

**CHRIST COLLEGE (AUTONOMOUS),  
IRINJALAKUDA**

**IRINJALAKUDA, THRISSUR - PIN 680 125**



**COMPLEMENTARY COURSE IN  
BOTANY FOR B.Sc. ZOOLOGY**

**(CHOICE BASED CREDIT AND SEMESTER SYSTEM)**

**SYLLABUS**

**(FOR THE STUDENTS ADMITTED FROM THE ACADEMIC YEAR 2016 ONWARDS)**

**BOARD OF STUDIES IN BOTANY (UG)**

**IRINJALAKUDA, THRISSUR**

**PIN 680 125, KERALA, 673 635, INDIA**

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*B. Sc. Botany***COMPLEMENTARY COURSE****Table 1. Course structure, Work load and Credit distribution**

Semester	Paper Code	Title of Paper	Hours/ Semester	Hours allotted /Week	Credit
S – I	BOT1C01 T	COMPLEMENTARY COURSE I. <b>Angiosperm Anatomy &amp; Microtechnique</b>	36 hrs	2	2
	BOT1C01 P	Complementary Course Practical I	36 hrs	2	*
S – II	BOT2C02 T	COMPLEMENTARY COURSE II. <b>Cryptogams, Gymnosperms &amp; Plant Pathology</b>	36 hrs	2	2
	BOT2C02 P	Complementary Course – Practical II	36 hrs	2	*
S – III	BOT3C03 T	COMPLEMENTARY COURSE - III <b>Morphology, Systematic Botany, Economic Botany, Plant Breeding &amp; Horticulture</b>	54 hrs	3	2
	BOT3C03 P	Complementary Course – Practical III	36 hrs	2	*
S – IV	BOT4C04 T	COMPLEMENTARY COURSE - IV <b>Plant Physiology, Ecology &amp; Genetics</b>	54 hrs	3	2
	BOT4C04 P	Complementary Course – Practical IV	36 hrs	2	*
		<b>Practical Paper Examination</b>			4
<b>TOTAL</b>					<b>12</b>
* Credits of practical paper (Total credits provided against External Practical paper)					

**B.Sc. PROGRAMME IN BOTANY**  
**Complementary Course Botany**

**Table 2. Course structure, Mark distribution, Scheme of examination**

Course code & Title of course	Instructional Hours		Duration of Exams	Marks				
	Theory	Practical		Theory		Practical		
				External	Internal	External	Internal	
<b>Semester -1</b> <b>BOT1C01 T</b> Anatomy & Microtechnique	36	36	2 hrs	64	16	--	--	80
<b>Semester-2 :</b> <b>BOT2C02 T</b> Cryptogams, Gymnosperms & Plant Pathology	36	36	2 hrs	64	16	--	--	80
<b>Semester-3:</b> <b>BOT3C03 T</b> Morphology, Syst. Botany, Economic Botany, Plant Breeding & Horticulture	54	36	3 hrs	64	16	--	--	80
<b>Semester- 4:</b> <b>BOT4C04 T</b> Plant Physiology, Ecology & Genetics	54	36	3 hrs	64	16	--	--	80
<b>Semester- 4:</b> Comple. Course External Practical Exam Record Submission	--	--	3 hrs	--	--	64 [50+10+ 4]	16	80
<b>Total</b>	<b>180</b>	<b>144</b>	<b>-</b>	<b>256</b>	<b>64</b>	<b>64</b>	<b>16</b>	<b>400</b>

## SCHEME OF EVALUATION

Evaluation of theory paper and practical papers will be based on 80:20 pattern.

### Theory Examination

Total	-	80 marks
External	-	64 marks
Internal	-	16 marks

#### Distribution of internal marks [Theory]

Attendance	-	4
Test paper	-	8
Seminar & assignment	-	4
<b>Total</b>		<b>16</b>

### Practical Examination

Total	-	80 marks
External	-	64 marks {Ext.Exam -50, Record-10, Submn-4}
Internal	-	16 marks

#### Distribution of internal marks [Practical]

Attendance	-	4
Record	-	8
Lab involvement & test	-	4
<b>Total</b>		<b>16</b>

### Submission

Students are expected to submit 8 duly certified Herbarium sheets and field book on the day of Practical examination.

**FIRST SEMESTER COMPLEMENTARY BOTANY**  
**Course Code: BOT1C01**  
**ANGIOSPERMIC ANATOMY AND MICROTECHNIQUE**

**Total: 72 Hours (Theory: 36 hours, Practical: 36 hours)**

**ANGIOSPERM ANATOMY**  
**(Theory: 27 Hours)**

**Module I**

1. Tissues - Definition, Kinds - Meristematic & Permanent;
  - a. Meristematic tissues - Classification – based on origin & position; Organisation of root apex and differentiation of tissue – Histogen theory; Organisation of stem apex and differentiation of tissues - Tunica & Corpus theory.
  - b. Permanent tissues - Definition - Classification;  
Simple tissues (Parenchyma, Collenchyma and Sclerenchyma), Complex tissues (Xylem & Phloem)  
Secretory tissues - Glandular tissues (Nectaries in *Euphorbia pulcherrima*,  
Stinging hairs in *Tragia*)  
Oil glands in *Citrus*, *Eucalyptus*; Digestive glands in *Nepenthes*;  
Laticiferous tissues (Non-articulate latex ducts in *Euphorbia* and  
articulate latex duct – latex vessels in *Hevea*).  
Hydathodes
2. Vascular bundles – types: conjoint - collateral, bicollateral, concentric and radial. **9 hrs.**

**Module - II**

**Primary structure of dicot and monocot root, dicot and monocot stem and leaf in dicot and monocot.**  
**6 hrs.**

**Module - III**

1. Normal secondary thickening in dicot stem (*Polyalthea* and *Vernonia*)
  - a. Intra stelar thickening: formation of cambial ring, its structure, fusiform and ray initials, storied and non - storied cambium, activity of the cambium, formation and structure of secondary wood, secondary phloem and vascular rays.
  - b. Extra stelar thickening: formation, structure and activity of the phellogen, formation of periderm in stem and root; bark and lenticel.
  - c. Growth rings, ring and diffuse porous wood, sapwood and heart wood, tyloses.
  - d. Normal secondary thickening in dicot root (*Tinospora* and *Papaya*)
2. Anomalous secondary growth in *Boerhaavia*. **12 hrs.**

### Practicals 30 Hours

1. Identify simple and complex tissues and determine the type of vascular bundles using microscope.
2. Make suitable micro preparations to study the anatomy of the following:
  - a) Dicot stem: *Cucurbita*, *Centella* (Primary structure);  
*Polyalthea*, *Vernonia* (Secondary structure).
  - b) Monocot stem: Bamboo, grass
  - c) Dicot root: *Tinospora* –young (Pri.), *Tinospora* – mature (Sec.)
  - d) Monocot root: *Colocasia*, *Musa*
  - e) Anomalous secondary growth (*Boerhaavia*).
  - f) Dicot leaf: *Ixora* and Monocot leaf: paddy/grass

### MICROTECHNIQUE (Theory: 9 hours)

#### Module - I

##### Microtechnique - Brief Introduction

1. Microscopy: simple, compound and electron microscope
2. Microtomy: Rotary type, serial sectioning, paraffin method, significance.
3. Killing and fixing: Killing and fixing agents and their composition (Farmer's fluid and FAA.)
4. Dehydration and clearing - reagents (mention only)
5. Stains – Saffranin and acetocarmine, preparation and use.

#### Practicals - 6 hrs

1. Familiarise the structure and working of compound microscope
2. Demonstration of microtome serial sectioning, staining and mounting.
3. Preparation of Safranin, FAA and Acetocarmine

#### References: Anatomy

1. Cuttler, E.G. 1969. Plant Anatomy - Part I Cells & Tissue. Edward Arnold Ltd., London.
2. Cuttler, E.G. 1971. Plant Anatomy, Part III Organs Edward Arnold Ltd., London.
3. Esau K. 1985. Plant Anatomy (2nd ed.) Wiley Eastern Ltd. New Delhi.
4. Pandey B.P. Plant Anatomy, S. Chand & Co. Delhi.
5. Vasishta P.C. 1974. Plant Anatomy, Pradeep Publication, Jalandhar.
6. Tayal M.S Plant Anatomy. Rastogi Publishers, Meerut.

#### References: Microtechnique

1. Johansen, D.A. 1940. Plant Microtechnique. Mc Graw – Hill Book Company, Inc. New York.
2. Kanika, S. 2007. Manual of Microbiology – Tools and Techniques. Ane's student edition.
3. Khasim, S.K., 2002. Botanical Microtechnique; principles and Practice, Capital Publishing Company, New Delhi.
4. Toji, T. 2004. Essentials of Botanical Microtechnique. Apex Infotec Publ.

**SECOND SEMESTER COMPLEMENTARY BOTANY**  
**Course Code: BOT2C02T**  
**CRYPTOGAMS, GYMNOSPERMS & PLANT PATHOLOGY**  
**Total: 72 Hours (Theory: 36 hours, Practical: 36 hours)**

**Cryptogams, Gymnosperms & Plant Pathology**

Theory: 32hrs..

**Module - I**

1. Virus: General account of viruses, including structure of TMV & Bacteriophage. **2hrs.**
2. Bacteria: Classification based on shape of flagella, structure, nutrition (brief account), reproduction and economic importance - agriculture, industry and medicine. **3 hrs.**
3. Cyanobacteria: General account, structure, life - history and economic importance of Nostoc **2 hrs.**

**Module - II**

1. Phycology: General characters, classification, evolutionary trends in algae.
2. Structure, reproduction, life history and economic importance of the following classes with suitable examples:
  - a) Chlorophyceae (*Spirogyra*)
  - b) Phaeophyceae (*Sargassum*)
  - c) Rhodophyceae (*Polysiphonia*). **7 hrs.**
3. Mycology: General characters, classification (Alexopoulos, 1979). (brief mention only) and evolutionary trends in fungi. Important features of the following divisions:
  - a) Mastigomycotina
  - b) Ascomycotina
  - c) Basidiomycotina.
4. Structure and life history of *Puccinia* (developmental details not required) **4 hrs.**

**Module - III**

1. Bryology: General account, morphology and life - history of *Riccia*. **4 hrs.**
2. Lichenology: General account and economic importance of Lichens with special reference to *Usnea*. **3 hrs.**
3. Pteridology: General account, morphology and life history of *Selaginella* **4 hrs.**
4. Gymnosperms: General account, morphology and life history of *Cycas* (Anatomy not required) **4 hrs.**

**Module - IV**

1. Plant Pathology: Study the following plant diseases with special reference to pathogens, symptoms, method of spreading and control measures.
  - 1) Leaf mosaic of Tapioca
  - 2) Citrus canker
  - 3) Blast of paddy **3 hrs.**

**Practicals: 32hrs.**

- 1) Make suitable micro preparations of vegetative and reproductive structures of *Sargassum*, *Puccinia*, *Riccia* and *Selaginella*
- 2) Identify and draw labelled diagrams of the types mentioned in the syllabus.

**Plant pathology**

**Practical: 4 hrs.**

- 1) Identify the diseases (mentioned in the theory syllabus) on the basis of symptoms and causal organisms.

**References: Cryptogams**

- 1) Fritsch, F.E. 1935. The structure and reproduction of the algae. Vol. 1 and II, Uni. Press. Cambridge.
- 2) Morris, I. 1967. An Introduction to the algae. Hutchinson and Co. London.
- 3) Papenfuss, G.F. 1955. Classification of Algae.
- 4) B.R. Vasishta. Introduction to Algae
- 5) B.P. Pandey Algae
- 6) Mamatha Rao, 2009 – Microbes and Non-flowering plants. Impact and applications. Ane Books, New Delhi.
- 7) Sanders, W.B. 2001. Lichen interface between mycology and plant morphology. *Bioscience*, 51: 1025-1035.
- 8) B.R. Vasishta. Introduction to Fungi.
- 9) P.C. Vasishta Introduction to Bryophytes.
- 10) B.P. Pandey Introduction to Pteridophytes

**References: Gymnosperms**

- 1) Chamberlain C.J., 1935, *Gymnosperms – Structure and Evolution*, Chicago University Press.
- 2) Sreevastava H.N. 1980, *A Text Book of Gymnosperms*. S. Chand and Co. Ltd., New Delhi.
- 3) Vasishta P.C. 1980, *Gymnosperms*. S. Chand and Co., Ltd., New Delhi.

**References: Plant Pathology**

- 1) Agros, G.N. 1997. *Plant Pathology* (4th ed) Academic Press.
- 2) Bilgrami K.H. & H.C. Dube. 1976. *A textbook of Modern Plant Pathology*. International Book Distributing Co. Lucknow.
- 3) Pandey, B.P. 1999. *Plant Pathology. Pathogen and Plant diseases*. Chand & Co. New Delhi.

### THIRD SEMESTER COMPLEMENTARY BOTANY

Course Code: BOT3C03T

#### MORPHOLOGY, SYSTEMATIC BOTANY, ECONOMIC BOTANY, PLANT BREEDING AND HORTICULTURE

Total: 90 Hours (Theory: 54 hours, Practical: 36 hours)

#### Morphology

Theory: 8 hrs.

##### Module - I

1. Leaf - Structure, simple, compound, venation and phyllotaxy.
2. Inflorescence - racemose, cymose, special, types with examples
3. Flower - as a modified shoot- structure of flower - floral parts, their arrangement, relative position, cohesion and adhesion of stamens, symmetry of flowers, types of aestivation and placentation, floral diagram and floral formula. **8 hrs.**

##### Practicals: 4 hrs.

1. Identify the different types of inflorescence included in the syllabus and record the same **4 hrs.**

##### Reference: Morphology

1. Sporne, K.R. 1974. Morphology of Angiosperms. New Delhi.

#### Systematic Botany

Theory; 28 hrs.

##### Module- I

1. Introduction, scope and importance **1hr.**
2. Herbarium techniques: collection, drying, poisoning, mounting & labelling. Significance of herbaria and botanical gardens; Important herbaria and botanical gardens in India. **4 hrs.**
3. Nomenclature - Binomial system of nomenclature, basic rules of nomenclature (validity, effectivity and priority), International Code of Botanical Nomenclature. **3 hrs.**
4. Systems of classification - Artificial, Natural, Phylogenetic (Brief account only). Bentham & Hooker's system of classification in detail. **4 hrs.**
5. Modern trends in taxonomy - Chemotaxonomy, Numerical taxonomy and Cytotaxonomy (brief account only) **2 hrs.**
6. Study the following families: Malvaceae, Fabaceae (with sub-families) Rubiaceae, Apocynaceae, Euphorbiaceae and Poaceae. **14 hrs.**

## Systematic Botany

### Practical: 20hrs.

1. Determine the systematic position of local plants comes under the syllabus based on their vegetative and floral characters
2. Students shall be able to describe the plants in technical terms and draw the L.S. of flower, floral diagrams and the floral formula of two plants belong to each family and record the same.
3. Students are expected to submit ten properly identified duly certified herbarium specimens belonging to families included in the syllabus during the practical examination.

### References: Systematic Botany

1. Radford, A.E. 1986. Fundamentals of Plant Systematics. Harpor & Row Publishers, New York.
2. Sivarajan, V.V. 1991. Introduction to Principles of Plant Taxonomy. Oxford & IBH, New Delhi.
3. Jeffrey, C. 1968. An introduction to Plant Taxonomy, London
4. Gurucharan Singh, 2001. Plant Systematics. Theory and practice. Oxford & IBH Publications New Delhi.
5. Sharma O.P. 1990, Plant Taxonomy – Tata McGraw Hills. Publishing company Ltd
6. Subramanyam N.S. Modern Plant Taxonomy. Vikas Publishing House Pvt Ltd.
7. Pandey & Misra. Taxonomy of angiosperms. Ane books Pvt Ltd.

### Economy Botany

Theory: 4 hrs.

### Module -I

1. Brief account on the various categories of plants based on their economic importance
2. Study the following plants with special reference to their binomial, family, morphology of the useful part and their uses.
  - a) Cereals - Paddy, Wheat
  - b) Pulses - Black gram, Green gram
  - c) Oil - Coconut, Gingelly
  - d) Fibre - Cotton
  - e) Latex - Rubber
  - f) Beverages - Tea, Coffee
  - g) Spices - Pepper, Cardamom, Clove
  - h) Medicinal plants – *Rauwolfia serpentina*, *Justicia adhatoda*, *Santalum album* and *Curcuma longifolia*.

**Practical: 4 hrs.**

1. Identify at sight the economically important plant produces and products mentioned in module III, and learn the binomial and family of the source plants, morphology of the useful parts and uses.

**References: Economic Botany**

1. Pandey B. P (1987) - Economic Botany
2. Verma V. (1984) - Economic Botany
3. Hill A.W (1981) - Economic Botany, McGraw Hill Pub

**Plant Breeding [Theory: 7hrs.]**

1. Objectives of plant breeding
2. Methods of plant breeding:
  - a) Plant introduction b) Selection - Mass, Pure line and clonal,
  - c) Hybridization : intervarietal, interspecific and intergeneric hybridization.
  - d) Mutation breeding e) polyploidy breeding and
  - f) breeding for disease resistance

**Practical: 4 hrs.**

1. Demonstration of hybridization technique

**References: Plant Breeding**

1. Allard. R.W. 1960. Principles of Plant breeding, John Wiley & Sons, Inc, New York.
2. Singh, B.D. 2005. Plant Breeding - Principles & methods , Kalyani Publishers, New Delhi.
3. Chaudhari. H.K. Elementary Principles of Plant breeding, Oxford & IBH Publishers.

**Horticulture [Theory: 7 hrs.]**

1. Horticulture- introduction: definition, branches, significance
2. Methods of plant propagation:
  - a) Seed propagation
  - b) Vegetative propagation
    - i. Cutting – stem, root, leaf
    - ii. Layering – air layering
    - iii. Grafting: Approach grafting, Tongue grafting
    - iv. Budding: Patch and T-budding

**Practical: 4 hrs.**

1. Demonstration of layering, grafting and budding

**References:- Horticulture**

1. Text book of Horticulture - K. Manibhushan Rao - Macmillan India Ltd.
2. Introduction to Horticulture – N. Kumar (First Edition, Rajalakshmi Publication,1996)

## FOURTH SEMESTER COMPLEMENTARY BOTANY

Course Code: BOT4C04 T

### PLANT PHYSIOLOGY, ECOLOGY AND GENETICS

Total: 90 Hours (Theory: 54 hours, Practical: 36 hours)

#### PLANT PHYSIOLOGY

[Theory: 36 hours]

#### Module - I

1. Structure of plant cell and cell organelles (Brief account only)
2. Water relations - Permeability, Imbibition, Diffusion, Osmosis and water potential
3. Absorption of water- Active and passive mechanisms
4. Ascent of sap -Root pressure theory, Transpiration pull or cohesion-tension theory.
5. Transpiration -Types, mechanism of stomatal movement: K<sup>+</sup> ion theory, significance of transpiration, antitranspirants.

12 hrs.

#### Module - II

1. Photosynthesis - Introduction, significance, Two pigment systems, red drop, Emerson enhancement effect, action and absorption spectra.  
Mechanism of photosynthesis - Light reaction, cyclic & non-cyclic photo phosphorylation, Dark reactions-Calvin cycle, C<sub>4</sub> cycle, photorespiration (a brief account only). Factors affecting photosynthesis.
2. Respiration - Definition, Kinds of respiration - aerobic and anaerobic; Glycolysis, Krebs cycle, Terminal oxidation, Fermentation

15 hrs.

#### Module - III

1. Plant growth - Definition, phases of growth, natural plant hormones, synthetic auxins (Brief account only)
2. Senescence and abscission, Photoperiodism & vernalization.
3. Dormancy of seeds- Factors causing dormancy, photoblastin, techniques to break dormancy, physiology of fruit ripening.

9 hrs.

#### Practicals - 18 hours

Learn the principle and working of the following apparatus/experiments

1. Thistle funnel osmoscope
2. Ganong's potometer
3. Ganong's light-screen
4. Ganong's respirometer
5. Absorbo transpirometer
6. Kuhne's fermentation vessel
7. Mohl's half-leaf experiment
8. Experiment to demonstrate suction due to transpiration
9. Experiment to show evolution of O<sub>2</sub> during photosynthesis

**References:**

1. William G. Llopkins, (1999). Introduction to Plant Physiology, 2nd edition, John Wiley A Sons, Inc.
2. Frank B. Salisbury and Cleon W. Ross (2002). Plant Physiology 3rd edition. CBS publishers and distributors.
3. G. Ray Noggle and George J. Fritz Introductory Plant Physiology, Prentice Hall.
4. Goodwin Y.W., and Mercer E.I. (2003) Introduction to Plant Biochemistry. 2nd edition. CBS Publishers and distributors.

**PLANT ECOLOGY** [Theory: 9 hours]

**Module - I**

1. Ecology-Definition, Ecosystem: ecological factors – biotic and abiotic. **2 hrs.**
2. Ecological adaptations: Morphological, anatomical and physiological adaptations of the following types: Hydrophyte (*Vallisneria*, *Hydrilla*), Xerophyte (*Opuntia*, *Nerium*), Halophyte (*Avicennia*), Epiphytes (*Vanda*) and parasites (*Cuscuta*). **4. hrs.**
3. Ecological succession –Process of succession, types of succession, Hydrosere **3. hrs.**

**Practicals** (Total: 9 hrs.)

1. Study the morphological and anatomical adaptations of the hydrophytes, xerophytes, halophytes, epiphytes and parasites mentioned in the syllabus

**References:**

1. Ambasht R.S. 1988. A text book of Plant Ecology. Students Friends Co. Varanasi.
2. Dash M.C. 1993. Fundamentals of Ecology. Tata McGraw Hill Publishing Company Ltd. New Delhi.
3. Michael S. 1996. Ecology. Oxford University Press, London.
4. Sharma, P.D. 2008-2009. Ecology and Environment. Rastogi Publication.
5. Kumar H.D. 1977. Modern Concepts of Ecology. Vikas Publications. New Delhi.

**GENETICS Theory: 9hrs.**

1. Introduction and brief history of genetics
2. Mendel's experiments, symbolisation, terminology, heredity and variation;
3. Monohybrid cross, Dihybrid cross, Laws of Mendel, test cross and back cross.
4. 4.. Modified Mendelian ratios 1) Incomplete dominance in *Mirabilis jalapa*
5. Gene interactions: Complementary genes -flower colour in *Lathyrus odoratus* (9:7ratio), Epistasis - Fruit colour in *Cucurbita pepo* (12:3:1 ratio).

**Practical: 9 hrs.**

1. Students are expected to work out problems related to Monohybrid, Dihybrid, Test cross, Incomplete dominance and Modified Mendelian ratios and has to be recorded.

**References: - Genetics**

1. Sinnot, W.L.C. Dunn & J. Dobzhansky 1996. Principles of Genetics. Tata Mc Graw Hill Publishing Company Ltd., New Delhi.
2. Verma, P.S. & Agarwal 1999. Text book of Genetics. S. Chand & Co., New Delhi.
3. Rastogi V.B. 2008, Fundamentals of Molecular Biology, Ane Books, India.
4. Gupta, P.K. Text Book of Genetics. Rastogi Publications, Meerut.

**MODEL QUESTION PAPER**  
**First Semester Complementary Botany**  
**ANATOMY & MICROTECHNIQUE**  
**Course Code: BOT1C01T**

Time: 3hrs

Max. 64 marks

**Part A**

(Answer all questions)

1. Quiescent centre is found in -----
2. Casparian strips occur in -----
3. Proponent of Kopper-Kappe theory
4. Calcium carbonate crystals are found as -----
5. Name a dicot plant showing anomalous secondary growth
6. Type of stomata in Ixora is -----
7. Name a fixative agent.
8. Roughness of grass leaf is due to the presence of -----
9. Give the expansion of FAA
10. Growth of cells wall is accomplished by -----

10x1=10 marks

**Part B**

(Answer any seven questions)

11. What are tyloses? Mention their function.
12. What are annual rings?
13. Laticiferous tissue.
14. Concentric vascular bundles.
15. Monocot vascular bundle.
16. What are lenticels?
17. Define resolving power.
18. Name the optical parts of a compound microscope.
19. Acidic stains.
20. Natural dyes.

7 x 2= 14 marks

### Part C

(Answer any six of the following)

21. What is meristem? Classify them based on position, origin and function.
22. With suitable labelled diagrams, describe the primary structure of a dicot stem.
23. Explain the extra stelar secondary growth in stem
24. Give a detailed account of isobilateral leaf with the help of labelled sketch
25. Briefly describe the mechanism of electron microscope
26. Important anatomical characters of Dicot root
27. Comment on Sap wood and heart wood
28. Distinguish between ring porous wood and diffuse porous wood

6 x 4 = 24 marks

### Part D

(Answer any two of the following)

29. With suitable labelled diagrams, describe the simple and complex tissues in plants
30. Describe the anomalous secondary growth in Boerhaavia stem
31. Describe the normal secondary growth in dicot root with suitable diagrams.

2 x 8 = 16 marks

**Second Semester Complementary Botany**  
**CRYPTOGAMS, GYMNOSPERMS AND PLANT PATHOLOGY**  
**Course Code: BOT2C02T**

Time: 3hrs

Max. 64 marks

**Part A**

(Answer all questions) Fill

in the blanks with suitable words.

1. Nucleus of Nostoc is -----
2. is an example for Gm-ive bacteria
3. is the pathogen responsible for Blast of paddy
4. Cell wall of Bacteria is made up of -----
5. are non vascular embryophytes
6. Viroids are -----
7. Fruiting body of Usnea is -----
8. Whittker placed Bacteria in the Kingdom -----
9. discovered Virus
10. Heterospory is seen in -----

1x10=10 marks

**Part B**

(Answer all questions)

Answer any seven questions

11. Describe rhizoids in Riccia
12. What is heterospory?
13. What are heterocyst?
  
14. Give the expansion of AIDS & HIV
15. Account on shoots in Pinus
16. What do you mean by heteroceanous fungi?
17. Pigments in Algae
18. Biological control
19. Cystocarp in Polysiphonia
20. Symptoms of the Blast of paddy

7 x 2 = 14 marks

**Part - C**

Answer any six (short essay)

21. Explain the morphology of rhizophore in Selaginella
22. List out different methods of disease control
23. Describe the structure of Riccia sporophyte.
24. Draw a neat labeled diagram of Bacteria
25. Distinguish between Cryptostomata and Conceptacle
26. Describe the receptacle of Sargassum
27. Describe the structure of a Bacteriophage
28. Give an account on the reproduction in Lichens

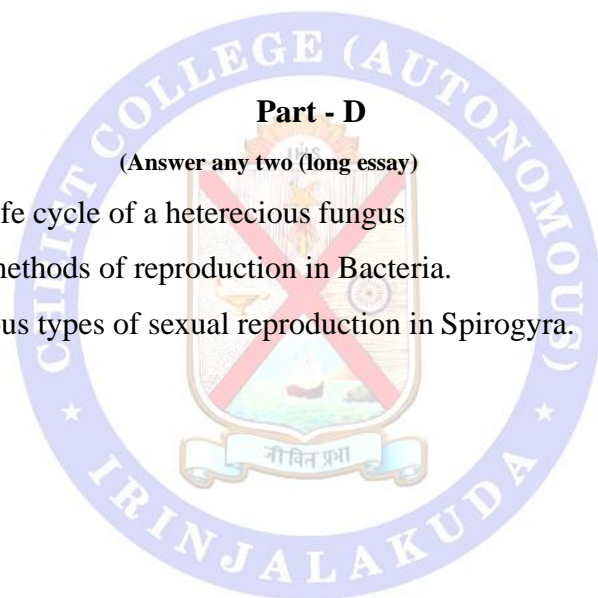
6 x 4=24 marks

**Part - D**

(Answer any two (long essay))

29. Describe the life cycle of a heterecious fungus
30. Describe the methods of reproduction in Bacteria.
31. Describe various types of sexual reproduction in Spirogyra.

2 x 8 = 16 marks



**Third Semester Complementary Botany**  
**MORPHOLOGY, SYSTEMATIC, BOTANY, ECONOMIC BOTANY,**  
**PLANT BREEDING AND HORTICULTURE**

**Course Code: BOT3C03T**

Time: 3hrs

Max. 64 marks

**Part A**

(Answer all questions)

Answer in one word

1. Spadix is an inflorescence found in -----
2. Leaves without petiole are called -----
3. Most of the cereals belong to the family .....
4. Name the author of "Species plantarum"
5. The binomial of cotton plant is -----
6. Name the fruit of family Fabaceae.
7. Euphorbia produces ----- type of inflorescence.
8. Name the family with inferior ovary.
9. Coffee and tea belong the category -----
10. Give an example of Phylogenetic system of classification

1x10=10 marks

**Part B**

(Answer any seven questions)

11. Define phyllotaxy. Mention different types.
12. Chemicals used to protect herbarium sheets.
13. Why grafting is not successful in monocots?
14. Name the alkaloids extracted from Rauwolfia.
15. Draw the floral diagram of Fabaceae.
16. Principles of ICBN
17. Describe the spikelet in Poaceae
18. Comment on the morphology of angiosperm flower.
19. Give the binomial, Family and useful part of cotton and rubber.
20. Define T-budding.

2 x 7 = 14 marks

**Part C**

(Answer any six of the following)

21. Mass selection and Pureline selection
22. Organization of ICAR
23. What is the importance of Quarantine in plant breeding technique?
24. What is meant by Doctrine of signature? Explain it by giving suitable examples.
25. Describe the characters of the family Rubiaceae
26. What is placentation? Write different types.
27. Describe Resistance breeding
28. Describe different methods of vegetative propagation

6x4=24 marks

**Part D**

(Answer any two of the following)

29. Write an essay on Bentham & Hookers's system of classification
30. Discuss the modern trends in taxonomy giving suitable examples.
31. Define hybridization and describe the process of hybridization.

2x8=16 marks

**Fourth Semester Complementary Botany**  
**PLANT PHYSIOLOGY, ECOLOGY AND GENETICS**  
**Course Code: BOT4C04T**

Time: 3hrs

Max. 64 marks

**Part A**

(Answer all questions)

Answer in one word

1. Name the Father of Genetics.
  2. is a Xerophyte.
  3. Name the enzyme which fixes CO<sub>2</sub> in C<sub>3</sub> plants.
  4. Wilting of plants occurs when ----- tissue is removed.
  5. The monohybrid genotypic ratio is -----.
  6. The cohesion tension theory regarding ascent of sap was given by -----
  7. Incomplete dominance is reported in -----
  8. The oxidation of NADH<sub>2</sub> yields ----- number of ATP
  9. Give an example of inter genic interaction
  10. Ethylene gas is used for -----
- 1x10 =10 marks

**Part B**

(Answer all questions) Short answer questions

11. Define fermentation.
  12. What is photolysis?
  13. Mention the role of pneumatophore.
  14. Methods to overcome dormancy.
  15. Briefly explain photophosphorylation.
  16. Photosystems in plants.
  17. Define water potential.
  18. Define abscission & senescence.
  19. Test cross & back cross.
  20. Vernalization.
- 2 x7=14 marks

**Part C**

(Answer any six of the following)

21. Describe glycolysis and its significance
22. What is oxidative phosphorylation? Explain its significance
23. Explain the role of auxins and cytokinins in plant growth and development.
24. What is photoperiodism? Classify plants accordingly.
25. How is cactus adapted to live in deserts?
26. Describe epistasis with example.
27. List out the adaptations in Hydrophytes
28. Describe the stomatal mechanism in plants

6 x 4 = 24 marks

**Part D**

Answer any two of the following

29. Discuss the mechanism and significance of Hatch and Slack pathway in Photosynthesis.
30. Describe the steps of citric acid cycle.
31. What is plant succession? Describe Hydrosere.

2 x 8 = 16 marks

## B.Sc. Complementary Botany Practical Examination

Time: 3 hrs

Max. 50marks

1. Prepare a T.S. of specimen **A**. Stain and mount in glycerine. Draw cellular diagram and label the parts. Identify giving reasons. Leave the preparation for valuation.  
(Preparation – 4; Diagram – 3; Reasons 2; Identification – 1) 10 marks
  
2. Refer specimen **B** to its family, giving diagnostic characters.  
(Identification 1; Reasons 4) 5 marks
  
3. Take a V.S. of flower **C**. Draw a labelled diagram. Construct the floral diagram and give the floral formula.  
(Diagram - 2, Floral diagram - 2, Floral formula - 1) 5 marks
  
4. Make suitable micro preparations of **D**. Draw labelled diagram. Identify giving reasons. Leave the preparation for valuation.  
(Preparation – 2, Diagram – 1, Identification – 1, Reasons – 1) 5 marks
  
5. Determine the ecological group of specimen **E**, with important adaptations.  
(Identification – 1; Adaptations -2 ) 3 marks
  
6. Set up the experiment **F**. Explain the working and state its aim:  
(Set up – 2; Working – 2; Aim – 1) 5 marks
  
7. Give the binomial, family and morphology of useful parts in **G & H**.  
(Bonomial – 1; Family - 1 ; Morphology - 1) 2 x 3 = 6 marks
  
8. Name the disease, pathogen and important symptoms in **I**.  
(Name -1, Pathogen -1, Symptoms - 2) 4 marks
  
9. Spot at sight, specimens **J, K & L** 3x1=3 marks
  
10. Genetics problem –M. 4 marks

50 marks

Record

10 marks

Submission (Herbarium sheets) 4 marks

Total

-----  
64 marks

## Key to Specimens

A - Anatomy materials – root or stem (Primary or Secondary) and anomalous secondary thickening (Boerhaavia stem)

B - Twig with flower of dicot plants mentioned in the syllabus

C - A flower and flower buds belong to the families included in the  
-Specimens from cryptogams included in the syllabus D -

### *Puccinia*

E - Ecology materials given in their respective centres. F-

Physiological experiments mentioned in the syllabus G & H -

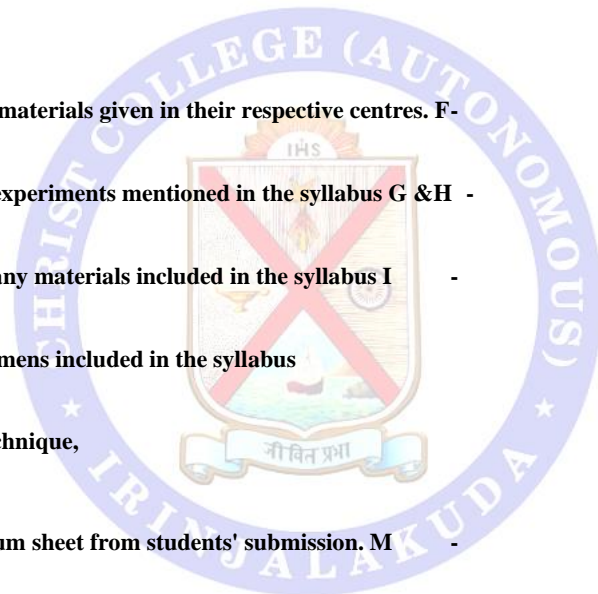
Economic botany materials included in the syllabus I -

Diseased specimens included in the syllabus

J - Microtechnique,

K, & L Herbarium sheet from students' submission. M -

Genetics problem



**Table-1: Distribution of internal marks for Theory and Practical**

Parameters		Theory course	Practical course	Marks distribution	
				Theory (Max)	Practical (Max)
1	Attendance	25%	25%	4	4
2	Average of marks obtained in the 1 <sup>st</sup> & 2 <sup>nd</sup> Internal Examination together calculated out of 8	50%		8	
3	Assignment & Seminar	25%		2 2	
5	Timely submission of record sheets		50%	nil	8
6	Model Practical Examination marks		25%	Nil 1	4
7	<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>16</b>	<b>16</b>

**Table-2: Percentage of Attendance and eligible internal marks**

<b>% of attendance</b>	<b>% of marks to be awarded</b>	<b>Marks eligible</b>
Above 90%	100	4
85-89%	80	3.5
80-84%	60	2.5
76-79%	40	1.5
75%	20	1

**Table - 3: The proportion of % of marks obtained in internal examination and internal marks need to be awarded.**

<b>Class</b>	<b>% of marks obtained in Internal Examination</b>	<b>Internal marks to be awarded</b>
1	Fail (0-34)	Nil
2	36-49	1
3	50-59	2
4	60-79	3
5	80-90	3.5
6	90-100	4