment, Selective and Differential Media
3. Tests for Coliform
4. Methylene Blue Reductase Test
5. Wine Production and Estimation of Lactic Acid

ECOLOGY AND ENVIRONMENTAL BIOTECHNOLOGY

(26 Hours)

- 1 Construction of Quadrat, Belt and Line Transect - Calculation of Frequency, Percentage, Density and Abundance
- 2 Effect of Toxic Substances (Chemicals) on Mitogenic Property of Onion Root
- 3 Morphological and Structural Adaptations of Hydrophytes, Xerophytes and Halophytes (any two in each category)
Hydrophyte: any two
Xerophyte: any two
Halophyte: any one

PATTERN OF ASSESSMENT

Continuous Assessment Test:

Total Marks: 50

Duration: 90 minutes

Two Tests (2 x 20 = 40 Marks)

Record 10 Marks

End Semester Examination:

Total Marks: 50

Duration: 3 hours

1. Cell Biology (Squash) Identification of 2 Stages and Diagram 7
2. Microbiology – Inoculation – Description, Diagram 7
Gram's Staining 7
3. Ecology – Quadrat / Transect - Calculation 7
Sectioning – Identification, Diagram and Reasons 7
4. Spotters (3 x 5) Identification, Diagram and Reasons 15
Two Spotters from Molecular Biology
One Spotter from Microbiology

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600086.

**Interdisciplinary Core Course Offered by the Departments of Botany and Chemistry to
B.Sc. Chemistry and B.Sc. Plant Biology and Plant Biotechnology Degree Programmes**

SYLLABUS

(Effective from the academic year 2019-2020)

BIOANALYTICAL TECHNIQUES

CODE:19ID/IC/BA55

CREDITS:5

L T P: 5 1 0

TOTAL TEACHING HOURS: 78

OBJECTIVES OF THE COURSE

- To provide an understanding of extraction and separation techniques
- To use spectroscopic techniques to understand the structure of phytochemicals
- To determine cell size and morphology using microscopy
- To understand the basic principles of various instrumentation

COURSE LEARNING OUTCOMES

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

- Extract and separate phytochemicals using separation techniques
- Isolate biomolecules using centrifugation and gel electrophoresis
- Characterize and analyse the extracted product
- Examine and check the purity of a sample
- Separate a substance based on its solubility
- Estimate the metal ions by spectrophotometry and Flame photometry
- Assess the water quality using turbidimetry.

Unit 1 (16 Hours)

Microscopy: Principle, Construction and Application

- 1.1 Light microscopes – Compound, Phase Contrast, Differential Interference Contrast and Confocal Microscopes.
- 1.2 Preparation of Specimen for Light Microscopy – Paraffin Techniques – Fixatives: FAA, Carnoy's, Dehydration and Infiltration, Embedding and Sectioning (Paraffin Blocks), Staining and Mounting.
- 1.3 Electron Microscopes – TEM, specimen preparation for TEM.

Unit 2 (15 Hours)

Centrifugation: Principle, Instrumentation and Application

- 2.1 Bench, Ultracentrifuge, Refrigerated, Continuous flow centrifuge and Microfuge.
- 2.2 Density gradient and differential centrifugation
- 2.3 Isolation of Chloroplast (Practical)

Unit 3 **(16 Hours)**

Separation Techniques

- 3.1 Separation by solvent extraction: Principle, Extraction by chemically active solvents, Soxhlet extraction, Factors Influencing the Extraction Efficiency.
- 3.2 Capillary Electrophoresis (Capillary Zone and Capillary Gel), Gel Electrophoresis – Agarose and Polyacrylamide, Orthogonal-Field-Alternation, Gel Electrophoresis (OFAGE), Field Inversion Gel Electrophoresis (FIGE), Immunoelectrophoresis.
- 3.3 Separation of Proteins/ DNA using Gel Electrophoresis (Practical)
- 3.4 Separation by Precipitation, methods of Filtering, Drying- Ignition & Incineration of Precipitate, Nucleation, Crystal Growth, Solubility Product, Principle, Factors affecting Solubility, Purity of Precipitates, Co-precipitation and Post Precipitation

Unit 4 **(14 Hours)**

Purification techniques

- 4.1 Desiccants: Types, efficiency, regeneration and choice of desiccants
- 4.2 Technique of drying of solids, Distillation: Types, Theory and techniques of fractional, Steam and Vacuum distillation
- 4.3 Recrystallisation, Sublimation - Types, techniques and applications
- 4.4 Criteria and test for purity- melting point, boiling point and density

Unit 5 **(17 Hours)**

Spectroscopic Techniques and Spectrochemical Methods

- 5.1 Introduction to Spectroscopy, Lambert Beer's law-statement and deviation; UV-Visible-instrumentation and applications-estimation of Mn^{2+}
- 5.2 Nephelometry and Turbidimetry Principle, Instrumentation and Applications-determination of TDS of water sample
- 5.3 Principle, Instrumentation and Applications of Atomic absorption Spectroscopy (estimation of Ca), Flame photometry (estimation of K/Na) and Fluorimetry (estimation of Fluorescein)

BOOKS FOR STUDY

- Gopalan, R, Subramanian, P.S and Rengarajan, K. *Elements of Analytical Chemistry*. New Delhi: Sultan Chand, 2004.
- Skoog, D.A, West, D.M. *Fundamentals of Analytical Chemistry*. Thomson Asia, 2014.
- Steven, E Ruzin, *Plant Microtechnique and Microscopy*, USA: Oxford University, 1999.
- Jensen, W.A. *Botanical Histochemistry*. New Delhi: TataGraw – Hill, 1962.
- Vogel, A.I. *Vogel's Textbook of Quantitative Chemical Analysis*. Prentice Hall, Science, 2000.

BOOKS FOR REFERENCE

- Beckman Coulter, Daniel, C Liebler. *Introduction to Proteomics: Tools for new biology*, Human, 2002.
- Day R.A.Jr. & A.L. Underwood. *Quantitative Analysis*. New Delhi: Prentice Hall of India, 1993.
- Herb Schwartz and Andras Guttman. *Separation of DNA by Capillary Electrophoresis*, USA

James P. Landers, *Handbook of Capillary and Microchip Electrophoresis and Associated Microtechniques*, USA: CRC, 2008.

Karp Gerald. *Cell and Molecular Biology: Concepts and Experiments*. USA: Wiley, 2013.

Landers, James P. *Handbook of Capillary Electrophoresis*. USA: CRC, 1996.

Mendhan, J., *Vogel's Textbook of Quantitative Chemical Analysis*. New Delhi: Pearson 2009.

Skoog, Douglas A, James F. Holler & Timothy A. Nieman. *Principles of Instrumental Analysis*. Singapore: Haracourt Asia, 2001.

Srivastava, T.N & P.C.Kamboj. *Systematic Analytical Chemistry*. New Delhi: Shobanlal Nagin Chand, 1999.

Usharani, S. *Analytical Chemistry*. New Delhi: Macmillan, 2006.

WEB RESOURCES

<https://www.britannica.com/science/separation-and-purification>

<http://www.britannica.com/EBchecked/topic/108875/separation-and-purification>

<http://www.chemistry.co.nz/stoichiometry.htm>

PATTERN OF ASSESSMENT

Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes

Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the Blanks - 5, T/F or Match the following or single line answer - 5

Section B – 3 x 5 = 15 Marks (3 out of 5 to be answered)

Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

Other Components:

Seminars/Quiz/Open Book Tests/Group Discussion/Assignments/Problem Solving

MCQ/Model Preparation/Short Answer Tests

End-Semester Examination: Total Marks: 100 Duration: 3 hours

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)

Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V (A). PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

PLANT PHYSIOLOGY

CODE:19BT/MC/PP64

CREDITS:4

L T P:4 0 0

TOTAL TEACHING HOURS:52

OBJECTIVES OF THE COURSE

- To study the fundamental processes of plants including physical, chemical and biological functions in the context of cellular activities at organism level
- To understand the concept of growth and working mechanism in plants
- To gain knowledge on practical application of plant growth regulators
- To give a practical exposure through conduct of experiments in relation to environment.

COURSE LEARNING OUTCOMES

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

- appreciate the metabolic events such as Photosynthesis, Respiration and Transpiration
- gain knowledge on integrated activities of plants
- identify the nutritional requirement of plants
- understand the physiology of flowering
- enrich scientific reasoning and ability to interpret experimental data through experiential learning

Unit 1 (10 Hours)

Water Relations in Plants

- 1.1 Water Potential : Imbibition, Diffusion, Osmosis, Plasmolysis, Diffusion Pressure Deficit (DPD), Osmotic Pressure and Turgor Pressure
- 1.2 Transpiration: Definition, Significance and Mechanism of Stomatal Transpiration, Starch - Sugar Interconversion, Synthesis of Organic Acid in Guard Cells, ATP driven H^+ and K^+ Exchange Pump, Role of ABA in Stomatal opening and closure
- 1.3 Water Movement across the Root and Xylem - Active and Passive Absorption

Unit 2 (10 Hours)

Mineral Nutrition

- 2.1 Macronutrients and Micronutrients – Role and its deficiency in plants
- 2.2 Mechanism of Mineral Salt Absorption: Theories; Contact Exchange Theory, Carbonic Acid Theory, Donnan Equilibrium; Carrier Concept and Cytochrome Pump Theory, Transport of Organic Solutes: Phloem Loading and Unloading
- 2.3 Sources of Nitrogen, Nitrate and Nitrite Reduction, Assimilation of Nitrite and Ammonium

Unit 3 (10 Hours)

Photosynthesis

- 3.1 Light Reaction: Red Drop, Emerson Enhancement Effect, Pigment System I and II, Phosphorescence and Fluorescence
- 3.2 Photophosphorylation, CO₂ assimilation pathway: C₃, C₄ cycle, CAM and Photorespiration
- 3.3 Factors influencing Photosynthesis

Unit 4 (11 Hours)

Respiration

- 4.1 Respiratory Quotient
- 4.2 Glycolysis, Substrate level Phosphorylation, Entner - Doudroff Pathway, Glyoxylate Cycle
- 4.3 Krebs Cycle, Electron Transport Pathway, Oxidative Phosphorylation and Cyanide Resistant Pathway

Unit 5 (11 Hours)

Phytohormones and Physiology of Flowering

- 5.1 Phytohormones – Chemical Nature, Bioassay (one only), Physiological Effect and Practical Applications of the following Plant Growth Regulators: Auxin, ABA, Cytokinin, Giberellic Acid and Ethylene
- 5.2 Photoperiodism
- 5.3 Vernalization

BOOK FOR STUDY

Jain, V.K. *Fundamentals of Plant Physiology*. New Delhi: Chand, 2013.

BOOKS FOR REFERENCE

- Bidwell, R.G.S. *Plant Physiology*. New York: Macmillan, 1983.
- Devlin, R.M. *Plant Physiology*, New Delhi: Affiliated East, 1983.
- Malcom Wilkins, B. *Advanced Plant Physiology*. England: ELBS/Longman, 1968.
- Mukherji, S. and A.K. Ghosh. *Plant Physiology I*. Kolkatta: New Central, 2004.
- Noggle, G. Ray and G.J. Fritz. *Introductory Plant Physiology*. New Delhi: CBS, 1998.
- Salisbury, F.B and C. Ross. *Plant Physiology*. New Delhi: Prentice Hall. 2008.
- Sinha, R.K. *Modern Plant Physiology*. New Delhi: Narosa, 2015.
- Taiz, L and E. Zeiger. *Plant Physiology and Development*. New Delhi: Panima, 2018.
- Weston, G.D. *Crop Physiology – Biotechnology*. London: Butterworth – Heinemann, 1994.
- William, G. Hopkins, *Introduction to Plant Physiology*, Wiley, 2008.

JOURNALS

- Journal of Plant Physiology (Elsevier)
- Journal of Plant Physiology (Science Direct)
- International Journal of Plant Physiology and Biochemistry
- Indian Journal of Plant Physiology

WEB RESOURCES

- www.journals.elsevier.com
- www.springer.com
- www.academicjournals.org

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – Objective questions 9 x 1 = 9 marks
Very Short Answers 3 x 3 = 9 marks (3 out of 4 in 50 words each)

Section B – 2 x 6 = 12 marks (2 out of 3 questions to be answered in 200 words each)

Section C – 1 x 20 = 20 marks (1 out of 2 questions to be answered in 1000 words each)

Other Components: **Total Marks: 50**

Seminars/Quiz/Assignments etc. (any 2)

End Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A – Objective questions 18 x 1 = 18 marks

Choose the correct answer 5 x 1 = 5 marks

Fill in the blanks 5 x 1 = 5 marks

Match the following 5 x 1 = 5 marks

True or False 3 x 1 = 3 marks

Very Short Answers 6 x 3 = 18 marks (6 out of 9 in 50 words each)

Section B – 4 x 6 = 24 marks (4 out of 6 questions to be answered in 200 words each)

Section C – 2 x 20 = 40 marks (2 out of 4 questions to be answered in 1000 words each)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V(A). PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

PLANT BIOTECHNOLOGY

CODE:19BT/MC/PB64

CREDITS:4

L T P:4 1 0

TOTAL TEACHING HOURS:65

OBJECTIVES OF THE COURSE

- To study the fundamental principles of tissue culture
- To understand the applied aspects of Biotechnology and Genetic Engineering
- To gain knowledge on plant gene interaction and expression
- To get familiar with the concepts of modern technology pertaining to large scale production of agricultural products

COURSE LEARNING OUTCOMES

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

- apply the knowledge gained from Genetic Engineering in agriculture
- carry out research in plant tissue culture
- to make venture in plant genome research
- enable the students to pursue higher studies and research work in Biotechnology
- provide an opportunity to get employment in Biotechnology industries and laboratories

Unit 1 (15 Hours)

Tissue Culture

- 1.1 Totipotency, Differentiation, Dedifferentiation, Redifferentiation, Culture techniques: sterilization, inoculation, incubation, acclimatization, organogenesis, embryogenesis and regeneration
- 1.2 Organ culture: Shoot Culture, Anther and Embryo Culture
- 1.3 Cell culture: Single cell culture, Suspension culture and Synthetic seeds
- 1.4 Somatic Hybridization: Protoplast Culture: Isolation, Culture and Fusion: Spontaneous and Induced Fusion, Identification and Selection of Hybrid Cells
- 1.5 Somaclonal Variation

Unit 2 (11 Hours)

Plant molecular biology

- 2.1 Plant Genome Organization
- 2.2 Gene expression – Post transcriptional and Post translational modification
- 2.3 Chloroplast genome

Unit 3 (13 Hours)

rDNA technology

- 3.1 Introduction to Genetic Engineering

- 3.2 Techniques: Restriction Endonucleases, Ligation, Electrophoresis, Blotting
3.3 Hybridization, Autoradiography, PCR, DNA sequencing – Sanger's method

Unit 4
Gene transfer in Plants (13 Hours)

- 4.1 Cloning Vectors: pUC 18, YAC and BAC
4.2 Ti Plasmid
4.3 Gene Transfer Technique using *Agrobacterium*
4.4 Physical Delivery Methods: PEG stimulated, Ballistics (Particle gun), Electroporation, Microinjection

Unit 5
Applications in Biotechnology (13 Hours)

- 5.1 Transgenic Plants for Crop Improvement: Insect Resistance
5.2 Transgenic Plants - Edible Vaccines
5.3 Molecular markers (RFLP, RAPD) in crop improvement program
5.4 Bioethics and Biosafety

BOOK FOR STUDY

Satyanaarayana, U. *Biotechnology*. Kolkata, 2015.

BOOKS FOR REFERENCE

- Anand Prakash., *Plant Tissue Culture*. SBW, 2014.
Dubey, R.C. *A Text book of Biotechnology*. New Delhi: S.Chand, 1993
Freifelder, D. *Molecular Biology*. Boston: Jones and Barlett, 1987.
Glick, B.R., and J.J.Pasternak. *Molecular Biotechnology - Principles and Applications of Recombinant DNA*. New Delhi: Panima, 1994.
Ignacimuthu, S. *Basic Bio-Technology*. New Delhi: Tata-McGraw Hill, 1996.
Ignacimuthu, S.J. *Biotechnology –An Introduction*. New Delhi: Narosa, 2015.
Kalyan Kumar De. *An Introduction to Plant Tissue Culture*. Kokatta: New Central Book Agency, 2000.
Kumar, H.D. *A Text book of Bio-Technology*. New Delhi: East West, 1993.
Kamal Nayan joshi., *Biotechnology*., Delhi: Manglam, .2013.
Narayanaswamy, S. *Plant Cell and Tissue Culture*. New Delhi: Tata McGraw Hill, 1994.
Patel, A.H. *Industrial Microbiology*. New Delhi: Macmillan, 1990.
Purohit, S, S. and S. K.Mathur. *Biotechnology - Fundamentals and Applications*. Agrobios. 2000.
Purohit, S.S. *Agricultural Biotechnology*. New Delhi: Agro Botanica, 2000.
Renuka Sharma., *Transgenic Crops*. Discovery, 2013.
Sharma H.P., *Plant Tissue Culture*. Agrobios, 2012.
Sanjay Kumar Sharma. *Plant Tissue Culture*. Book Enclave Jaipur, 2016.
Trehan, K. *Biotechnology*. New Delhi: Wisley Easter, 1991.
Treven, M.D.S. Baffery, R.H.Goulding and F.Standbury. *Bio-Technology – The biological principles*. New Delhi: .Tata-McGraw, Hill, 2011.
Watson, J.D., M.Gilman, J.Witkowski and M.Zoller. *Recombinant DNA*. New York: Scientific American Books, 1990.

JOURNALS

Plant Biotechnology Journal
Journal of Plant Molecular Biology & Biotechnology
Journal of Genetic Engineering and Biotechnology
International Journal of Genetic Engineering

WEB RESOURCES

www.greenpeace.org
www.genengnews.com
www.sustainabletable.org
www.iari.res.in
www.nipgr.res.in

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**
Section A – Objective questions 9 x 1 = 9 marks
Very Short Answers 3 x 3 = 9 marks (3 out of 4 in 50 words each)
Section B – 2 x 6 = 12 marks (2 out of 3 questions to be answered in 200 words each)
Section C – 1 x 20 = 20 marks (1 out of 2 questions to be answered in 1000 words each)

Other Components: **Total Marks: 50**
Seminars/Quiz/Assignments etc. (any 2)

End Semester Examination: **Total Marks: 100** **Duration: 3 hours**
Section A – Objective questions 18 x 1 = 18 marks
Choose the correct answer 5 x 1 = 5 marks
Fill in the blanks 5 x 1 = 5 marks
Match the following 5 x 1 = 5 marks
True or False 3 x 1 = 3 marks
Very Short Answers 6 x 3 = 18 marks (6 out of 9 in 50 words each)

Section B – 4 x 6 = 24 marks (4 out of 6 questions to be answered in 200 words each)
Section C – 2 x 20 = 40 marks (2 out of 4 questions to be answered in 1000 words each)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V.A. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year (2019–2020))

GENETICS, PLANT BREEDING AND EVOLUTION

CODE:19BT/MC/GP64

CREDITS:4

L T P:4 1 0

TOTAL TEACHING HOURS:65

OBJECTIVES OF THE COURSE

- To understand the importance of hereditary and evolution
- To enable students to think analytically to solve genetic problems
- To provide a basic knowledge of the techniques of plant breeding
- To understand the principles and mechanism of evolution.

COURSE LEARNING OUTCOMES

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

- understand the basic principles of inheritance in plants
- gain knowledge on the interactions of genes
- understand the inheritance of linked genes and recombination of genes
- describe the inheritance of X and Y linked genes
- construct personal and family pedigrees
- understand the theories of evolution.

Unit 1 (13 Hours)

Basic Concepts of Genetics-I

- 1.1 Mendelian Genetics
- 1.2 Gene interactions: Allelic (Incomplete dominance and Co-dominance) and Non-Allelic (Dominant and Recessive Epistasis, Inhibitory, Complementary, Additive and Duplicate genes).
- 1.3 Multiple Gene Inheritance - Skin colour in man and Ear length in *Maize*
- 1.4 Extra- Chromosomal Inheritance in *Mirabilis jalapa* and Yeast

Unit 2 (13 Hours)

Basic Concepts of Genetics-II

- 2.1 Linkage in Maize
- 2.2 Theories of Crossing Over – Classical Theory and Chiasma Theory
- 2.3 Chromosomal Aberrations- deletion, duplication, inversion and translocation.
- 2.4 Sex Determination in *Melandrium*
- 2.5 Sex Linkage in Man – Colour Blindness

Unit 3 (13 Hours)

Human Genetics

- 3.1 Down's Syndrome
- 3.2 Klinefelter's Syndrome
- 3.3 Sickle Cell Anaemia
- 3.4 Muscular Dystrophy
- 3.5 Genetic Counselling

Unit 4 (13 Hours)

Plant Breeding

- 4.1 Objectives of Plant Breeding
- 4.2 Selection Methods - Pure line and Clonal
- 4.3 Basic Hybridization Techniques
- 4.4 Induced Polyploidy in Plant Breeding
- 4.5 Induced Mutation in Plant Breeding

Unit 5 (13 Hours)

Evolution

- 5.1 Origin of Life – Spontaneous and Chemosynthetic
- 5.2 Theory of Inheritance of Acquired characters
- 5.3 Theory of Natural Selection
- 5.4 Mutation theory of De Vries
- 5.5 Synthetic theory of evolution

BOOK FOR STUDY

Verma, P.S., V.K. Agarwal *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology* New Delhi: S.Chand, 2014

BOOKS FOR REFERENCE

- Benjamin, L. *Genes IX*. New York: Oxford University, 2014.
- Chahal, G.S. and Gosal, S.S. *Principles and Procedures of Plant Breeding, -Biological and Conventional Approaches* New Delhi: Narosa Publishing House Pvt. Ltd. 2015.
- Daniel L Harti., *Essential Genetics*. Jones and Bartlett, 2014.
- Kumar Sushil, *Plant Breeding and Genetics*, Jaipur, Book Enclave, 2016..
- Kumaresan, V. *Plant Breeding*. Nagercoil: Saras. 2009.
- Mann Rosanna, *Human Genetics and Genomics*, Callisto Reference, ,2017.
- Rastogi Veer Bala, *Organic Evolution*, Medtech, 2016.
- Singh, M.P. and Sunil Kumar, *Genetics and Plant Breeding*, Vol .I & II New Delhi, APH Publishing Corporation, 2016.
- Trivedi Dipali, J. *Human Genetics*, 2016.
- Zingare A. K, *Plant Breeding and Seed Saving*. New Delhi: Satyam, 2013.

WEBSITES

- www.genome.gov/12514286
- www.dnalc.org
- www.kumc.edu/gec
- www.mendelweb.org

JOURNALS

Journal of Plant Breeding and Genetics
Indian Journal of Plant Breeding and Genetics
Journal of Plant Breeding and Crop Science
Journal of Plant Science and Molecular Breeding
International Journal of Organic Evolution
Journal of Human Evolution
Ecology and Evolution Journal
Molecular Biology and Evolution
Journal of Plant Systematics and Evolution
Journal of Botany
Genetic Resources and Crop Evolution

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**
Section A – Objective questions 9 x 1 = 9 marks
Very Short Answers 3 x 3 = 9 marks (3 out of 4 in 50 words each)
Section B – 2 x 6 = 12 marks (2 out of 3 questions to be answered in 200 words each)
Section C – 1 x 20 = 20 marks (1 out of 2 questions to be answered in 1000 words each)

Other Components: **Total Marks: 50**
Seminars/Quiz/Assignments etc. (any 2)

End Semester Examination: **Total Marks: 100** **Duration: 3 hours**
Section A – Objective questions 18 x 1 = 18 marks
Choose the correct answer 5 x 1 = 5 marks
Fill in the blanks 5 x 1 = 5 marks
Match the following 5 x 1 = 5 marks
True or False 3 x 1 = 3 marks
Very Short Answers 6 x 3 = 18 marks (6 out of 9 in 50 words each)
Section B – 4 x 6 = 24 marks (4 out of 6 questions to be answered in 200 words each)
Section C – 2 x 20 = 40 marks (2 out of 4 questions to be answered in 1000 words each)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

**B.Sc. DEGREE: BRANCH V(A). PLANT BIOLOGY AND
PLANT BIOTECHNOLOGY**

SYLLABUS

(Effective from the academic year (2019–2020))

**PLANT PHYSIOLOGY, PLANT BIOTECHNOLOGY AND GENETICS, PLANT
BREEDING AND EVOLUTION - PRACTICAL**

CODE:19BT/MC/P663

CREDITS:3

L T P:0 0 6

TOTAL HOURS:78

PLANT PHYSIOLOGY

(26 Hours)

1. Determination of Osmotic Pressure using Plasmolytic Method
2. Determination of Water Potential by Dye method
3. Effect of Environmental Factors on Transpiration - Light and Wind
4. Effect of Quality of Light and CO₂ Concentration on the Rate of Photosynthesis
5. Separation of Chlorophyll Pigments by Paper Chromatography
6. Demonstration of Peroxidase Activity
7. Determination of the Rate of Respiration using Ganong's Respiroscope

DEMONSTRATION EXPERIMENTS

1. Colorimetric Estimation of Nitrate Reductase
2. Effect of Auxin on Root formation
3. Demonstration of Hill's Reaction
4. Effect of temperature on Permeability

PLANT BIOTECHNOLOGY

(26 Hours)

1. Tissue Culture Techniques
 - a. Composition and Preparation of M.S. Medium - Shoot tip culture and Callus Culture
 - b. Composition and Preparation Nitsch Medium - Anther Culture
 - c. Composition and Preparation White's Medium - Embryo Culture
2. Photomicrographs in Genetic Engineering
3. Demonstration of SDS-PAGE

GENETICS, PLANT BREEDING & EVOLUTION

(26 Hours)

1. Problems based on Interaction of Genes-Allelic and Non-Allelic
2. Problems based on Gene Mapping
3. Life Cycle of *Drosophila* (Culture Studies) - Demonstration
4. Construction and Analysis of Family Pedigree Charts
5. Plant Breeding Photomicrographs included in the Syllabus

PATTERN OF ASSESSMENT

Continuous Assessment Test:

Two Tests (2 x 20 = 40 Marks)

Record 10 Marks

Total Marks: 50

Duration: 90 minutes

End Semester Examination:

1. Physiology – Expt. set up (individual)

2. Genetics – Problems

3. Tissue culture

4. Spotters – Physiology (1)

Genetic Eng. (1)

Applied Biotech (1)

Plant Breeding (1)

Total

Total Marks: 50

Duration: 3 hours

10

10

10

20

50

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

DEPARTMENT OF VALUE EDUCATION

SYLLABUS

(Effective from the academic year 2019–2020)

LIFE SKILLS : AN APPROACH TO A HOLISTIC WAY OF LIFE

CODE:19VE/SS/HL63

CREDITS:3

L T P:3 0 0

TOTAL TEACHING HOURS:39

OBJECTIVES OF THE COURSE

- To help students grow in spirituality and to experience themselves as integrated persons
- To help students understand themselves as relational beings and appreciate their role in family and society
- To help students recognize the commonality and differences of the different religions in India
- To help students grow in an awareness of the protective laws regarding women
- To prepare students to make informed choices in family and career

COURSE LEARNING OUTCOMES

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

- Appreciate themselves as integrated persons
- Recognize their role in family and society and become aware of the different protective laws in favour of women
- Make prudent choices for career and family
- Manage work life balance
- Live a harmonious life and be a channel of peace

Unit 1

Spiritual Self (10 Hours)

- 1.1 Understanding spirituality-Understanding the Spiritual side of oneself
- 1.2 Role of religious practices and growing in spirituality
- 1.3 Acceptance of self – self-identity, self-worth, self-respect, self-appreciation and self- presentation
- 1.4 Nurturing self - being at home with self, being able to connect with the inner self
- 1.5 Relationship with the Divine:
Discovering the Divine in self, creation, and others – St. Francis of Assisi-
Canticle of creatures Seeking the Divine through meditation, prayer and
worship

Unit 2

Relational Self: Women in the family (17 Hours)

- 2.1 Understanding one's self in the context of family
- 2.2 Family networks
- 2.3 Family time – prayer, meals, and relaxation

- 2.4 Family and social values: respect for others, understanding individual needs and responsibilities – give and take
- 2.5 Understanding different parenting styles – authoritarian, permissive and democratic
- 2.6 Appreciating the gift of womanhood – foundress-Mary of the Passion’s vision of womanhood
- 2.7 Opting for marriage, single, religious or a life committed to a cause
- 2.8 Marriage and family, choice of life partner, marital relationships, planning of family
- 2.9 Other types of relationships - pre-marital relationships, live-in relationship and LGBT issues
- 2.10 Roles and responsibilities of women as home makers and career woman, work life balance (WLB)
- 2.11 Marriage as a sacred bond and fidelity in marriage

Unit 3

Integrated Self

(12 Hours)

- 3.1 Integrating the spiritual, relational, social/political self
- 3.2 Integrating one’s past with the present and the future for holistic living
- 3.3 Social Issues- crimes against women, harassment, gender discrimination, dowry, abortion, separation, divorce and cyber-crimes
- 3.4 Legal rights of women-property, marital and adoptive rights
- 3.5 Sensitization to different religions and religious practices in family and society
- 3.6 Challenges of inter caste and inter religious marriages
- 3.7 Integration of self with family, community and society

Retreat/Workshop – Required for course completion.

BOOKS FOR REFERENCE

Davidar(Eds). Human Values. All India Association of Christian Higher Education. (AIACHE) New Delhi: 2013.

James, G.M. et.al. In Harmony-Value Education at College Level. Chennai: Prakash, 2011.

James, G.M. Personality Development For Life Issues and Coping Strategies. Chennai: 2011

Teaching / Learning Methods

Lectures /Group Discussions/Presentations/Seminars/Guest Lectures

PATTERN OF ASSESSMENT:

Marks: 50

Task based/Seminars/Poster Making/Scrap book/Assignment

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V. A. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

FRUIT PRESERVATION AND NUTRITION

CODE:19BT/ME/FN45

CREDITS:5

L T P:50 0

TOTAL HOURS:65

OBJECTIVES OF THE COURSE

- To study the practical methods of preserving fruits and vegetables
- To understand the nutritive value of fruits and vegetables
- To enable students to develop a scientific bent of mind

COURSE LEARNING OUTCOMES

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

- understand the preservation of fruits and vegetables
- develop a detailed understanding of the nutritive value of fruits and vegetables
- get familiar with the canning of fruits and vegetables
- gain confidence in preparation of wine and cider
- acquire practical skills in the preparation of food products

Unit 1 (13 Hours)

Preservation of Fruits and Vegetables

- 1.1 Temperature- High and Low
- 1.2 Drying
- 1.3 Radiation
- 1.4 Chemical Preservatives
- 1.5 Packaging of Fruits and Vegetables- CFB Boxes

Unit 2 (13 Hours)

Nutritive Value of Fruits and Vegetables

- 2.1 Classification of Fruits
- 2.2 Minerals
- 2.3 Vitamins
- 2.4 Antioxidants
- 2.5 Pigments

Unit 3 (13 Hours)

Canning

- 3.1 Steps in Canning
- 3.2 Canning of Fruits
- 3.3 Canning of Vegetables
- 3.4 Advantages and Limitations of Canning
- 3.5 Home Canning

Unit 4 (13 Hours)
Fermented Beverages
4.1 Beetroot Wine
4.2 Grape Wine
4.3 Cider
4.4 Vinegar

Unit 5 (13 Hours)
Practical
Preparation of the following products:
5.1 Guava Jelly
5.2 Mixed Fruit Jam
5.3 Mixed Vegetable Pickle
5.4 Lime Syrup
5.5 Grape Crush
5.6 Pineapple Squash

BOOK FOR STUDY

Roday Sunethra, *Food Science and Nutrition*, 3rd edition, Oxford University Press, 2018.

BOOKS FOR REFERENCE

Didier Montet, Ramesh C. Ray *Fermented Foods, Part I: Biochemistry and Biotechnology*, 1st ed. New Delhi: CRC Press, 2015.

Frazier, W.C. and D.C. West Hoff, *Food Microbiology*, 5th edition New Delhi: T McGraw Hill, 2013.

.Ray Bibek and Bhunia Arun, *Fundamental Food Microbiology*, 5th ed, T & F, India, 2018.

Srilakshmi, B. *Nutrition Science*, 6th ed, New Age International Publishers, 2017.

JOURNALS

Journal of Food Science

Journal of Food Science and technology

Journal of Nutrition of Food Science

Food Science Research Journal

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – Objective questions 9 x 1 = 9 marks
Very Short Answers 3 x 3 = 9 marks (3 out of 4 in 50 words each)

Section B – 2 x 6 = 12 marks (2 out of 3 questions to be answered in 200 words each)

Section C – 1 x 20 = 20 marks (1 out of 2 questions to be answered in 1000 words each)

Other Components: **Total Marks: 50**

Seminars/Quiz/Assignments etc. (any 2)

End Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A – Objective questions 18 x 1 = 18 marks

Choose the correct answer 5 x 1 = 5 marks

Fill in the blanks 5 x 1 = 5 marks

Match the following 5 x 1 = 5 marks

True or False 3 x 1 = 3 marks

Very Short Answers 6 x 3 = 18 marks (6 out of 9 in 50 words each)

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Section C – 2 x 20 = 40 marks (2 out of 4 questions to be answered in 1000 words each)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V. A. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

PROJECT

CODE:19BT/ME/PR45

CREDITS:5

Guide lines:

- **Page Limit:** The dissertation shall be within a space about 40-50 pages typed in font size 12, with 1½ line spacing in A4 size paper
- **Each dissertation will contain the following certificate:** “Dissertation submitted to Stella Maris College (Autonomous) Chennai, by Name of the candidate, Department Number, Department of Botany, Place, Month and Year
- **Submission:** Each student will prepare two copies of the dissertation and submit 15 days before the commencement of the End Semester Examination. One copy (hard and soft) to be submitted to the Head of the Department

PATTERN OF ASSESSMENT

Continuous Assessment Test:

Total Marks: 50

Periodical review and submission of reports

End Semester Examination:

Total Marks: 50

Dissertation and Viva-Voce

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V(A). PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

HORTICULTURE

CODE:19BT/ME/HC45

CREDITS:5

L T P:5 0 0

TOTAL HOURS:65

OBJECTIVES OF THE COURSE

- To provide theoretical and practical knowledge of gardening
- To get practical training in gardening techniques
- To enable the students to be self-reliant and to develop their entrepreneurial skills

COURSE LEARNING OUTCOMES

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

- gain the skill in fundamental practices of vegetative propagation of plants
- become self - reliant to develop their own organic kitchen and terrace gardening
- implement the cultural practices of various plants
- become an entrepreneur in cut flowers, bonsai and terrarium

Unit 1 (13 Hours)

Introduction and Techniques

- 1.1 Introduction, divisions of Horticulture and famous gardens of India(Rashtrapathi Bhavan Garden, New Delhi, Brindavan Garden, Mysore, Indian Botanical Garden, Kolkata and Botanical Garden, Ooty)
- 1.2 Garden Implements
- 1.3 Growing Plants in Pot: Types of Pots, Potting and Repotting
- 1.4 Pot Culture (growing annuals)- Practical

Unit 2 (13 Hours)

Garden Components and Propagation

- 2.1 Garden and its Components: Fencing Hedge, Borders, Flower Beds, Edging, Lawn, Drives and Paths, Water Garden and Garden Adornments
- 2.2 Vegetative Propagation: Cutting, Layering, Grafting and Budding (Theory and Practical)
- 2.3 Sexual propagation by means of seeds

Unit 3 (13 Hours)

Cultural Practices

Propagation, Planting and Harvesting of the following Plants:

- 3.1 Fruits: Mango and Guava
- 3.2 Vegetable Crops: Onion and Potato
- 3.3 Economic Flowers : Rose and Jasmine
- 3.4 Vegetable Forcing

Unit 4 **(13 Hours)**

Organic Horticulture and Types of Gardens

- 4.1 Organic Horticulture – organic gardening system, soil & nutrient management, pest & weed control approach
- 4.2 Kitchen Garden – Layout: Theory and Practical
- 4.3 Market Garden and Truck Garden
- 4.4 Rock Garden and Terrace Garden

Unit 5 **(13 Hours)**

General Topics

- 5.1 Landscaping and Lawn maintenance
- 5.2 Cut Flowers, Flower Arrangement: Fresh and Dry (Theory and Practical)
- 5.3 Bonsai: Theory and Practical
- 5.4 Terrarium: Theory and Practical

BOOK FOR STUDY

Kumar, N. *Introduction to Horticulture*, Nagercoil: Rohini Agencies.1980.

BOOKS FOR REFERENCE

- Bhattacharyya and Purohit. *Organic Farming Biocontrol and Biopesticide Technology*. Agrobios India, 2012.
- Chauhan, D.V.S. *Vegetable Production in India*. Agra: Ram Prasad, 1968.
- Edmund, J.B., T.L.Senn, F.S.Andrews and R.G.Halfacre. *Fundamentals of Horticulture*. London: Tata McGraw Hill, 1994.
- George Acquaaah. *Horticulture Principles and practices*. London: PHI Learning, 2009.
- Gopalswamy Iyengar, K.S. *Complete Gardening in India*. Bangalore: Kalyan.1970.
- Janick, J. *Horticultural Science*. New Delhi: Surgeet, 1962.
- John Lindley, *Theory of Horticulture*. Facsimile pulisher,2018
- Naik, K.C. *South Indian Fruits and their Culture*, Madras: P.Varadharaj, 1968.
- Randhawa, G.S. *Ornamental Horticulture in India, Today and Tomorrow*. New Delhi: Indian Council of Agriculture Research, 1980.
- Sheela, V. L. *Horticulture*, Chennai: MJP, 2011.
- Saini R.S., *Laboratory Manual of Analytical Techniques in Horticulture*, Jodhpur: Agrobios, 2012.
- Yawalkar, K.S. *Vegetable Crops of India*. Nagpur: Agri -Horticultural, 1961.

JOURNALS

- Indian Journal of Horticulture
- International Journal of Horticulture and Crop Science
- Journal of Horticultural Sciences

WEB RESOURCES

- www.hortportal.org
- agritech.trau.ac.in
- www.agrihorticultureindia.com

PATTERN OF ASSESSMENT

Continuous Assessment Test:	Total Marks: 50	Duration: 90 minutes
Section A – Objective questions	9 x 1 = 9 marks	
Very Short Answers	3 x 3 = 9 marks (3 out of 4 in 50 words each)	

Section B – $2 \times 6 = 12$ marks (2 out of 3 questions to be answered in 200 words each)

Section C – $1 \times 20 = 20$ marks (1 out of 2 questions to be answered in 1000 words each)

Other Components:

Total Marks: 50

Seminars/Quiz/Assignments etc. (any 2)

End Semester Examination:

Total Marks: 100

Duration: 3 hours

Section A – Objective questions $18 \times 1 = 18$ marks

Choose the correct answer $5 \times 1 = 5$ marks

Fill in the blanks $5 \times 1 = 5$ marks

Match the following $5 \times 1 = 5$ marks

True or False $3 \times 1 = 3$ marks

Very Short Answers $6 \times 3 = 18$ marks (6 out of 9 in 50 words each)

Section B – $4 \times 6 = 24$ marks (4 out of 6 questions to be answered in 200 words each)

Section C – $2 \times 20 = 40$ marks (2 out of 4 questions to be answered in 1000 words each)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V (A). PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

INTRODUCTION TO BIOINFORMATICS

CODE:19BT/ME/BI45

CREDITS:5

L T P:5 0 0

TOTAL TEACHING HOURS:65

OBJECTIVES OF THE COURSE

- To study the basic concepts of Bioinformatics
- To understand the pattern of sequence similarity
- To learn molecular biology through genomics and proteomic
- To study gene expression systems through *in-silico* studies

COURSE LEARNING OUTCOMES

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

- apply knowledge in surfing biological databases
- carry out similarity searches for DNA/Protein sequences
- predict structures with Molecular modeling
- pursue higher studies and research work in Bioinformatics
- get employment in the Pharmaceutical industries and laboratories

Unit 1 (13 Hours)

Introduction and Databases in Bioinformatics

- 1.1 Introduction, Branches of Bioinformatics
- 1.2 Aim, Scope and Research areas of Bioinformatics
- 1.3 Biological Database Retrieval System – ORF finder, RE base cutter, Pub Chem

Unit 2 (13 Hours)

Biological Sequence Databases

- 2.1 National Center for Biotechnology Information (NCBI): Tools and Databases of NCBI, Nucleotide Database, Protein Database, Gene Expression Database
- 2.2 EMBL Nucleotide Sequence Database (EMBL-Bank): Introduction, Sequence Retrieval, Sequence Submission to EMBL, Sequence analysis tools
- 2.3 DNA Data Bank of Japan (DDBJ): Introduction, Resources at DDBJ, Data Submission at DDBJ
- 2.4 Swiss-Prot and PIR: Introduction and Salient Features.
- 2.5 sequence analysis of nucleic acid/protein data using web-based tools - Practical

Unit 3 (13 Hours)

Sequence Alignment

3.1 Sequence analysis (Proteins and Nucleic acids) – FASTA formatting

3.2 Sequence alignment methods

3.2.1 – Pairwise alignment (Local and Global) – BLAST

3.2.2 – Multiple alignment – CLUSTAL W

3.3 Pairwise and Multiple alignments – Practical

Unit 4 (13 Hours)

Protein structure prediction

4.1 Structural Databases

4.2 Methods for protein structure prediction

4.2.1 – Secondary structure predictions - Chou-Fasman and Garnier-Osguthorpe- Robson (GOR) method

4.2.2 – Tertiary structure predictions – Homology Modelling

4.3 Molecular modelling –RASMOL - Practical

Unit 5 (13 Hours)

Applications of Bioinformatics

5.1 Structural Bioinformatics in Drug Discovery

5.2 Quantitative structure-activity relationship (QSAR) – Test for toxicity evaluation

5.3 Microbial genome applications, Crop improvement

BOOK FOR STUDY

Springer-Verlag, *Basics of Bioinformatics*, Berlin Heidelberg, 2013.

BOOKS FOR REFERENCE

Andreas D Baxevanis, B F Francis Oullette “*Bioinformatics: A practical guide to the analysis of genes and proteins*”. 2nd ed. Wiley publishers, 2005.

Arthur Lesk “*Introduction to Genomics*” 2nd ed. Oxford University Press 2007.

Campbell A. M., Heyer L. J. *Discovering Genomics, Proteomics and Bioinformatics. II Edition*. Benjamin Cummings, 2006.

David Mount “*Bioinformatics: sequence and genome analysis*” 3rd ed. Cold Spring Harbor Laboratory Press, 2004.

Ghosh Z. and Bibekanand M. *Bioinformatics: Principles and Applications*. Oxford University Press, 2008.

Jin Xiong “*Essential Bioinformatics*”, 1st ed. Cambridge University Press, 2006.

Ranganathan, Narain & Kuppaswamy *Biotechnology & Bioinformatics*, Wisdom Press, 2011.

Pevsner, *Bioinformatics and Functional Genomics*, John Wiley publishers, 3rd ed., 2015.

WEBSITES

www.genome.gov/12514286

https://www.youtube.com/watch?v=w-uk-_TOgR_0&list=PLb0W_W0k29_aHrF8aZzK17ORTesZsd-IING

<https://www.youtube.com/watch?v=SAweFv8I8ow&list=PL1ay9ko4A8skYqjhrA4INDZ7IHtebS0IY>

<https://www.youtube.com/watch?v=IQCbNrafCtM>

<https://www.youtube.com/watch?v=cd6O8FbrVjw>

<https://www.youtube.com/watch?v=ZNIQCrCibL8>
www.ncbi.org
www.embl.org

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – Objective questions 9 x 1 = 9 marks
Very Short Answers 3 x 3 = 9 marks (3 out of 4 in 50 words each)

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STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V. A. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

BIOTECHNIQUES

CODE:19BT/ME/BT45

CREDITS:5

L T P:50 0

TOTAL HOURS:65

OBJECTIVES OF THE COURSE

- To provide an understanding of extraction and separation techniques
- To use spectroscopic techniques to understand the structure of phytochemicals
- To determine cell size and morphology using microscopy
- To understand the basic principles of various instrumentation

COURSE LEARNING OUTCOMES

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

- extract and separate phytochemicals using separation techniques
- isolate biomolecules using centrifugation and gel electrophoresis
- characterize and analyse the extracted product
- examine and check the purity of a sample
- separate a substance based on its solubility
- estimate the samples by spectrophotometry

Unit 1 (13 Hours)

Microscopy- Principle, Construction and Application of Light Microscopes

- 1.1 Compound, Stereo, Polarized Light, Phase Contrast, Fluorescence, Differential Interference Contrast, Laser Scanning and Confocal Microscopes
- 1.2 Preparation of Specimen for Light Microscopy: Paraffin Techniques – Fixatives:FAA, Carnoy's ,Dehydration and Infiltration, Embedding and Sectioning (Paraffin Blocks), Staining – Single and Double Stain and Mounting
- 1.3 Micrometry
- 1.4 Microtomes: Rotary , Wood Microtome, Cryotomy, Ultramicrotomy
- 1.5 Maceration, Leaf Clearing

Unit 2 (13 Hours)

Electron Microscopy-Principle, Construction and Working

- 2.1 Preparation of Specimen for Transmission Electron Microscopy (TEM)
 - 2.1.1 Fixatives - Glutaraldehyde and Osmium Tetraoxide
 - 2.1.2 Embedding - Spurr, Epon
 - 2.1.3 Knives - Glass and Diamond
 - 2.1.4 Specimen Support -Grid
 - 2.1.5 Staining - Positive and Negative Staining

2.2 Preparation of Specimen for Scanning Electron Microscope (SEM)

2.2.1 Fixing, Critical Point Drying

2.2.2 Freeze Drying, Freeze Fracture, Freeze Etching

2.2.3 Specimen Coating - Sputter Coating, Shadow Casting

Unit 3 (13 Hours)

Quantitative Techniques

3.1 pH Meter - Construction and Application

3.2 Colorimetry: Beer-Lambert's Law, Single Beam

3.3 Spectrophotometry - UV-Visible Spectroscopy, Basic Principle, Instrumentation, Single and Double Beam Spectrophotometers (Block diagrams only)

3.4 Estimation of Protein using Spectrophotometer (Practical)

Unit 4 (13 Hours)

Separation Techniques

4.1 Chromatography - Principles, Techniques and Application of Thin Layer Chromatography, Column Chromatography, and High Performance Liquid Chromatography

4.2 Electrophoresis: Principles, Techniques and Applications of Agarose, PAGE

4.3 Separation of Proteins and DNA by Electrophoresis (Practical)

Unit 5 (13 Hours)

Centrifugation

5.1 Centrifuge: Principle, Unit of Measurement and Instrumentation

5.2 Types: Bench, Ultracentrifuge, Analytical and Microfuge

5.3 Density Gradient and Differential Centrifugation

5.4 Centrifuge-Isolation of Chloroplast and Mitochondria (Practical)

BOOKS FOR REFERENCE

Herb Schwartz and Andras Guttman. *Separation of DNA by Capillary Electrophoresis*, USA
James P. Landers, *Handbook of Capillary and Microchip Electrophoresis and Associated Microtechniques*, USA: CRC, 2008.

Jensen, W.A. *Botanical Histochemistry*. New Delhi: TataGraw-Hill, 1962.

Karp Gerald, *Cell and Molecular Biology: Concepts and Experiments*. USA: Wiley, 2013.

Landers, James P. *Handbook of Capillary Electrophoresis*. USA: CRC, 1996.

Mendhan, J., *Vogel's Textbook of Quantitative Chemical Analysis*. New Delhi: Pearson 2009.

Sass, J.E. *Botanical Microtechnique*. USA: Ames, 1985.

Skoog, D.A, West, D.M. *Fundamentals of Analytical Chemistry*. Thomson Asia, 2014

Steven E Ruzin. *Plant Microtechnique and Microscopy*. USA: Oxford University, 1999.

Usharani, S. *Analytical Chemistry*. New Delhi: Macmillan, 2006.

WEB RESOURCES

<https://www.britannica.com/science/separation-and-purification>

<http://www.britannica.com/EBchecked/topic/108875/separation-and-purification>

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – Objective questions 9 x 1 = 9 marks
Very Short Answers 3 x 3 = 9 marks (3 out of 4 in 50 words each)

Section B – 2 x 6 = 12 marks (2 out of 3 questions to be answered in 200 words each)

Section C – 1 x 20 = 20 marks (1 out of 2 questions to be answered in 1000 words each)

Other Components: **Total Marks: 50**

Seminars/Quiz/Assignments etc. (any 2)

End Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A – Objective questions 18 x 1 = 18 marks

Choose the correct answer 5 x 1 = 5 marks

Fill in the blanks 5 x 1 = 5 marks

Match the following 5 x 1 = 5 marks

True or False 3 x 1 = 3 marks

Very Short Answers 6 x 3 = 18 marks (6 out of 9 in 50 words each)

Section B – 4 x 6 = 24 marks (4 out of 6 questions to be answered in 200 words each)

Section C – 2 x 20 = 40 marks (2 out of 4 questions to be answered in 1000 words each)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086.

**General Elective Course Offered by the department of Botany
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SYLLABUS

(Effective from the academic year 2019–2020)

HERBAL THERAPY

CODE:19BT/GE/HT22

CREDITS:2

L T P:2 0 0

TOTAL HOURS:26

OBJECTIVES OF THE COURSE

- To create an awareness on the understanding of Indian Systems of Medicine
- To discover the importance of plants
- To identify some local herbal plants and their parts as medicine

COURSE LEARNING OUTCOMES

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

- understand the basic principles of Indian Systems of Medicine
- recognize the importance of herbs as medicinal plants and their usage in common ailments
- prepare some Ayurvedic and Siddha medicines for some common ailments

Unit 1 (9 Hours)

Indian Systems of Medicine

- 1.1 Introduction: Ayurveda, Siddha and Unani
- 1.2 Basic Principles of Ayurveda: Panchamahabhutas, Tridhosha Concept and Malas
- 1.3 Preparation of Ayurvedic and Siddha Medicine
Ayurveda: Svarasa (Juice); Churna (Powder);Kalka (Paste); Kashaya (Decoction and Infusion) and Bhasma
Siddha: Lavanam, Pashanam, Loham, Rasam and Gandhakam

Unit 2 (8 Hours)

Herbs and Therapeutics

- 2.1 Herbal remedies for some common ailments: Diarrhoea, Ulcer, Cold, Asthma, Fever, Hypertension, Jaundice, Chickenpox, Diabetes, Menstrual Disorders,
- 2.2 General Health Tonics and Salads
- 2.3 Preparations of Ayurvedic Medicines: Churnam, Decoction, Leghyam, Tailam and Skin Cream (Practical)

Unit 3 (9 Hours)

Skin and Hair care

- 3.1 Role of Dhatu in physical beauty
- 3.2 Herbal Care for Facial Skin - Herbal Face Pack for Dry, Oily and Normal Skin:

- Herbal Remedy for Pimples, Acnes, Black Heads, Corns, Warts and Boils
 3.3 Herbal Remedy for Dandruff, Premature Greying and Loss of Hair: Hair Washes
 and Herbal Hair Tonics
 3.4 Demonstration of Facial and Hair Care

BOOKS FOR REFERENCE

- Dastur, J.F. *Medicinal plants of India and Pakistan*. New Delhi: D.B.Taraporewala, 1988.
 Duke, J.A. *Handbook on Medicinal Herbs*. London: CRC, 2002
 Dananjay J Deshpande., *Handbook of Medicinal Herbs.*, Jodhpur: Agrobios, 2010.
 Hans, R.H. *Ayurveda the Gentle Health System*. New Delhi: Motilal Banarsidass, 1994.
 Jaibala,S. and G. Balakrishnan. *A Hand Book of Common Remedies Based on Siddha System of Indian Medicine*. St. Louis Institute, 1994.
 Judith H.Morrison. *The Book of Ayurveda, A guide to personal wellbeing*. London:Gaia Books, 1994.
 Kapoor, L.D. *Handbook of Ayurvedic Medicinal Plants*. India: CRC, 2001.
 Prajapati, N.D. and S.S.Purohit. *Agro's Color Atlas of Medicinal Plants*. Jodhpur: Agrobios, 2006
 Reddy, K.J, B.Bahadur, B.Bhadriah and M.L.N.Rao. *Advances in Medicinal Plants*. New Delhi: Universities, 2007
 Saha, N.N. *Herbal Remedies*. New Delhi: Universal, 1981.

PATTERN OF ASSESSMENT

Continuous Assessment Test:	Total Marks: 25	Duration: 1 Hour
Section A – Objective questions	15 x 1 = 15 marks	
Choose the correct answer	5 x 1 = 5 marks	
Match the following	5 x 1 = 5 marks	
True or False	5 x 1 = 5 marks	

Section B – 2 x 5 = 10 marks (2 out of 4 questions to be answered in 200 words each)

Other Components:	Total Marks: 25
Individual - 15 marks	
Group work – 10 marks	

No End Semester Examination

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

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SYLLABUS

(Effective from the academic year 2019–2020)

FRUIT PRESERVATION - ONLINE

CODE:19BT/GE/FP22

CREDITS:2

L T P:2 0 0

TOTAL HOURS:26

OBJECTIVES OF THE COURSE

- To minimize spoilage of fruits and vegetables
- To train students in the preparation and preservation of different fruit products
- To make students to develop a scientific bent of mind

COURSE LEARNING OUTCOMES

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

- gain knowledge on the preservation of fruits and vegetables
- acquire practical skills in the preparation of food products
- understand the causes and types of spoilage
- learn the scientific way of preparing food products

Unit 1

Introduction

(4 Hours)

- 1.1 Principles of Fruit Preservation
- 1.2 Types of Spoilage
- 1.3 Factors Promoting Spoilage

Unit 2

Methods and Techniques of Fruit Preservation

(10 Hours)

- 2.1 Methods: Refrigeration, Freezing, Canning, Dehydration and Chemical Preservatives
- 2.2 Techniques: Proportion of Ingredients, Selection of Fruits, Estimation Tests, Filling and Bottling of Products and Precautions

Unit 3

Preparation of products preserved in sugar and salt

(12 Hours)

- 3.1 Sugar: Lime Syrup, Grape Crush, Orange Squash, Mixed Fruit Jam, Guava Jelly,
- 3.2 Salt: Tomato Chutney and Mixed Vegetable Pickle

BOOK FOR STUDY

Roday Sunethra, *Food Science and Nutrition*, 3rd ed, Oxford University Press, 2018.

BOOKS FOR REFERENCE

- Blank, F.C. *Handbook of Food and Nutrition*. Jodhpur: Agrobios, 2000.
- Frazier, W.C. and D. C. West Hoff., *Food Microbiology*. 5th ed. New Delhi: T McGraw Hill, 2013.
- Kulshrestha, S. K. *Food Preservation*. New Delhi: Vikas, 1994.
- .Ray Bibek and Bhunia Arun, *Fundamental Food Microbiology*, 5th ed, T & F, India, 2018
- Scenetra, R. *Food Science and Nutrition*. Oxford University, 1997.
- Swaminathan, M. *Handbook of Food Science and Experimental Foods*. Bangalore: 1992.

PATTERN OF ASSESSMENT

No End Semester Examination Total marks: 50

No. of Assignments – 8 (MCQs, Fill ups and One word answers) = 30 marks

Best 6 of 8 assignments to be considered

Video uploading (2 modules) = 20 marks

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SYLLABUS

(Effective from the academic year 2019–2020)

FUNDAMENTALS OF HORTICULTURE

CODE:19BT/GE/FH22

CREDITS:2

L T P:2 0 0

TOTAL TEACHING HOURS:26

OBJECTIVES OF THE COURSE

- To enable students to be self-reliant and to develop their entrepreneurial skills
- To enhance practical skills through experiential learning
- To understand the various divisions of Horticulture

COURSE LEARNING OUTCOMES

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

- develop interest towards gardening
- initiate and develop their own nursery
- become an Entrepreneur

Unit 1

Introduction and Plant Propagation

(10 Hours)

- 1.1 Introduction: Divisions of Horticulture
- 1.2 Few famous Gardens in India
- 1.3 Types of Gardens: Indoor, Public and Kitchen Garden
- 1.4 Pot cultures: Selection of Pots, Potting, Repotting and Potting Mixtures
Demonstration: Potting
- 1.5 Vegetative Propagation: Layering, Cutting, Grafting
- 1.6 Layering, Cutting, Grafting (Demonstration)

Unit 2

Lawn and Landscaping

(8 Hours)

- 2.1 Lawn and Lawn Making
- 2.2 Garden adornments
- 2.3 Principle and components of landscaping

Unit 3

Commercial Floriculture

(8 Hours)

- 3.1 Cut Flowers, Importance and Methods to Prolong Vase Life
- 3.2 Flower Arrangement - Fresh and Dry
- 3.3 Flower Arrangement - Fresh and Dry (Practical)

BOOK FOR STUDY

Kumar, N. *Introduction to Horticulture*. Nagercoil: Rohini, 1980.

BOOKS FOR REFERENCE

Acquaah, George. *Horticulture Principles and practices*, (4th ed.). London: PHI, 2009.

Chauhan, D.V.S. *Vegetable Production in India*. Agra: Ram Prasad, 1968.

Edmund, J.B., T.L.Senn, F.S.Andrews and R.G.Halfacre, *Fundamentals of Horticulture*, (4th ed.). London: Tata McGraw Hill, 1994.

Iyengar, Gopalswamy. K.S. *Complete Gardening in India*. Bangalore: Kalyan, 1970.

Janick, J. *Horticultural Science*, (3rd ed.). New Delhi: Surgeet, 1962.

Naik, K.C. *South Indian Fruits and their Culture*. Madras: P.Varadharaj, 1968

Randhawa, G.S. *Ornamental Horticulture in India, Today and Tomorrow*. New Delhi: Indian Council of Agricultural Research, 1980.

Sheela, V. L. *Horticulture*, Chennai: MJP, 2011.

Syamal, M.M. *Commercial Floriculture*. Delhi: 2014.

Saini R.S. *Laboratory Manual of Analytical Techniques in Horticulture*. Jodhpur: Agrobios. 2012.

Yawalkar, K.S. *Vegetable Crops of India*. Nagpur: Agri –Horticultural, 1961.

PATTERN OF ASSESSMENT

Continuous Assessment Test: Total Marks: 25 Duration: 1 Hour

Section A – Objective questions 15 x 1 = 15 marks

Choose the correct answer 5 x 1 = 5 marks

Match the following 5 x 1 = 5 marks

True or False 5 x 1 = 5 marks

Section B – 2 x 5 = 10 marks (2 out of 4 questions to be answered in 200 words each)

Other Components: Total Marks: 25

Individual - 15 marks

Group work – 10 marks

No End Semester Examination

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086.

**General Elective Course Offered by the department of Botany
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SYLLABUS

(Effective from the academic year 2019–2020)

WASTE MANAGEMENT

CODE:19BT/GE/WM22

CREDITS:2

L T P:2 0 0

TOTAL TEACHING HOURS:26

OBJECTIVES OF THE COURSE

- To monitor water quality
- To reduce, recycle and reuse wastes
- To protect the environment from pollution

COURSE LEARNING OUTCOMES

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

- identify and classify different types of waste
- study the management of solid and liquid wastes
- adopt waste minimization and pollution prevention techniques

Unit 1 (9 Hours)

Recycling of Wastes

- 1.1 Wastes: Solid and Liquid Wastes
- 1.2 Segregation of waste at source
- 1.3 Waste Generation and Sources - Municipal, Kitchen, Garden, Agricultural, Industrial and e-waste
- 1.4 Composting and Vermicomposting

Unit 2 (9 Hours)

Sewage Disposal

- 2.1 Primary Treatment
- 2.2 Secondary Treatment: Aerobic - Septic Tanks, Trickling Filters and Oxidation Pond; Anaerobic - Sludge Digestion
- 2.3 Tertiary Treatment - Chemical, Ozone and Reverse Osmosis

Unit 3 (8 Hours)

Water Quality and Water Purification

- 3.1 Tests for Water Purity - Coliform Test
- 3.2 Water Treatment - Steps involved in Water Treatment in typical Water Purification Plant

BOOK FOR STUDY

Purohit, S.S. *A Textbook of Environmental Sciences*, Student ed, 2009.

BOOKS FOR REFERENCE

Gupta, P.K. *Vermicomposting for Sustainable Agriculture*. India: Agrobios. 2004.
Grace, G. and D. Martin, *The Rodale Book of Composting*. Kindle ed, 2018.
Ismail, S.A. *The Earthworm*. Goa: Other India, 2005.
Kumar, H.D. *Environmental Pollution*. M.D, 2004.
NIIR Board. *Modern Technology of Waste Management*, Asia Pacific, 2004.
Rachel, M.A. *Analysis of Waste Water for use in Agriculture*, WHO, 1996.
Sathe, T.V. *Vermiculture and Organic Farming*. Daya, 2004.
Panda S.C., *Principles and Practices of Water Management*. Agrobios, 2011.
Patwardhan, A.D., *Industrial Waste Water Treatment*. 12th edn, 2017.

PATTERN OF ASSESSMENT

Continuous Assessment Test:	Total Marks: 25	Duration: 1 Hour
Section A – Objective questions	15 x 1 = 15 marks	
Choose the correct answer	5 x 1 = 5 marks	
Match the following	5 x 1 = 5 marks	
True or False	5 x 1 = 5 marks	

Section B – 2 x 5 = 10 marks (2 out of 4 questions to be answered in 200 words each)

Other Components:	Total Marks: 25
Individual - 15 marks	
Group work – 10 marks	

No End Semester Examination

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086.

**General Elective Course Offered by the department of Botany
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SYLLABUS

(Effective from the academic year 2019–2020)

FLORICULTURE

CODE:19BT/GE/FR22

CREDITS:2

L T P:2 0 0

TOTAL HOURS:26

OBJECTIVES OF THE COURSE

- To introduce the basics of floriculture as an art for business
- To understand the various techniques and methods in flower propagation
- To develop their practical and entrepreneurial skills

COURSE LEARNING OUTCOMES

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

- understand floriculture as an art of business
- enrich their knowledge on different techniques involved in flower arrangement
- develop their own nursery

Unit 1 (8 Hours)

Basics of Floriculture

- 1.1 Introduction: Aim and scope of Floriculture
- 1.2 Manures, Fertilizers, Biofertilizers, Vermicompost and Growth Regulators
- 1.3 Techniques of Growing Plants – Potting and Repotting (Theory and Practical);
Types of Pots and Hanging Baskets
- 1.4 Preparation of Herbal Solutions and Application of Sprays and Dusts to check
Pest attack

Unit 2 (9 Hours)

Vegetative Propagation and Commercial Floriculture I

- 2.1 Vegetative Propagation Methods: Cutting and Layering (Theory and Practical)
- 2.2 Green House-Control of Temperature, Humidity and Light in Covered Structures
- 2.3 Commercial uses of cut flowers and greens - Rose, Carnation, Gladiolus, Aster,
Dianthus and Celosia, Ferns, Palms, Cycads and Thuja
- 2.4 Propagation, Harvesting and Marketing of Rose, Carnation, Chrysanthemum
and Jasmine

Unit 3 (9 Hours)

Commercial Floriculture II

- 3.1 Flower Arrangement – Fresh and Dry (Theory and Practical)
- 3.2 Preparation of Flowers for Display in Flower Shows, Garland, Hair Pieces,
Bouquets

3.3 Holding of Cut Flowers-Harvesting, Conditioning and Storage of Cut Flowers and Methods to Prolong Vase- Life

BOOK FOR STUDY

Sheela, V. L. *Horticulture*, Chennai: MJP, 2011.

BOOKS FOR REFERENCE

Bhattacharyya and Purohit. *Organic Farming Biocontrol and Biopesticide Technology*. India: Agrobios ,2012.

Bose. T.R and Yadev, L.P. *Commercial Flowers*. Calcutta: Naya Prakash, 1989.

Bose, T. K. Maiti R.G., Dhua, R.S and Das,F., *Floriculture and Landscaping*, Calcutta: Naya Prakash, 1999.

Gopalswamy Iyengar, K. S., *Complete Gardening in India*. Bangalore Kalyan, 1970.

John Lindley, *Theory of Horticulture*. Facsimile Pulisher, 2018.

Kumar,N., *Introduction to Horticulture*. Nagercoil: Rohini, 1980.

Lauria, A. and Ries.V.H., *Floriculture, Fundamentals and Practices*. Jodhpur: Agrobios, 2001.

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 25** **Duration: 1 Hour**

Section A – Objective questions 15 x 1 = 15 marks

Choose the correct answer 5 x 1 = 5 marks

Match the following 5 x 1 = 5 marks

True or False 5 x 1 = 5 marks

Section B – 2 x 5 = 10 marks (2 out of 4 questions to be answered in 200 words each)

Other Components: **Total Marks: 25**

Individual - 15 marks

Group work – 10 marks

No End Semester Examination

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V. A. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

AGRICULTURE

CODE:19BT/UI/AR23

CREDITS:3

OBJECTIVES OF THE COURSE

- To enable students to learn about the agricultural practices in India
- To understand the economic importance of farm crops
- To familiarize students with the modern methods of farming

COURSE LEARNING OUTCOMES

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

- gain knowledge on fertilizers, weeds and water resources
- identify different types of soils
- acquire a deeper understanding of farm crops
- learn a variety of methods for pest control
- understand the local cropping patterns
- become familiar with the water resources of Tamil Nadu

Unit 1

Modern Trends in Agriculture

- 1.1 Precision Agriculture
- 1.2 Vertical Farming Techniques-Hydroponics and Aeroponics
- 1.3 Hybrid Seed Technology

Unit 2

Fertilizers and its Uses

- 2.1 Organic Fertilizers - Farm Yard Manure and Biofertilizers
- 2.2 Inorganic Fertilizers – Nitrogenous, Phosphatic, Potassic
- 2.3 Residual Effects of Fertilizers

Unit 3

Weed and Pest Control

- 3.1 Weed Control: Mechanical, Biological and Chemical
- 3.2 Integrated Pest Management
- 3.3 Transgenic Plants for Crop Improvement: Herbicide Resistance, Insect Resistance, Resistance against Viral, Bacterial and Fungal Pathogens

Unit 4

Water Resources and Cropping Patterns

- 4.1 Water resources of Tamil Nadu (Rivers, Dams and Monsoons)
- 4.2 Cropping patterns of Tamil Nadu: Multiple cropping, Relay cropping, Intercropping, Mixed cropping and Multi-Tier cropping
- 4.3 Classification of Soils in India

Unit 5

Farm Crops: Economic Importance

- 5.1 Cereals: Rice and Wheat
- 5.2 Pulses: Blackgram and Pigeon Pea
- 5.3 Oil Seeds: Groundnut and Sunflower Seed
- 5.4 Sugar crops: Sugar Cane
- 5.5 Vegetables: Potato and Onion
- 5.6 Spices: Pepper
- 5.7 Fibres: Cotton and Jute
- 5.8 Fruits: Mango and Citrus Fruits

BOOK FOR STUDY

Subbiah Mudaliar, V.T. - *Principles of Agronomy*. Bangalore: 1979.

BOOKS FOR REFERENCE

Bhattacharyya.P and Purohit.S.S.*Organic Farming Biocontrol and Biopesticide technology*. India: Agrobios, 2012.

Edmond,J.B; Senn.T.L., Andrews,F.S. and Halfacre, R.G.-*Fundamentals of Horticulture*. New Delhi: Tata McGraw Hill, 1977.

Gosh Roy.M.K. *Green World Green Energy* New Delhi, 2013.

Ochse,J.J.Soule, M.J.;Dijkman,M.J. and Welburg C. – *Tropical and Subtropical Agriculture*, Vol.II. New York: Macmillan, 1961.

Purohit,S.S. and S.K.Mathur. *Biotechnology- Fundamentals and Applications*(3rd ed.) Jodhpur: Agrobios, 2000.

Shrivastava A.K. *Agriculture Science and Technology*, Agrotech., 2013.

Sushil Kumar. *Plant Breeding and Genetics*. Book Enclave, 2016

Wrigley Gordon, *Tropical Agriculture – The Development and Production*. ELBS,1998.

PATTERN OF ASSESSMENT

End Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A – 10 X 3 = 30 marks (10 out of 13 questions to be answered in 50 words each)

Section B – 5x 6 = 30 marks (5 out of 8 questions to be answered in 200 words each)

Section C – 2 x 20 = 40 marks (2 out of 4 questions to be answered in 1000 words each)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086.

B.Sc. DEGREE: BRANCH V. A. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2019–2020)

FORESTRY

CODE:19BT/UI/FR23

CREDITS:3

OBJECTIVES OF THE COURSE

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

COURSE LEARNING OUTCOMES

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

- gain knowledge on the different types of forests and their distribution
- understand the concepts of protection, commercial and social forestry
- become familiar with national sanctuaries, parks and biospheres
- discover the variety of non-wood forest products
- determine the causes and consequences of deforestation
- appreciate peoples power in conservation of forests

Unit 1

Forest Types

- 1.1 Major Forest types in India with special reference to Tamil Nadu
- 1.2 Forest Ecosystem
- 1.3 Forests as Centers of Biodiversity
- 1.4 Biodiversity Hotspots

Unit 2

Protection Forestry

- 2.1 Conservation- *in-situ* and *ex-situ*
- 2.2 National Forest Policy, Forest Conservation Act
- 2.3 National Sanctuaries, National Parks and Biosphere Reserves
- 2.4 Role of People: Chipko Movement, Saalumarada Thimmakka and Hugo Wood

Unit 3

Commercial Forestry

- 3.1 Forests as Sources of Timber
- 3.2 Nonwood Forest Products: fodder, food, oil, fiber, paper and medicine

Unit 4

Social Forestry

- 4.1 Agroforestry- Afforestation and Reforestation Programmes
- 4.2 Ecological Benefits

- 4.3 Deforestation: Causes and Consequences
- 4.4 Plantation Forestry

Unit 5

Silviculture

- 5.1 Artificial and Natural Regeneration of some important Forest Plants: Teak and Casuarina
- 5.2 Forest Education and Management

BOOKS FOR REFERENCE:

- Bruce Alan. *Forest products biotechnology*. Taylor & Francois. 2005.
- Bridger Blackeney., *Handbook of Forestry*. Agrotech., 2013.
- Kumar, U and Asija M.J. *Biodiversity Principles and Conservation*.,India: Agrobios, 2011.
- Manikandan K, Prabhu S, *Indian Forestry A Breakthrough Approach To Forest Services*, Jain Brothers, 2018
- Pathak, P.S, Ram Newaj. *Agroforestry: Potentials and Opportunities*. India Agrobios, 2012.
- Powell, Baden B.H. *Manual of Forest Law*. New Delhi:Biotech, 2004.
- Uthappa AR, Sangram Bhanudas Chavan, *Competitive Forestry*, New Vishal Publications, 1st ed. 2015
- Vyas, G. P. D. *Community Forestry*. Jodhpur: Agrobios, 2006.

PATTERN OF ASSESSMENT

End Semester Examination:
hours

Total Marks: 100

Duration: 3

Section A – 10 X 3 = 30 marks (10 out of 13 questions to be answered in 50 words each)

Section B – 5x 6 = 30 marks (5 out of 8 questions to be answered in 200 words each)

Section C – 2 x 20 = 40 marks (2 out of 4 questions to be answered in 1000 words each)