

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

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

SYLLABUS

(Effective from the academic year 2015 – 2016)

ALGAE, FUNGI AND LICHENS

CODE: 15BT/MC/AF14

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVES

- To enable students to understand the diverse assemblage of lower plants
- To understand the life cycle patterns of lower plants

ALGAE

Unit 1 (6 hrs.)

- 1.1 Classification of Algae (Bold and Wynne, 1978)
- 1.2 Characteristics of Algal Divisions

Unit 2 (20 hrs.)

- Detailed study of the Thallus Organisation, Reproduction and Life Cycle Pattern of the following forms (no development)
- 2.1 Cyanochloronta - *Nostoc*
 - 2.2 Chlorophycophyta - *Volvox*, *Caulerpa* and *Cladophora*
 - 2.3 Charophyta - *Chara*
 - 2.4 Phaeophycophyta - *Sargassum*
 - 2.5 Rhodophycophyta - *Polysiphonia*

FUNGI

Unit 3 (6 hrs.)

- 3.1 Classification of Fungi (Alexopoulos and Mims, 1979)
- 3.2 Characteristics of major Fungal classes

Unit 4 (15 hrs.)

- Detailed Study of the Thallus Organisation, Reproduction and Life Cycle Pattern of the following forms (no development)
- 4.1 Chytridiomycetes - *Synchytrium*
 - 4.2 Plasmodiophoromycetes - *Plasmodiophora*
 - 4.3 Oomycetes - *Albugo*
 - 4.4 Ascomycetes - *Peziza*
 - 4.5 Basidiomycetes - *Puccinia*
 - 4.6 Deuteromycetes - *Cercospora*

LICHENS

Unit 5

(5 hrs.)

5.1 Lichens: Types: Foliose, Crustose and Fruticose, Structure, Reproduction, Ecological and Economic importance

TEXT BOOKS

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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins

Section A – Objective questions 9 x 1 = 9 marks
Short paragraphs 3 x 3 = 9 marks (3 out of 4)

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)

Third Component:

List of evaluation modes:

Seminars

Quiz

Assignments

End Semester Examination

Total Marks: 100

Duration: 3 hours

Section A – Objective questions 18 x 1 = 18 marks
Short paragraphs 6 x 3 = 18 marks (6 out of 9)

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 2015 – 2016)

PRINCIPLES OF APPLIED BIOTECHNOLOGY

CODE: 15BT/MC/PB14

CREDITS: 4

L T P: 4 0 0

TOTAL HOURS: 52

OBJECTIVES

- To understand the applied aspects of Biotechnology
- To study the fundamental principles and applications of biotechnology in food, health care, and energy

Unit 1

Introduction

(5 hrs.)

- 1.1 Introduction and Scope of Biotechnology
- 1.2 Mass cultivation, Nutraceutical and Pharmaceutical Applications of SCP (*Spirulina*)
- 1.3 Algal Biofertilizers

Unit 2

Mushroom Cultivation

(10 hrs.)

- 2.1 Mushrooms: Morphology, Types - *Pleurotus sp.*, *Agaricus sp.* and *Volvariella sp.*
- 2.2 Identification of edible and poisonous mushrooms, Nutritive value
- 2.3 Cultivation – *Pleurotus sp.* and *Agaricus sp.* -Isolation, Spawn Production, Growth Media, Spawn running, Harvest and Uses

Unit 3

Dairy Technology

(15 hrs.)

- 3.1 Cheese: Principles of Cheese making, Milk, Starter Culture, Coagulant, Knitting of Curds, Salting, Pressing and Ripening
- 3.2 Types of Cheese: Cheddar, Camembert and Roquefort
- 3.3 Yoghurt Manufacture
- 3.4 Demonstration on yoghurt preparation

Unit 4

Bakery

(7 hrs.)

- 4.1 Bread production
- 4.2 Forms and Functions of Yeast in Bread Making
- 4.3 Estimation of Rate of Fermentation Using Yeast (Practicals)

Unit 5

(15 hrs.)

Fermentation Technology

5.1 Media and Equipment

5.2 Antibiotics: Penicillin - Strain Selection, Media, Fermentation, Harvest, Recovery and Uses

5.3 Organic acid: Citric acid - Production, Recovery and Industrial applications

5.4 Demonstration on Citric Acid Production

Field Visits and Workshops

- Visit to Nallayan Research Centre (Mass Cultivation and Microscopic Studies of *Spirulina*)
- Workshop on Mushroom Cultivation
- Visit to Modern Bakery

BOOKS FOR REFERENCE

Dhawan, V. *Biotechnology for Food and Nutritional Security*. India: TERI, 2004.

Dubey, R.C. *A Text book of Biotechnology*. New Delhi: S.Chand, 1993.

Ignacimuthu, S. *Basic Biotechnology*. New Delhi: Tata-McGraw, Hill, 1996.

Ignacimuthu, S.J. *Biotechnology –An Introduction*. New Delhi: Narosa, 2012.

Kumar, H.D. *A Text book of Biotechnology*. New Delhi: East West, 1993.

Kamal Nayan Joshi. *Biotechnology*. Manglam, Delhi.2013.

Patel, A.H. *Industrial Microbiology*. New Delhi: Macmillan, 1999.

Prescott and Dunn. *Industrial Microbiology*. USA: The AVI, 1987.

Srivastava H.S. *An Introduction to Biotechnology*. Meerut: Rastogi, 2001.

Trehan, K. *Biotechnology*. New Delhi: Wiley, 1991.

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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

Section A – Objective questions 9 x 1 = 9 marks
Short Paragraphs 3 x 3 = 9 marks (3 out of 4)

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)

Third Component:

List of evaluation modes:

Seminars

Quiz

Assignments

End Semester Examination

Total Marks: 100

Duration: 3 hours

Section A – Objective questions 18 x 1 = 18 marks
Short Paragraphs 6 x 3 = 18 marks (6 out of 9)

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 2015 – 2016)

ALGAE, FUNGI AND LICHENS - PRACTICAL

CODE: 15BT/MC/P112

CREDITS: 2

L T P: 0 0 3

TOTAL HOURS: 39

ALGAE

Study of the forms mentioned in the theory syllabus

Visit to places of Phycological importance - Kovalam

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

FUNGI

Study of the forms mentioned in the theory syllabus

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

Visit to Rice Research Station, Chevapet, Thirur

LICHENS

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

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Two Tests each of 90 mins. duration (2 X 20 = 40 Marks)

Record

10 Marks

End Semester Examination

Duration: 3 hrs

Marks: 50

- | | |
|--|------------|
| 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 (Division, Class, Genus and Morphology) | 10 |
| 5. Herbarium (Algae – 3, fungi – 2) | |

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086
Allied Core Offered to Students of B.Sc Advanced Zoology and Biotechnology

SYLLABUS
(Effective from the academic year 2015 – 2016)

GENERAL BOTANY – I

CODE: 15BT/AC/GB14

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVES

- To learn the characteristic features of a few botanical families and to know their economic importance
- To understand the structural details of the lower groups in the plant kingdom

Unit 1 (17 hrs.)

Taxonomy

- 1.1 A general outline of Bentham and Hooker's Classification
- 1.2 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. Arecaceae

Unit 2 (7 hrs.)

Anatomy

- 2.1 Primary Structure of Dicot Stem and Root
- 2.2 Secondary Growth in Typical Dicot Stem and Root
- 2.3 Leaf: Isobilateral and Dorsiventral

Unit 3 (10 hrs.)

Algology

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

Unit 4 (10 hrs.)

Mycology

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

Unit 5**(8 hrs.)****Plant Pathology**

5.1 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

TEXT BOOK

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

BOOKS FOR REFERENCE

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

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.

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.

Singh, V., Pande P.C and Jain D.K: *Anatomy of Seed Plants*. India: Rastogi, 1996.

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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

Section A – Objective questions 9 x 1 = 9 marks
Short Paragraphs 3 x 3 = 9 marks (3 out of 4)

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)

Third Component:

List of evaluation modes:

Seminars

Quiz

Assignments

End Semester Examination

Total Marks: 100

Duration: 3 hours

Section A – Objective questions 18 x 1 = 18 marks
Short Paragraphs 6 x 3 = 18 marks (6 out of 9)

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

Allied Core Offered Students of Advanced Zoology and Biotechnology

SYLLABUS

(Effective from the academic year 2015 – 2016)

GENERAL BOTANY - I – PRACTICAL

CODE: 15 BT/AC/P111

CREDITS: 1

L T P: 0 0 2

TOTAL HOURS: 26

TAXONOMY

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

ANATOMY

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

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

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Two Tests each of 90 mins. duration (2 X 20 = 40 Marks)

Record

10 Marks

End Semester Examination

Duration: 3 hrs

Marks: 50

1. Taxonomy – Description (1)	10
2. Anatomy – Sectioning & Identification (1)	10
3. Spotters (5) – 5 x 5	25
4. Pathology specimen	5

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

SYLLABUS

(Effective from the academic year 2015 – 2016)

BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS

CODE: 15BT/MC/BP24

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVES

- To learn the classification, structure, organization, reproduction and life cycles of lower vascular plants
- To study the primitive and advanced features of living and fossil forms

Unit 1 (10 hrs.)

Classification and Characteristics

- 1.1 Classification of Bryophyta (Proskauer, 1957) and Characteristic Features of following classes: Hepaticopsida, Anthocerotopsida, Bryopsida
- 1.2 Classification of Pteridophyta (Reimers, 1951) and Characteristic Features of the following classes: Lycopsida, Sphenopsida and Pteropsida
- 1.3 Classification of Gymnospermae (Bierhorst, 1971) and Characteristic Features of the following classes: Cycadopsida and Gnetopsida

Unit 2 (12 hrs.)

Bryophytes

- 2.1 A Detailed Study of the Thallus Structure, Anatomy and Reproduction of the following (no development): Hepaticopsida – *Porella*, Anthocerotopsida – *Anthoceros*, Bryopsida - *Polytrichum*

Unit 3 (12 hrs.)

Pteridophytes

- 3.1 A Detailed Study of the Plant Body, Anatomy and Reproduction of the following: (no development): Lycopsida – *Lycopodium*, Sphenopsida – *Equisetum*, Filices - *Marsilea*

Unit 4 (11 hrs.)

Gymnosperms

- 4.1 A Detailed Study of the Plant Body, Anatomy and Reproduction of the following (no development): Cycadopsida – *Cycas* and Gnetopsida – *Gnetum*

Unit 5

(7 hrs.)

Fossils

5.1 Table of the Geological Time Scale

5.2 Process of Fossilization

5.3. Fossil forms - Pteridophyta: *Lepidodendron*, *Stigmaria*,
Lepidostrobus and *Lepidocarpon*
Gymnosperms: *Williamsonia*

TEXT BOOK

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, 1967.

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.

Sporne, K.R., *Morphology of Pteridophytes*, B.I, 1976.

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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

Section A – Objective questions 9 x 1 = 9 marks
Short Paragraphs 3 x 3 = 9 marks (3 out of 4)

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)

Third Component:

List of evaluation modes:

Quiz

Assignments

End Semester Examination

Total Marks: 100

Duration: 3 hours

Section A – Objective questions 18 x 1 = 18 marks
Short Paragraphs 6 x 3 = 18 marks (6 out of 9)

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 2015 – 2016)

BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS - PRACTICAL

CODE: 15BT/MC/P221

CREDITS: 1

L T P: 0 0 2

TOTAL HOURS: 26

BRYOPHYTES

- 1 Porella
- 2 Anthoceros (slides only)
- 3 Polytrichum (slides only)

PTERIDOPHYTES

- 1 Lycopodium
- 2 Equisetum (slides only)
- 3 Marsilea

GYMNOSPERMS

- 1 Cycas
- 2 Gnetum (slides only)

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Two Tests each of 90 mins. duration (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

Allied Core Offered to Students of Advanced Zoology and Biotechnology

SYLLABUS

(Effective from the academic year 2015 – 2016)

GENERAL BOTANY – II

CODE: 15 BT/AC/GB24

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVES

- To enable students to understand the physiological activities occurring in plants
- To study the structure, organization, reproduction and life cycle of lower plants

Unit 1 (16 hrs.)

Bryophyta , Pteridophyta and Gymnospermas

- 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 *Adiantum*
- 1.4 A Detailed Study of the Life-Cycle (no development) of *Cycas*

Unit 2 (12hrs.)

Physiology - I

- 1.1 Photosynthesis - Light Reaction: Red Drop, Emerson Enhancement Effect, Pigment System I and II, Phosphorescence, Fluorescence, Cyclic and Non Cyclic Photo Phosphorylation. Dark Reaction: C3 and C4
- 1.2 Respiration – Aerobic: Glycolysis, Krebs Cycle, Organization of the Respiratory Chain, Electron Transport Pathway and Oxidative Phosphorylation. Anaerobic Fermentation

Unit 3 (8 hrs.)

Physiology - II

- 3.1 Plant Growth Regulators - Auxins, Gibberellins, Cytokinins, ABA and Ethylene-Practical Applications
- 3.2 Photoperiodism – Long and Short Day Plants – Phytochrome, Florigen and Vernalisation

Unit 4 (8 hrs.)

Applied Botany I

- 4.1 Bonsai Technique
- 4.2 Cut Flowers, Importance and Methods to Prolong Vase Life
- 4.3 Flower Arrangement - Fresh and Dry

Unit 5 (8 hrs.)

Applied Botany II

- 5.1 Principles of Plant Tissue Culture
- 5.2 Oyster and Button Mushroom: Cultivation and Marketing

TEXT BOOK

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.

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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

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Third Component:

List of evaluation modes:

Quiz

Assignments

End Semester Examination

Total Marks: 100

Duration: 3 hours

Section A – Objective questions 18 x 1 = 18 marks
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STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

Allied Core Offered to Students of Advanced Zoology and Biotechnology

SYLLABUS

(Effective from the academic year 2015 – 2016)

GENERAL BOTANY –II PRACTICAL

CODE: 15BT/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

PHYSIOLOGY

Physiology Experiments included in the Syllabus – Observation and Interpretation

Rate of Photosynthesis with varying Intensity and Quality of Light

Rate of Respiration using Respiroscope

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Two Tests each of 90 mins. duration (2 X 20 = 40 Marks)

Record 10 Marks

End Semester Examination

Duration: 3hrs

Marks: 50

- | | |
|---|----|
| 1. Pteridophyte and Gymnosperm
Sectioning & Identification, Diagram, Reasons (1) | 20 |
| 2. Individual experiment: Physiology – set up, procedure, tabulation, result | 10 |
| 3. Spotters (5) Identification, Diagram, Reasons 5 x 4 | 20 |

STELLA MARISCOLLEGE (AUTONOMOUS), CHENNAI – 600 086

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

SYLLABUS

(Effective from the academic year 2015 – 2016)

TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY

CODE: 15BT/MC/TE34

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVES

- To understand the vegetative and reproductive features of a few families of angiosperms
- To identify some of the common flowering plants of Tamil Nadu

TAXONOMY OF ANGIOSPERMS

Unit 1 (10 hrs.)

Classification and Plant Morphology

- 1.1 Phenetic (Linnaean, Bentham and Hooker), Phylogenetic (Angiosperm Phylogeny Group III (APG III)) Systems of Classification
- 1.2 Detailed study of Bentham and Hooker's Classification (Merits and Demerits)
- 1.3 Overview of Plant Morphology - Habit, Roots, Stems, Buds, and Leaves
- 1.4 Floral Morphology: Flowers, Floral Diagram and Floral Formulae
- 1.5 Fruit Morphology Fruit Types

Unit 2 (10 hrs.)

Nomenclature and Herbaria

- 2.1 Plant nomenclature: Binomial and Polynomial, Author Citation (ICN)
- 2.2 Herbarium Techniques: Collection, Pressing, Drying, Poisoning, Mounting and Preservation of Plant Specimens
- 2.3 Important Botanical Gardens and some Important Herbaria
 - 2.3.1 Acharya JCB Botanical Garden, Kolkata, Sims Park, Coonoor, TN., Experimental Garden, Yercaud. Kew Gardens, UK
 - 2.3.2 Central National Herbarium (BSI), Coimbatore, Rapinat Herbarium, Trichy, TN

Unit 3 (11 hrs.)

Detailed Study of the Diagnostic Characteristics and Economic Importance of the following:

- 3.1 Polypetalae - Annonaceae, Rutaceae, Fabaceae (including the subfamilies), Cucurbitaceae and Apiaceae

Unit 4 (11 hrs.)

Detailed Study of the Diagnostic Characteristics and Economic Importance of the following:

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

Unit 5 (10 hrs.)

A Brief Study of the Economic Products: Botanical name, Common name, Family, Morphology of the Useful Part and Uses of the following: -

- 5.1 Fibre and Fibre yielding Plants: Cotton, Jute
- 5.2 Tannins and Dyes: *Acacia catechu*, *Caesalpinia sappan*, *Haematoxylum campechianum*
- 5.3 Gums and Resins: Gum Arabic, Resin, Dammar Gum, Guggul, Olibanum
- 5.4 Spices and Condiments: Cumin, Mustard, Turmeric, Cinnamon, Nutmeg,
- 5.5 Bay Leaves, Fenugreek and Asafoetida
- 5.6 Fumitories and Masticatories: Tobacco, Cannabis, Areca Nut and Betel Leaf

TEXT BOOKS

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.

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.

Lawrence, George.H.M., *Taxonomy of Vascular Plants*, New Delhi: Oxford IBH, 1987.

Maiti R K., *Introduction to Modern Economic Botany*. Agrobios, 2009.

Rendle, A.B. *Classification of Flowering Plants*, Vol.I& II. London: Cambridge University, 1980.

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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

Section A – Objective questions 9 x 1 = 9 marks
Short Paragraphs 3 x 3 = 9 marks (3 out of 4)

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)

Third Component:

List of evaluation modes:

Crossword,

Open book test

Quiz

Assignments

End Semester Examination

Total Marks: 100

Duration: 3 hours

Section A – Objective questions 18 x 1 = 18 marks
Short Paragraphs 6 x 3 = 18 marks (6 out of 9)

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 2015 – 2016)

PHYTOTHERAPY AND ETHNOBOTANY

CODE: 15BT/MC/PE34

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVES

- To create an awareness about indigenous medicinal systems and tribal traditional practices
- To learn the therapeutic property of plants through preparation of herbal medicines

Unit 1 (14 hrs.)

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, Poultice: Salves, Compresses, Mouthwash
- 1.3 Adulteration, Detection and Standardization of Herbal Drugs
- 1.4 Validation of Herbal Drugs and Good Manufacturing Practices
- 1.5 Preparation of the following (Practical) Ayurveda / Siddha Medicines for Common Ailments: Infusion and Decoction, Poultice, Salves and Creams, Mouth wash and Herbal Tooth Powder, Tailam, Churnam and Leghyam
- 1.6 Microscopic and Qualitative Analysis of Herbal Drug (Churnam) (Practical)

Unit 2 (18 hrs.)

Organoleptic Study

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

- 2.1 Roots: *Asparagus racemosus*, *Rauwolfia serpentina*
- 2.2 Underground Stem : *Zingiber officinalis*, *Curcuma longa* and *Allium cepa*
- 2.3 Leaves: *Ocimum sp.*, *Tylophora asthmatica*, *Catharanthus roseus* and *Aloe vera*
- 2.4 Flowers: *Hibiscus rosa-sinensis* and *Datura stramonium*
- 2.5 Fruits: *Piper longum*, *Terminalia chebula*, *Myrstica fragrans* and *Emblica officinalis*
- 2.6 Seeds : *Trigonella foenum – graceum* and *Pongamia glabra*
- 2.7 Bark : *Cinnamomun zeylanicum*
- 2.8 Whole Plant : *Azadirachta indica*, *Eclipta alba*, and *Phyllanthus amarus*

Unit 3 (8hrs.)

Ethnobotany

- 3.1 Ethnobotany : Definition and Scope
- 3.2 Methodologies of Ethnobotanical Research: Fieldwork, Literature, Herbaria and Musea
- 3.3 Ethnobotany as a lead to Modern Drug Discovery: Memory plus, Liv 52 Chawanaprash, Pankajakasturi Choornam
- 3.4 Ethnobotanical Studies of Irula Tribes
- 3.5 Bioprospecting and Commercial use of Traditional Knowledge
- 3.6 Traditional knowledge (TK) in relation to Intellectual Property Rights and Biopiracy

Unit 4 (5 hrs.)

Biodiversity

- 4.1 Role of Ethnobotany in Conservation of Biodiversity
- 4.2 Ex situ Conservation & In situ Conservation

Unit 5 (7 hrs.)

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 Facial and Hair Care using Herbal Products(Demonstration)

BOOKS FOR REFERENCE

- 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.

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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

Section A – Objective questions 9 x 1 = 9 marks
Short Paragraphs 3 x 3 = 9 marks (3 out of 4)

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)

Third Component:

List of evaluation modes:

Herbal Medicine preparation and analysis (Histochemical and Microscopic)

Quiz

Assignments

Scrap book and Herbarium of Medicinal plants

End Semester Examination

Total Marks: 100

Duration: 3 hours

Section A – Objective questions 18 x 1 = 18 marks

Short Paragraphs 6 x 3 = 18 marks (6 out of 9)

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 2015 – 2016)

TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY - PRACTICAL

CODE: 15BT/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 classification of the given specimens

Field Trip to Kolapakkam / Sholinganallur

ECONOMIC BOTANY

Economically important products of families mentioned in Units 3-5 of the theory syllabus

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Two Tests each of 90 mins. duration (2 X 20 = 40 Marks)

Record

10 Marks

End Semester Examination:

Total Marks: 50

Duration: 3 Hours

1 Family Identification	2 x 4 = 8
2 Description, Drawing & Dissection	1 x 12 = 12
3 Key Preparation	5
4 Spot at sight	20
5 Herbarium	5

STELLA MARISCOLLEGE (AUTONOMOUS) CHENNAI- 600 086

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

SYLLABUS

ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS

CODE: 15BT/MC/AE44

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVES

- To study the complex tissue organization of plant bodies
- To provide an understanding of reproduction in angiosperms

Unit 1 (10 hrs.)

Meristems

- 1.1 Meristem: Classification, Organization of Shoot Apex and Root Apex
- 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

Unit 2 (10 hrs.)

Vascular Elements

- 2.1 Secondary Xylem: Vessels, Tracheids, Wood Parenchyma and Rays, Sap Wood, Heartwood, Annual Rings, Dendrochronology
- 2.2 Secondary phloem: Sieve Tubes, Companion Cells, Phloem Parenchyma and Fibres

Unit 3 (10 hrs.)

Secondary Growth

- 3.1 Secondary Growth of Normal Dicot Root and Dicot Stem
- 3.2 Anomalous Growth: Primary and Secondary Structures in Dicots
- 3.3 Primary Thickening Meristem in Monocots
- 3.4 Anomalous Secondary Thickening in Monocot Stem - *Dracaena*

Unit 4 (10 hrs.)

Leaf

- 4.1 Leaf - Internal Structure of Dorsiventral, Isobilateral and Centric, Leaf Abscission
- 4.2 Epidermis – Stomata – Structure and Types
- 4.3 Epidermal Hairs and Appendages

Unit 5**(12 hrs.)****Embryology**

5.1 Microsporangium: Microsporogenesis - Male Gametophyte

5.2 Megasporangium: Megasporesogenesis - Female Gametophyte -

Monosporic(*Polygonum*), Bisporic(*Allium*) and Tetrasporic (*Peperomia*)

5.3 Double Fertilization, Apomixis

5.4 Endosperm - Types and Functions; Ruminant Endosperm

5.5 Embryo - Development of Dicot Embryo – *Capsella bursa pastoris*,
Polyembryony**TEXT BOOKS**Bhojwani, S.S and S.P. Bhatnagar. *Embryology of Angiosperms*. New Delhi:Vikas, 1986.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.**PATTERN OF EVALUATION****Continuous Assessment:****Total Marks: 50****Duration: 90 mins.****Section A** – Objective questions 9 x 1 = 9 marks
Short Paragraphs 3 x 3 = 9 marks (3 out of 4)**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)**Third Component:****List of evaluation modes:**

Seminars

Quiz

Assignments

End Semester Examination**Total Marks: 100****Duration: 3 hours****Section A** – Objective questions 18 x 1 = 18 marks
Short Paragraphs 6 x 3 = 18 marks (6 out of 9)**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 2015 – 2016)

ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS - PRACTICAL

CODE: 15BT/MC/P442

CREDITS: 2

L T P: 0 0 3

TOTAL HOURS: 39

PLANT ANATOMY

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 root
Monocot stem
- 2 Secondary structure: Dicot Stem
Dicot Root
- 3 Leaf: Isobilateral - *Nerium*
Dorsiventral - *Grass*
Centric - *Allium*
- 4 Stomatal types: Dicot
- 5 Anomalous Structure:

Primary: *Nyctanthus*
Boerhaavia
Secondary: *Bignonia*
Bougainvillea
Leptadenia
Dracaena
- 6 Nodal Anatomy: Unilacunar, Trilacunar and Multilacunar nodes (diagrammatic sketch only)
- 7 Histochemistry: Methods to identify cellulose, lignin, protein, sugar, starch, lipids, nucleic acids
- 8 Ergastic substances: Druses, Raphides and Cystolith

EMBRYOLOGY

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 EVALUATION

Continuous Assessment:

Total Marks: 50

Two Tests each of 90 mins. duration (2 X 20 = 40 Marks)

Record 10 Marks

End Semester Examination:

Total Marks: 50

Duration: 3 hours

Sectioning, Drawing, Identification with reasons

3 x 8 = 24

Embryo Dissection

6 = 6

Spotters (2 Anatomy, 2 Embryology)

4 x 5 = 20

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

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

SYLLABUS

(Effective from the academic year 2015 – 2016)

CELL AND MOLECULAR BIOLOGY

CODE: 15BT/MC/CM54

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVES

- To provide an overview of the cellular and molecular aspects of the plant cell
- To analyse the structure and function of the cell

Unit 1 (15 hrs.)

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 of the Cell Membrane, 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 (10 hrs.)

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, Giant Chromosomes- Lampbrush, Polytene
- 2.4 Cell Cycle - Mitosis and Meiosis

Unit 3 (7 hrs.)

DNA Replication

- 3.1 Modes of Replication - Conservative and Semiconservative
- 3.2 DNA Replication - Initiation, Replication forks, Leading Strand and Lagging Strand Synthesis; Proteins involved in Replication
- 3.3 DNA Repair: Direct Repair – Photoreactivation

Unit 4 (10 hrs.)

Transcription

- 4.1 Molecular Structure of Three Classes of RNA (mRNA, rRNA, tRNA)
- 4.2 Central Dogma
- 4.3 Transcription of Prokaryotic Genes: Initiation, Elongation and Termination
- 4.4 Processing of Eukaryotic mRNA - Capping, Splicing and Polyadenylation

Unit 5**(10 hrs.)****Translation and Gene Regulation**

- 5.1 Genetic Code - Triplet Codon for Protein Synthesis
- 5.2 Mechanism of Translation - Initiation, Elongation and Termination
- 5.3 Prokaryotic Regulation: Operon Concept – lac operon
- 5.4 Eukaryotic Regulation: Genetic Imprinting

TEXT BOOK

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 DeRobertis. 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.

Polard.F.D.,W.C.Earnshaw and J.L.Schwartz. *Cell Biology*.Philadelphia: Saunders, 2008.

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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

Section A – Objective questions 9 x 1 = 9 marks
Short Paragraphs 3 x 3 = 9 marks (3 out of 4)

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)

Third Component:

List of evaluation modes:

Seminars

Quiz

Assignments

End Semester Examination

Total Marks: 100

Duration: 3 hours

Section A – Objective questions 18 x 1 = 18 marks
Short Paragraphs 6 x 3 = 18 marks (6 out of 9)

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 2015 – 2016)

MICROBIOLOGY

CODE: 15BT/MC/MB54

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVE

- To provide an understanding of microorganisms and their contributions to everyday processes

Unit 1 (4 hrs.)

History of Microbiology

- 1.1 Germ Theory of Disease, Vaccination, Koch's Postulates, Whittaker's Five Kingdom Theory

Unit 2 (14 hrs.)

Bacteria

- 2.1 Classification (Bergey's Manual), Outlines of major groups only
- 2.2 Morphology: Cell Wall, Capsule, Flagella, Fimbriae, Nucleus, Plasmids and Storage Granules
- 2.3 Growth: Growth Curve, Factors Affecting Growth, Nutritional Types and Types of Media
- 2.4 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)
- 2.5 Endospore
- 2.6 Genetic Recombination: Conjugation, Transformation and Transduction

Unit 3 (12 hrs.)

Viruses

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

Unit 4 (12 hrs.)

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 Food Borne Illness: Clostridium and Salmonella
- 4.5 Causal organisms, Symptoms and Control measures of Citrus Canker, Bunchy top of Banana and Little leaf of Brinjal

Unit 5 (10 hrs.)

Microbiology of Water and Air

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

TEXT BOOK

Powar, C.B, and H.F.Daginawala. *General Microbiology* - Vol. II, Mumbai: Himalaya, 1991.

BOOKS FOR REFERENCE

Atlas, R.M. *Microbial Ecology*. India: KalaikathirAchagam, 1998.

Hogg, S. *Essentials Microbiology*. England: John Wiley, 2005.

Joanne M Willey., *Microbiology*. MC Graw- Hill, 2011.

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.

Presscot, L.M., P.H. John and D.A. Klein, *Microbiology*. U.S.A.: W.M. Brown, 2005.

Tortora, G.J, *Microbiology. An Introduction*, California: Benjamin Cummings, 2004.

Volk, A. Wesley, and M.F. Wheeler, *Basic Microbiology*, USA: J.B. Lippincott, 1980.

WEB RESOURCES

www.abou.com/general+microbiology

JOURNALS

Folia Microbiologia

Microbiology

Indian Journal of Microbiology

Plant Microbes Symbiosis: Applied Facetes

International Microbiology

Journal of Industrial Microbiology and Biotechnology

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

Section A – Objective questions 9 x 1 = 9 marks
Short Paragraphs 3 x 3 = 9 marks (3 out of 4)

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)

Third Component:

List of evaluation modes:

Seminar

Group projects

Quiz

Assignments

End Semester Examination

Total Marks: 100

Duration: 3 hours

Section A – Objective questions 18 x 1 = 18 marks
Short Paragraphs 6 x 3 = 18 marks (6 out of 9)

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 2015– 2016)

ECOLOGY AND ENVIRONMENTAL BIOTECHNOLOGY

CODE: 15BT/MC/EE54

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVES

- 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 and remedying toxicity

Unit 1 (10 hrs.)

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, Shanon's Index of General Diversity
- 1.3 Sampling of Population - Quadrat, Transect, Loop and Point method

Unit 2 (10 hrs.)

Environmental Toxicology

- 2.1 Biomagnification
- 2.2 Bioaccumulation
- 2.3 Biotransformation - DDT
- 2.4 Testing methods of Toxicity: Acute and Subacute Tests

Unit 3 (10 hrs.)

Biomonitoring

- 3.1 Biodegradation of PCP using Microbes
- 3.2 Biosensors
- 3.3 Bioleaching
- 3.4 Bioindicators
- 3.5 Phytoremediation

Unit 4 (11 hrs.)

Risk Assessment

- 4.1 Hazard Identification
- 4.2 Dose-Response Assessment
- 4.3 Exposure Assessment
- 4.4 Risk Characterization

Unit 5

General Topics

(11 hrs.)

5.1 Environmental Impact Assessment (EIA) – Screening, Scoping, Impact Assessment, Mitigation, Reporting, Reviewing, Decision-Making and Post- Monitoring

5.2 Environmental Quality Monitoring - .Air, Water and Soil Sampling Methods

TEXT BOOK

Sharma P. D. *Environmental Biology and Toxicology*. India: Rastogi, 2003.

BOOKS FOR REFERENCE

Alan Scragg. *Environmental Biotechnology*. New York: Oxford University, 2007.

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

Deepender, B. *Environment and Ecology*. Jaipur: Printwell, 1996.

Levinton, J.S. *Marine Biology, Function, Biodiversity and Ecology*. New York: Oxford University, 2001.

Ludwig, J.A., *Statistical Ecology*. New York : John Wiley, 1989.

Puri, G.S., *Forest Ecology*. New Delhi. Oxford and IBH, 1996.

Santra, S.C., *Environmental Science*. India: New Central, 2005.

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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

Section A – Objective questions 9 x 1 = 9 marks
Short Paragraphs 3 x 3 = 9 marks (3 out of 4)

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)

Third Component:

List of evaluation modes:

Seminar

Group projects

Quiz

Assignments

End Semester Examination

Total Marks: 100

Duration: 3 hours

Section A – Objective questions 18 x 1 = 18 marks
Short Paragraphs 6 x 3 = 18 marks (6 out of 9)

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 2015 – 2016)

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

CODE: 15BT/MC/P553

CREDITS: 3

L T P: 0 0 6

TOTAL HOURS: 78

CELL AND MOLECULAR BIOLOGY

(26 hrs.)

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

MICROBIOLOGY

(26 hrs.)

- 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
- 3 Preparation of Nutrient Media and Broth
- 4 Isolation of Bacteria and Fungi from Soil on Various Media: Enrichment, Selective and Differential Media
- 5 Gram Staining
- 6 Antimicrobial Property using Antibiotic Discs / Turmeric

Demonstration Experiments:

- 1 Effect of Temperature and pH on Bacterial Growth
- 2 Motility Test
- 3 Tests for Coliform
- 4 Estimation of BOD
- 5 Vermitechnology
- 6 Methylene Blue Reductase Test
- 7 Wine Production and Estimation of Lactic Acid

ECOLOGY AND ENVIRONMENTAL BIOTECHNOLOGY

(26 hrs.)

- 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
 - Mesophyte : any two

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Two Tests each of 90 mins. duration (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

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

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

SYLLABUS

(Effective from the academic year 2015 – 2016)

PLANT PHYSIOLOGY

CODE: 15BT/MC/PP64

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVES

- To study the physiological and biochemical pathways involved in the functioning of the plant
- To understand the practical application in the field of Agriculture and Horticulture

Unit 1 (12 hrs.)

Water Relations in Plants

- 1.1 Water Potential: Definition and Components, Measurement and Relation of Water Potential in an Idealized, Flaccid and Turgid Cell
- 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 hrs.)

Mineral Nutrition

- 1.1 Macronutrients and Micronutrients (Manganese, Zinc, Copper, Molybdenum and Boron)
- 1.2 Mechanism of Mineral Salt Absorption: Theories; Donnan Equilibrium; Carrier Concept and Cytochrome Pump Theory
- 1.3 Transport of Organic Solutes: Phloem Loading and Unloading
- 1.4 Sources of Nitrogen, Biochemistry of Nitrogen Fixation, Nitrate and Nitrite Reduction, Assimilation of Nitrite and Ammonium Ions

Unit 3 (10 hrs.)

Photosynthesis

- 3.1 Principles of Light Absorption by Plants, Photosystem I and II: Composition, Function, Location in Thylakoids and Photophosphorylation Reactions
- 3.2 CO_2 assimilation pathway: C_3 , C_4 cycles and CAM, Photorespiration, Factors influencing Photosynthesis

Unit 4 (10 hrs.)

Respiration

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

Unit 5 (10 hrs.)

Growth and Plant Growth Regulators

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

TEXT BOOKS

Verma. V. *Text Book of Plant Physiology*. New Delhi: Emkay, 1989.

BOOKS FOR REFERENCE

Bidwell, R.G.S. *Plant Physiology*. New York: Macmillan, 1983.

Devlin.R.M. *Plant Physiology*, New Delhi: Affiliated East, 1983.

MalcomWilkins.B. *Advanced Plant Physiology*. England: ELBS/Longman, 1968.

Mukherji, S. and A.K.Ghosh. *Plant Physiology*, 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. 2004.

Sinha,R.K. *Modern Plant Physiology*. New Delhi: Narosa, 2014.

Taiz,L and E.Zeiger.*Plant Physiology*. New Delhi: Panima, 2004.

Weston, G.D. *Crop Physiology – Biotechnology*. London: Butterworth – Heinamann, 1994.

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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

Section A – Objective questions 9 x 1 = 9 marks
Short Paragraphs 3 x 3 = 9 marks (3 out of 4)

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)

Third Component:

List of evaluation modes:

Seminar

Group projects

Quiz

Assignments

End Semester Examination

Total Marks: 100

Duration: 3 hours

Section A – Objective questions 18 x 1 = 18 marks
Short Paragraphs 6 x 3 = 18 marks (6 out of 9)

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 2015 – 2016)

PLANT BIOTECHNOLOGY AND GENETIC ENGINEERING

CODE: 15BT/MC/PG64

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVE

- To study the fundamental principles of tissue culture
- To understand the applied aspects of Biotechnology and Genetic Engineering

Unit 1 (20 hrs.)

Tissue Culture

- 1.1 Totipotency, Culture techniques: Equipment, Media, Explant, Callus Formation, Organogenesis
- 1.2 Root culture, Shoot Culture, Anther and Pollen Culture
- 1.3 Cell culture, Protoplast Culture: Isolation, Culture and Regeneration
- 1.4 Somaclonal Variation
- 1.5 Somatic Hybridization and Cybrid: Spontaneous and Induced Fusion, Identification and Selection of Hybrid Cells
- 1.6 Applications: Horticulture, Pharmaceutical Industry

Unit 2 (10 hrs.)

Biotechnology in Agriculture

- 2.1 Transgenic Plants for Crop Improvement: Herbicide Resistance, Insect Resistance, Resistance against Viral, Bacterial and Fungal Pathogens
- 2.2 Transgenic Plants - Edible Vaccines. Transgenic Plants as Recombinant Protein Production Systems, Choice of Plant Species for Recombinant Vaccine Production
- 2.2 GM Plants: Bt Brinjal, Cotton, Golden Rice
- 2.3 Bioethics and Biosafety

Unit 3 (5 hrs.)

Biofuels

- 3.1 Bioethanol
- 3.2 Biohydrogen and Gobargas
- 3.3 Bio diesel: Petroplants

Unit 4 (9 hrs.)

Genetic Engineering

- 4.1 Introduction to Genetic Engineering
- 4.2 Techniques: Restriction Endonucleases, Ligation

- 4.3 Cloning Vectors: pUC 18, YAC and BAC
- 4.4 Genomic Libraries
- 4.5 Hybridization – Southern and Northern Blotting

Unit 5

(8 hrs.)

Genetic Engineering in Plants

- 5.1 Target Cells for Transformation
- 5.2 Gene Transfer Technique using *Agrobacterium*
- 5.3 Physical Delivery Methods: PEG stimulated, Microprojectile (Particle gun), Electroporation

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, 2012.
- 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.
- 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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

Section A – Objective questions 9 x 1 = 9 marks
Short Paragraphs 3 x 3 = 9 marks (3 out of 4)

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)

Third Component:

List of evaluation modes:

Seminars

Quiz

Assignments

End Semester Examination

Total Marks: 100

Duration: 3 hours

Section A – Objective questions 18 x 1 = 18 marks
Short Paragraphs 6 x 3 = 18 marks (6 out of 9)

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 (2015– 2016))

GENETICS, PLANT BREEDING AND EVOLUTION

CODE: 15BT/MC/GP64

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVES

- 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

Unit 1 (10 hrs.)

Basic Concepts of Genetics

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

Unit 2 (10 hrs.)

Linkage and Crossing Over

- 2.1 Linkage in Maize
- 2.2 Theories of Crossing Over – Classical Theory and Chiasma Theory
- 2.3 Mapping of genes
- 2.4 Sex Determination in Melandrium
- 2.5 Sex Linkage in Man – Colour Blindness and Haemophilia

Unit 3 (10 hrs.)

Human Genetics

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

Unit 4 (11 hrs.)

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

Unit 5**(11 hrs.)****Evolution**

5.1 Origin of Life – Spontaneous and Chemosynthetic

5.2 Theories of Evolution: Lamarck, Darwin, DeVries and
Modern Synthetic theory

5.3 Isolating Mechanisms – Concept of Species, Allopatric and Sympatric

TEXT BOOK

Verma, P.S and Agarwal, V.K. *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology*. New Delhi: S.Chand, 2007.

BOOKS FOR REFERENCE

Benjamin, L. *Genes IX*. New York: Oxford University, 2014.

Burns, G.W. and P.J.Botline, *The Science of Genetics - An Introduction to Heredity*. USA: Macmillan, 1989.

Chaudhari, *Elementary Principles of Plant Breeding*, New Delhi: Oxford and IBH, 1996.

Chahal,G.S. and Gosal,S.S. *Principles and Procedures of Plant Breeding*, New Delhi: Narosa, 2002.

Dale, Jeremy W., and Malcolm Von Schantz, *From Genes to Genomes, - Concepts, and Applications of DNA Technology*, UK: John Wiley, 2002.

Daniel L Harti., *Essential Genetics*., Jones and Bartlett, 2014.

Kumaresan, V. *Plant Breeding*. Nagercoil: Saras. 2009.

Snustad, D.P. and Simmons M.J., *Principles of Genetics*. USA: John Willey, 2006.

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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins

Section A – Objective questions 9 x 1 = 9 marks
Short Paragraph 3 x 3 = 9 marks (3 out of 4)

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)

III Component Tests:

List of evaluation modes:

Seminar
Group projects
Quiz
Assignments

End Semester Examination

Total Marks: 100

Duration: 3 hours

Section A – Objective questions 18 x 1 = 18 marks
Short Paragraph 6 x 3 = 18 marks (6 out of 9)

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 (2015– 2016))

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

CODE: 15BT/MC/P662

CREDITS: 2

L T P: 0 0 4

TOTAL HOURS: 52

(26 hrs.)

PLANT PHYSIOLOGY

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

DEMONSTRATION EXPERIMENTS

- 1 Colorimetric Estimation of Nitrate Reductase
- 2 Effect of Auxin on Root formation
- 3 Demonstration of Hill's Reaction
- 4 Estimation of Oil Content of *Brassica* Seeds by Soxhlet method

**PLANT BIOTECHNOLOGY & GENETIC ENGINEERING, GENETICS, PLANT
BREEDING & EVOLUTION** **(26 hrs.)**

- 1 Problems based on interaction of Genes and Gene Mapping
- 2 Life Cycle of *Drosophila* (Culture Studies)
- 3 Tissue Culture Techniques - Apical Meristem, Anther and Embryo Culture
- 4 Photomicrographs in Genetic Engineering
- 5 Plant Breeding Photomicrographs included in the Syllabus

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Two Tests each of 90 mins. duration (2 X 20 = 40 Marks)

Record

10 Marks

End Semester Examination:

Total Marks: 50

Duration: 3 Hours

1. Physiology – Expt. Set up (individual)	10
2. Genetics – Problems	10
3. Tissue culture – inoculation	10
4. Spotters – Physiology (1)	
Genetic Eng. (1) 4 x 5	20
Applied Biotech (1)	
Plant Breeding (1)	
Total	50

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH V(A). PLANT BIOLOGY AND PLANT BIOTECHNOLOGY
offered to Students of B.Sc Advanced Zoology and Biotechnology, Physics and Chemistry

SYLLABUS

(Effective from the academic year (2015– 2016))

BIOINSTRUMENTATION

CODE: 15BT/AE/BI45

CREDITS: 5

L T P : 4 1 0

TOTAL HOURS: 65

OBJECTIVE

- To introduce students to the working principles of various laboratory instruments and experimental techniques used in biological research

Unit 1 (13 hrs.)

Centrifugation: Principle, Instrument and Application

- 1.1 Bench, Ultracentrifuge, Refrigerated, Continuous flow centrifuge and Microfuge.
- 1.2 Density gradient and differential centrifugation
- 1.3 Isolation of Chloroplast (practical)

Unit 2 (13 hrs.)

Colorimeters: Principle, Instrument and Application

- 2.1 Beer-Lambert's Law
- 2.2 Single Beam Colorimeters
- 2.3 Colorimetric Determination of Vitamin B-12 (practical)

Unit 3 (13 hrs.)

Spectrophotometers: Principle, Instrument and Application

- 3.1 Single and Double Beam Spectrophotometers - (with the help of block diagrams only)
- 3.2 UV - Visible Spectrophotometer
- 3.3 Estimation of protein using Spectrophotometer (practical)

Unit 4 (13 hrs.)

Chromatography - Principles, Instrument and Application

- 4.1 Paper and Thin Layer
- 4.2 Column, Ion Exchange, Affinity Chromatography
- 4.3 GLC, HPLC and RPHPLC
- 4.4 Separation of Chlorophyll Pigment and Amino Acids using Paper Chromatography and Thin Layer Chromatography

Unit 5 (13 hrs.)

Electrophoresis: Principle, Instrument and Application

5.1 Capillary Electrophoresis (Capillary Zone and Capillary Gel), Gel Electrophoresis – Agarose and Polyacrylamide, Orthogonal-Field-Alternation, Gel Electrophoresis (OFAGE), Field Inversion Gel Electrophoresis (FIGE)

5.2 Immunoelectrophoresis

5.3 Separation of Proteins using Gel Electrophoresis

BOOKS FOR REFERENCE

Beckman Coulter, Daniel, C Liebler. *Introduction to Proteomics: Tools for new biology*, Human, 2002

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.

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

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

Section A – Objective questions 9 x 1 = 9 marks
Short Paragraphs 3 x 3 = 9 marks (3 out of 4)

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)

Third Component:

List of evaluation modes:

Seminars

Quiz

Assignments

End Semester Examination

Total Marks: 100

Duration: 3 hours

Section A – Objective questions 18 x 1 = 18 marks
Short Paragraphs 6 x 3 = 18 marks (6 out of 9)

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 2015 – 2016)

FRUIT PRESERVATION AND NUTRITION

CODE: 15BT/ME/FN55

CREDITS: 5

L T P: 4 1 0

TOTAL HOURS: 65

OBJECTIVES

- To study the principles involved in spoilage and preservation of fruits and vegetables
- To provide practical training in the preservation of fruits and vegetables

Unit 1 (13 hrs.)

Methods of Preservation

- 1.1 High Temperature
- 1.2 Low Temperature
- 1.3 Drying
- 1.4 Radiation
- 1.5 Chemical Preservatives

Unit 2 (13 hrs.)

Nutrition and Health

- 2.1 ICMR Five Food Groups
- 2.2 Nutrition in Fruits and Vegetables: Sources and Functions of Minerals (Ca, Mg, Fe and Zn), Vitamins, Proteins (Soyabean and Cowpea) and Antioxidants (Tomato and Capsicum- Red)
- 2.3 Pigments in Fruits and Vegetables: Chlorophylls, Carotenoids and Flavonoids

Unit 3 (13 hrs.)

Canning

- 3.1 The Process of Canning
- 3.2 Canning of Fruits: Apple, Banana, Mango and Pineapple
- 3.3 Canning of Vegetables: Bean, Carrot, Peas and Tomato

Unit 4 (13 hrs.)

Fermented Beverages

- 4.1 Preparation of Grape wine
- 4.2 Preparation of Cider
- 4.3 Preparation of Vinegar

Unit 5

(13 hrs.)

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

TEXT BOOK

Srilakshmi, B. *Food Science*. Chennai: New Age International, 2003.

BOOKS FOR REFERENCE

Blank, F.C., *Handbook of Food and Nutrition*, India: Agrobios, 2000.

Frazier, W.C. and D.C. West Hoff. *Food Microbiology*. New Delhi: Tata McGraw Hill, 1995.

Home scale- *Processing and Preservation Fruits and Vegetables*, India: Central Food Technological Research Institute, Mysore, 1996.

Kulshrestha, S. K. *Food Preservation*. New Delhi: Vikas, 1994.

Muller, H.G., *Nutrition and Food Processing*. India: Avi, 1998.

Ramakrishnan, S., *Nutritional Biochemistry*. India: T.R., 1996.

Scenetra, R., *Food Science and Nutrition*. New Delhi: Oxford University, 2007.

Swaminathan, M., *Handbook of Food Science and Experimental Foods*, Bangalore: Bangalore, 1992.

JOURNALS

- Journal of Food Science
- Journal of Food Science and technology
- Journal of Nutrition of Food Science
- Food Science Research Journal

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

Section A – Objective questions 9 x 1 = 9 marks
Short Paragraphs 3 x 3 = 9 marks (3 out of 4)

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)

Third Component:

List of evaluation modes:

Seminar

Group projects

Quiz

Assignments

End Semester Examination

Total Marks: 100

Duration: 3 hours

Section A – Objective questions 18 x 1 = 18 marks
Short Paragraphs 6 x 3 = 18 marks (6 out of 9)

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 2015 – 2016)

PROJECT

CODE: 15BT/ME/PR55

CREDITS: 5

L T P: 0 0 5

TOTAL HOURS: 65

DISSERTATION: 50 Marks

CA : 50

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 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

Guidelines for Evaluation

• Internal	-	50 marks
• Dissertation	-	50 marks
Review of Literature	-	10
Materials and Methods	-	10
Results and Discussion	-	20
Presentation	-	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 2015 – 2016)

HORTICULTURE

CODE: 15BT/ME/HC55

CREDITS: 5

L T P: 4 1 0

TOTAL HOURS: 65

OBJECTIVES

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

Unit 1 (15 hrs.)

Introduction

- 1.1 Classification of Horticultural Plants
- 1.2 Garden Implements
- 1.3 Garden and its Components: Fencing Hedge, Borders, Flower Beds, Edging, Lawn, Drives and Paths, Water Garden and Garden Adornments
- 1.4 Vegetative Propagation: Layering, Grafting and Budding
- 1.5 Vegetative Propagating Methods: Cutting/ Layering/ Grafting (Practicals)

Unit 2 (15 hrs.)

Cultural Practices

- 2.1 Propagation, Planting and Harvesting of the following Plants
 - 2.1.1 Fruits: Mango, Banana, and Guava
 - 2.1.2 Vegetable Crops: Onion, Potato, Brinjal and Lady's Finger

Unit 3 (14 hrs.)

Techniques in Gardening

- 3.1 Growing Plants in Pot: Types of Pots, Potting and Repotting
- 3.2 Pot Culture (growing annuals)- Practical
- 3.3 Hanging Basket
- 3.4 Kitchen Garden – Layout: Theory and Practical
- 3.5 Market Garden and Truck Garden
- 3.6 Rock Garden and Terrace Garden
- 3.7 Vegetable Forcing

Unit 4
Landscaping (13 hrs.)

- 4.1 Lawn Making and its Maintenance
- 4.2 Landscape Gardening

Unit 5
General Topics (8 hrs.)

- 5.1 Cut Flowers, Flower Arrangement: Fresh and Dry (Theory and Practical)
- 5.2 Economic Flowers : Rose and Jasmine
- 5.3 Bonsai: Theory and Practical
- 5.4 Terrarium: Theory and Practical

TEXT BOOK

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

BOOKS FOR REFERENCE

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 Acquaah. *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.

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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

Section A – Objective questions 9 x 1 = 9 marks
Short Paragraphs 3 x 3 = 9 marks (3 out of 4)

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)

Third Component:

List of evaluation modes:

Seminars
Quiz
Assignments

End Semester Examination

Total Marks: 100

Duration: 3 hours

Section A – Objective questions 18 x 1 = 18 marks
Short Paragraphs 6 x 3 = 18 marks (6 out of 9)

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 2015 – 2016)

ANALYTICAL TECHNIQUES IN PLANT SCIENCES

CODE: 15BT/ME/AT55

CREDITS: 5

L T P: 4 1 0

TOTAL HOURS: 65

OBJECTIVES

- To provide a basic knowledge of the working principles of the instruments used in biological research
- To understand the process of preparing plant tissues for analysis

Unit 1 (15 hrs.)

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 (15 hrs.)

Electron Microscopy-Principle, Construction and Working

- 2.2 Preparation of Specimen for Transmission Electron Microscopy (TEM)
 - 2.2.1 Fixatives - Glutaraldehyde and Osmium Tetraoxide
 - 2.2.2 Embedding - Spurr, Epon
 - 2.2.3 Knives - Glass and Diamond
 - 2.2.4 Specimen Support -Grid
 - 2.2.5 Staining - Positive and Negative Staining
- 2.3 Preparation of Specimen for Scanning Electron Microscope (SEM)
 - 2.3.1 Fixing, Critical Point Drying
 - 2.3.2 Freeze Drying, Freeze Fracture, Freeze Etching
 - 2.3.3 Specimen Coating - Sputter Coating, Shadow Casting

Unit 3 (13 hrs.)

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 (15 hrs.)

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 (7 hrs.)

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

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

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

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

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

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