



UNIVERSITY OF CALICUT

SYLLABUS
B. Sc. Botany
(Scheme of Examinations)

1981

B. Sc. Botany (for 1981 admission onwards)

UNIVERSITY OF CALICUT

(Abstract)

University of Calicut—Revised scheme and syllabi for B. Sc. Science subjects, in the light of the Supreme Court proceedings—Introduction of—Orders Issued.

GENERAL AND ACADEMIC (B) SECTION

No. GA/B3/4951/81

Dated, Calicut University. Po. 23-7-81

- Read :—1. Minutes of the standing committee of the Academic council held on 18-5-81.
2. Minutes of the Faculty of Science held on 6—6—81.
3. Minutes of the Academic Council held on 27-6-81.

ORDER

In the light of the Supreme court proceedings, the Standing Committee of the Academic Council at its meeting held on 18-5-81 resolved that a revised syllabus for the Degree course in Science subjects, prepared by the combined Board of Studies of Kerala and Calicut Universities can be accepted by the University.

Subsequently, the Faculty of Science at its meeting held on 6-6-81 considered and finalised and revised syllabi for B. Sc. Science subjects, prepared by the combined Board of Studies of the two Universities, consequent on the unified syllabi at pre-degree level.

The Academic Council at its meeting held on 27-6-81 has approved the revised scheme and syllabi for B. Sc. courses.

Sanction is therefore accorded for the revised scheme and syllabus for the following science subjects, at degree level, effective from 1981 admission onwards :

1. B. Sc. Mathematics (Main and subsidiary)
2. " Physics "
3. " Chemistry "
4. " Zoology "
5. " Botany "
6. " Geology "
7. " Statistics (Subsidiary) "

Revised scheme and syllabi are appended to this order.

Sd/-
Deputy Registrar (GA)
For Registrar

B. Sc. Botany Main
(Scheme of Examination)
(Effective from 1981 admissions)

	Teaching hours per week	Duration of exami- nation	Marks
<i>First year</i>			
Theory paper I—Anatomy and Embryology	4	3 hrs.	50
<i>Second year</i>			
Theory paper II—Thallophyta & Pathology	5	3 hrs.	50
<i>Third year</i>			
Theory paper III—Bryophyta Pteridophyta and gymnosperms	} 25	3 hrs.	75
Theory Paper—IV Morphology Taxonomy and Economic Botany		3 hrs.	75
Theory Paper V—Physiology & Ecology		3 hrs.	75
Theory Paper VI—Cytology Genetics, plant breeding & Evolution		3 hrs.	75
Theory Total			
<i>Practical</i>			
Paper I Anatomy, Morphology Taxonomy, Economic Botany and Embryology		3 hrs.	50
Paper II—Thallophyta, Bryophyta, Pteridophyta & Plant Pathology		3 hrs.	50
Paper III—Gymnosperms, Physiology, Ecology, Cytology & Genetics		3 hrs.	50
Laboratory Records			40
Herbarium and Field Notes			10
Practical Total			200
Grand Total (400+200)			600

B. Sc. Main

Distribution of Hours

Year	Paper	Subjects	Hours of tea- ching per year		Total No. of teaching hours per year
			Lecture	Practical	
First	I	Anatomy Embryology	45 15	45 15	120
Second	II	Thallophyta Pathology	75 15	45 15	150

Third	III	Bryophyta	15	15	150
		Pteridophyta	30	45	
		Gymnosperms	15	30	
"	IV	Morphology	15	15	180
		Taxonomy	60	60	
		Economic Botany	15	15	
"	V	Physiology	90	30	180
		Ecology	30	30	
"	VI	Cytology	45	30	240
		Genetics	90	30	
		Plant Breeding	15	—	
		Evolution	30	—	

**B. Sc. Botany—Subsidiary scheme of Examination
(Effective from 1931 admissions)**

	Teaching Hours per week	Duration Examination	Marks
<i>First year</i>			
Theory Paper I—Cryptograms, Gymnosperms Physiology and Pathology	4	3	60
<i>Second year</i>			
Theory Paper II—Taxonomy, Anatomy Ecology, Economic Botany, Genetics & Plant Breeding	5	3	60
Theory Total			120
<i>Practical</i>			
Subjects as per Theory Papers I & II		3	60
Laboratory Records			20
Practical Total			80
Grand Total (120+80)			200

Distribution of Hours

Year	Paper	Subject	Hours of Teaching		Total No. of teaching hours per year
			Lecture	Practical	
First	I	Cryptograms and Gymnosperms	30	45	120
		Physiology and Pathology	30	15	
Second	II	Taxonomy	30	30	150
		Anatomy	30	15	
		Ecology	10	5	
		Economic Botany	10	5	
		Genetics & Plant Breeding	10	5	

Distribution of Marks for Practical Examinations

Main

Practical Examinations

Paper I	Anatomy	14 marks
	Morphology	6 marks
	Taxonomy	16 marks
	Economic Botany	10 marks
	Embryology	4 marks
	Total	50 marks
Paper II	Thallophyta	15 marks
	Bryophyta	10 marks
	Pteridophyta	20 marks
	Pathology	5 marks
	Total	50 marks
Paper III	Gymnosperms	12 marks
	Physiology	9 marks
	Ecology	6 marks
	Cytology	8 marks
	Genetics	15 marks
	Total	50 marks

Subsidiary Practicals :

Cryptogams	12 marks
Gymnosperms	6 marks
Pathology	3 marks
Taxonomy	10 marks
Anatomy	10 marks
Ecology	4 marks
Physiology	6 marks
Economic Botany	3 marks
Genetics	6 marks
Total	60 marks

(Annexure — A)

SYLLABUS — BOTANY MAIN

(Effective from 1981 admissions)

FIRST YEAR

Botany Main Paper I

ANGIOSPERM ANATOMY AND EMBRYOLOGY

Total 120 hrs.

Angiosperm Anatomy

Lecture : 45 hrs.

Practical : 45 hrs.

- 1 Cell as the unit of structure and function — Parts of a plant cell: (Mention briefly only) : a. Nucleus b. Cytoplasm c. Cytoplasmic organelles d. Vacuoles. e. Non-living inclusions (chemical structure not needed) 1 hr.
 - i) Reserve food materials : Carbohydrates — soluble and insoluble types: glucose, sucrose, inulin and starch.
Proteins : aleurone grains.
Oil droplets.
 - ii) Secretory substances : pigments, enzymes and nectar
 - iii) Byproducts of metabolism: Nitrogenous products — alkaloids
Non-nitrogenous products: gums, resins, essential oils and tannins.
Mineral crystals: Calcium oxalate: raphides and druses.
Calcium carbonate: cystoliths. 2 hrs.
- f. Cell wall:
 - i) Gross structure: middle lamella, primary wall and secondary wall; pits; bordered and simple; plasmodesmata and their functions.
 - ii) Chemical constituents: cellulose, pectic-compounds lignin, cutin, suberin, mucilage, minerals.
 - iii) Ultra-structure: micellar and inter-micellar systems; micro-and macro-fibrils and their arrangement.
 - iv) Growth of the cell wall — growth in surface area by intussusception and increase in thickness by apposition. 3 hrs.
- 2 Tissues: definition and kinds — meristematic and permanent tissues.
 - A. Meristematic tissues:
 - i) Structure, types and function.
 - ii) Organisation of root apdex: in dicots — common type with three sets of initials.

- In monocots — maize types with four sets of initials.
- iii) Organisation of the shoot apex and differentiation of tissues.
- iv) Theories on apical organisation: apical cell theory, histogen theory and tunica-carpus theory 6 hrs.
- B. Permanent tissues: Structure and function of
- a) Simple tissues: Parenchyma, collenchyma and sclerenchyma.
- b. Complex tissues: Xylem and phloem
- c. Secretory tissue:
- i) Glandular trichomes in *Ocimum* and *Nymphaea*.
- ii) Digestive glands in *Drosera* and *Utricularia*
- iii) Nectaries
- iv) Hydathodes
- v) Secretory cells, cavities and canals in *Cinnamon*, *Citrus* and *Coriandrum*.
- vi) Laticifers: Non-articulated and articulated types. 10 hrs.
- 3 Vascular bundles: Origin and types; Conjoint; Collateral and bicollateral; open and closed.
Concentric: amphivasal and amphicribal
Radial.
- 4 Distribution of permanent tissues as in the primary structures of:
- i) Dicot stem: *Centella* and *Eupatorium*.
- ii) Monocot stem: *Grass type* and *Asparagus type*
- iii) Dicot root. *Limnanthemum* or *Tinospora* and *Ficus*
- iv) Monocot root: Maize or *Rhoeo* and velamen root of *orchid*
- v) Leaf: Dicot: Normal bifacial type: *Ixora* or *Hibiscus* Monocot: Equifacial (*Crinum*) and grass type 10 hrs.
- 5 A. Normal secondary growth in dicot stem: sunflower type:
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; growth ring porous and diffuse porous woods; sap wood and heart wood, tyloses. 4 hrs.
- B. Normal growth in thickness in a dicot root — *Ricinus* 2 hrs.
- C. Periderm formation in stem and root: initiation, formation, structure and activity of the phellogen; structure and function of periderm; bark. 2 hrs.
- 6 Anomalous growth in thickness in the stems of *Bigonia* and *Dracaena* 3 hrs.

Embryology

Lecture : 15 hrs.
Practical : 15 hrs.

- 1 Structure and development of microsporangia; microsporogenesis; Pollen morphology; male gametophyte.

- 2 Structure and development of megasporangia; megasporogenesis; monosporic (*Polygonum*); bisporic (*Allium*) and tetrasporic (*Adoxa*) types. 5 hrs.
- 3 Fertilization; double fertilization; endosperm formation and development (nuclear type only) 4 hrs.
- 4 Development of dicot embryo (*Capsella* type) and monocot embryo (*Sagittaria* type). 2 hrs.

Practical

- 1 to make preparations of normal stems, roots and leaves and anomalous types included in the syllabus for microscopic study and to make labelled diagrams and identify them giving reasons.
- 2 to identify at sight tissues and cell contents mounted under the microscope.
- 3 to identify, make labelled sketches and write note of interest on preparations showing mature anther, pollen, embryo sac and embryo of angiosperms included in the syllabus.

Books for reference

- 1 Esau K.-Anatomy of seed plants-John Wiley and Sons 1960
- 2 Esau K.-Plant Anatomy do.
- 3 Eames A. J. & Mac Daniels L. H.-An Introduction to Plant Anatomy-Mc Graw Hill Book Company (International student Edition) 1953
- 4 Fahn A.-Plant Anatomy-Pergamon Press
- 5 Stover-Anatomy of seed Plants
- 6 Vasishta P. C.-A Text Book of Plant Anatomy-S. Nagin & Co. 1974
- 7 Sen D. N. Anatomy of Angiosperms do. 1976
- 8 Chandurkar P. J.-Plant Anatomy-India Book House
- 9 Foster A. S.-Practical Plant Anatomy-D. Van Nostrand 1949
- 10 Haberlandt G.-Physiological Plant Anatomy-Mac Millan & Co. Edition 1965
- 11 Gangulee Das & Dutt-College Botany Vol-I Central Book Agency 1961
- 12 Tayyl M. S.-Plant Anatomy-Rastogi Publications 1969
- 13 Pandey B. P.-Plant Anatomy-S. Chand & Co. Ltd. 1978
- 14 Cutter-Plant Anatomy-Experiment and Interpretation
- 15 Maheswari P.-Introduction to Embryology of Angiosperms. Mc. Graw Hill 1960
- 16 Eames A. S.-Morphology of Angiosperms-Mc Graw Hill 1961
- 17 Gupta & Varshnaya-Embryology of Angiosperms Kedarnath Ramnath-1960
- 18 Bhojawani & Bhatnagar-The Embryology of Angiosperms Vikas Publishing House 1974
- 19 Malathy Raghavan-Sasya Anatomy-Kerala Bhasha Institute 1973
- 20 Sharma and Aswathi Embryology of Angiosperms.

5	Lichen	
	Type : Usnea	3 hrs.
	Uses of Saccharomyces.	
	Penicillium, Agaricus and Lichens	2 hrs.
	Plant Pathology	
	Lecture	15 hrs.
	Practical	15 hrs.

Study of the following plant diseases with reference to the symptoms, causes, dissemination, control and preventive measures.

- 1 *Virus Disease* :
Leaf Mosaic disease of Tapioca
- 2 *Bacterial Disease* :
Citrus canker 1 hr.
- 3 *Fungal Diseases*
1 Blast disease of paddy
2 Nutfall of Areacanut
- 3 Grey leaf spot of coconut (Pestalotia Palmarum)
- 4 Abnormal leaf fall of Rubber (Phytophthora) 11 hrs.
Brief account of the following Fungicides.
Bordeaux mixture
Lime Sulphur
Ethyl mercury chloride 2 hrs.

Practical

Students should be trained to make micropreparations of vegetative and reproductive structures of the types mentioned, make labelled sketches and identify giving reasons.

They should be able to identify at sight the types mentioned above, or pathological specimens and write illustrated notes on them.

List of Books

- 1 Rangaswami G.—Diseases of Crop Plants in India. -- Prentice Hall of India. New Delhi.
- 2 Pandey and Trivedi — A Text book of Botany Vol. I — Vikas Publishing House.
- 3 Ghomawat, Kapoor, Narayana —
A Text Book of Algae — Ramesh Book Depot, Jaipur.
- 4 Dube — A Text book of Fungi, Bacteria and Viruses — Vikas Publishing House.
- 5 Gangulee. Das and Dutta — College Botany — Vol. I — General Book Agency, 1971.
- 6 Fuller and Tippe — College Botany.
- 7 Smith G. M. — Cryptogamic Botany Vol. I and II — McGraw-Hill
- 8 Fritsch F. E. — The Structure and Reproduction of Algae Vol I and II, Cambridge University Press.
- 9 Randhawa M. S. — Zygnemaceae — ICAR.

- 10 Pal, Kundu, Sunderlingam-Charophyta — ICAR
- 11 Fritsch F. E. — Manual of Phycology.
- 12 Wolf and Wolf — The Fungi Vol. I and II — John Wiley and Sons.
- 13 Gwynne Vaughan and Barnes — The Structure and Development of Fungi — Cambridge University Press.
- 14 Alexopoulos — Introductory Mycology — John Willy.
- 15 Alexopoulos and Bold — Algae and Fungi.
- 16 Watter and McBee — General Microbiology — East West Press-1969.
- 17 Sreevastava J. P. — An Introduction to Fungi.
- 18 Mundkur-Fungi and Plant disease — Macmillan.
- 19 Smith G. M. — Text Book of Plant Virus Diseases.
- 20 I. R. R. I Rice Blast Diseases-proceedings of a Symposium IBH Publishing Com.
- 21 Capoor S. P. Important Virus Disease of Field and Garden Crops in India and their control — ICAR
- 22 Rangaswami G — Bacterial Plant Disease in India-Asia Publishing House.
- 23 Mukundan Plant Protection, Principles and Practice — Asia Publishing House.
- 24 Mudaliar — South Indian Field Crops — Viswanathan & Co.
- 25 Menon and Pandalai — The Coconut Palm-Indian Central Coconut Committee.
- 26 Harrer A. E — Modern Banana Production — Leonard Hill, London.
- 27 Melhus and Kent-Elements of Plant Pathology-McMillian Co.
- 28 Butler and Jones-Plant Pathology — McGrew Hill.
- 29 Salk-Fundamental Principles of Bacteriology — McGrew Hill.
- 30 Pelezar and Ried-Microbiology — McGrew Hill.
- 31 A Text Book of Botany — Vol. I — Pandey S. N. — Vikas Publishing Co.
- 32 A Text book of Modern Plant Pathology-Bilgram and Dube-Vikas
- 33 Apushpi Sasyasastram-Vol. I, — Kerala Bhasha Institute, Trivandrum.

FINAL YEAR

Botany Main — Paper III

Bryophytes, Pteridophytes and Gymnosperms

Total — 150 hrs.

General Characters of the groups and structure, reproduction, life history, systematic position and affinities of the types mentioned below under each group.

Bryophytes

Lecture	15 hrs.
Practicals	15 hrs.

Riccia, Marchantia, Anthoceros and Funaria

Pteridophytes :

	Lecture		30 hrs.
	Practicals		45 hrs.
1	Psilophytales	Rhynia	
2	Psilotales	Psilotum	
3	Lepidodendrales	Lepidodendron	
		Lepidostrobus	
		Lepidocarpon.	
4	Lycopodiales	Lycopodium	
5	Selaginellales	Selaginella	
6	Equisetales	Equisetum	
7	Filicales	Pteris	
8	Marsileales	Marsillea	

Gymnosperms

	Lecture		15 hrs.
	Practicals		30 hrs.
1	Cycadefilicales	Lyginopteris (Whole plant)	
2	Cycadales	Cycas	
3	Coniferales	Pinus	
4	Gnetales	Gnetum	

Practical

Students should be trained:

- 1 to make micropreparations and labelled drawings of the type prescribed.
- 2 To identify at sight or after detailed study the types included.
- 3 To write illustrated explanatory notes on specimens prescribed.

Books for Reference:

1. Arnold — An Introduction to Palaeobotany—McGraw Hill 1947
2. Eames A. J. — Morphology of Vascular Plants — Lower Groups McGraw Hill.
3. Smith G. M. — Gryptogamic Botany Vol. II, McGraw Hill.
4. Smith G. M.—Apushpi Sasyasasthram translated by Gopinathan Nair, Kerala Basha Institute 1978.
5. Parihar N. S. — An Introduction to Embryophyta-Bryophyta. Central Book Depot. 1965
6. do- -do- Pteridophyta.
7. Dublish & Agarwal — A text book of Bryophytes
8. Vasishtha P. C.—Vascular Cryptogams - Pteridophytes.
9. Venkateswaralu V.— Bryophyta
10. Chopra G. L.—A class book of Bryophyta
11. Gupta S. K. - Introductory Botany Vol. II
12. Coulter & Chamberlain Morphology of Gymnosperms
13. Chopra C. I. - Gymnosperms
14. F. O. Bower—The Origin of a land flora

- 15 - do, -- Primitive land plants
 16 Darrah—Paleobotany
 17 Sporne - Morphology of Gymnosperms
 18 Chauhan D. K. S. Cryptogams
 19 Dutta R. C. An Introduction to Gymnosperms
 20 Watson—The Structure and life of Bryophyta
 21 Chamberlain—Gymnosperms—Structure & Evolution
 22 Verdoon—Manual of Bryology
 23 -do- —Manual of Pteridology
 24 Scotd T. H. - Studies in Fossil Botany Vol. I & II A & C Black
 Ltd.
 25 Rashid—An Introduction to Pteridophyta—Vikas Publishing
 House.
 26 Pandey, Misra & Trivedi—A text Book of Botany Vol II --Vikas
 Publishing House.
 27 T. U. Joseph & M. M. Appachan—Anavrtha Beejikal—Kerala
 Bhasa Institute.
 28 K. Gopinathan Nair—Bryophyta—Kerala Bhasa Institute.

Botany Main

Paper IV

Morphology, Taxonomy of Angiosperms and Economic Botany :
 Total 180 hrs.

MORPHOLOGY : (Lecture 15 hrs. and Practical 15 hrs.)

1 Inflorescence :

- (a) Racemose type
- (b) Cymose type
- (c) Mixed type

2 Flower :

Flower as a modified branch, flower parts, their arrangement, relative position, numerical plan, cohesion and addition, symmetry of the flower, aestivation types, placentation types, types of ovules, floral diagram and floral formula.

3 Fruits and Seeds :

- (a) Simple fruits
- (b) Aggregate fruits
- (c) Multiple fruits

Parts of Seeds - Dicot and Monocot, Endospermic and non-endospermic.

Taxonomy : (Lecture 60 and Practical : 60 hrs.)

- 1 Importance of Taxonomy, Binomial Nomenclature, Bentham and Hooker's system of classification.
- 2 Study of the following families with special reference to the morphology of modified parts if any and plants of economic importance.

Annonaceae, Nymphaeaceae, Sterculiaceae, Rutaceae, Meliaceae, Anacardiaceae, Leguminosae, Combretaceae, Myrtaceae, Lythraceae, Cucurbitaceae, Umbelliferae, Compositae, Sapotaceae, Apocynaceae, Asclepidaceae, Convolvaceae, Solanaceae, Scrophulariaceae, Acanthaceae, Verbenaceae, Amalantaceae, Euphorbiaceae, Urticaceae, Orchidaceae, Scitamineae, Liliaceae, Aroideae, Gramineae.

3 Herbarium technique :

Economic Botany : (Lecture 15 hrs. and Practical : 15 hrs.)

Study of economic importance of plants listed below, specifying the Botanical name, family, economic products, morphology of useful products and uses.

Cereals and Millets : - Paddy, Wheat and Ragi.

Pulses : - Black gram, Red gram, Bengal gram.

Fruits : - Mango, Banana, Jack and Pine apple.

Sugar Yielding plant : - Sugar cane.

Tuber crops : - Tapioca, Potato, Sweet potato and Elephant foot yam.

Spices, Pepper, cardamom, clove and cinnamon

Beverages : - Tea, Coffee and Cocoa

Oil yielding plants : Coconut, ground nut and gingelly

Medicinal plants : Rauwolfia, Vinca rosea; Cinchona and

Adhatoda.

Hardwoods and Light Woods : - Teak wood, Rosewood, Bombax and Ailanthus.

Fibre yielding plants : - Cotton, Coir and Jute

Latex : - Para Rubber

Gums and Resins : - White Damar, Gum arabic and Asafoetida

Practical : - 1 Students must be able to identify Angiosperm plants to their respective families with reasons; draw labelled diagrams of L. S. of flowers, construct floral diagram and floral formula and describe the plant in technical terms

2 Explain with reasons morphological peculiarities of parts of plants belonging to families included under Taxonomy

3 Identify at sight the Angiospermic specimens in the herbarium sheets.

4 Identify the economic products obtained from the plants mentioned under economic Botany.

Books for Reference

1 Rendle-A. B. - The classification of flowering plants.

Vol. I & II Cambridge University Press-1959

2 Lawrence H. M. - Taxonomy of Vascular Plants, Macmillan-1958

3 Hutchinson J. - Families of flowering plants Vol. I & II - Oxford

- 1959
- 4 Warming and Potter—Hand book of Systematic Botany
 - 5 Swingle—Plant classification—D. C. Heath 1946
 - 6 Benson L.—Plant classification—D. C. Heath 1946
 - 7 Heywood V. H.—Plnnt Taxonomy—ELBS & E Arnold Ltd. 1970
 - 8 Porter C. L. Taxonomy of flowering plants - Freeman—1967
 - 9 Pritis and Shital P. M.—An Introduction to the Taxonomy of Angiosperms—Vikas Publishing House - 1979
 - 10 Vasista P. C. Taxonomy of Angiosperms - Chand & Co.
 - 11 Chopra C. L.—Angiosperms - Nagin & Co.
 - 12 K. N. Rao & Krishna Moorthi—Angiosperms—S. Viswanathan
 - 13 Yengna Narayana Iyer—Field crops of India—Bangalore Printing & Publishing Co. 1950
 - 14 Pandey B. P. Economic Botany - M. c. Graw Hill - 1952
 - 15 Mudhaliar V. T. S. - Common cultivated crops of South India, Ananda Nilayam Private Ltd., Madras—1955
 - 16 Rober W. Shery - Plants for man - George Allen & Unwin Ltd.
 - 17 David Sunder Raj and Tulasidas—Botany of field crops Macmillan
 - 18 R. Vasudevan Nair—Sasya Vargheekarana Thathwagal—Kerala Bhasa Institute

BOTANY MAIN—PAPER V

Plant Physiology & Ecology

A—Plant Physiology

Total 180 hrs.

Lecture 90 hrs.
Practical 30 hrs.

I 1. *Water relations of plants*

Water Absorption

- a) Organs of absorption—Root and root hairs
- b) Membranes—Permeable, differentially permeable and impermeable
- c) Physical aspects of absorption—imbibition, diffusion and osmosis
- d) Plant cell as an osmotic system—osmotic pressure—Effective osmotic pressure, Turgor pressure, Wall pressure—Diffusion pressure deficit.
- e) Plasmolysis—significance.
- f) Mechanism of absorption of water—passive, active.
- g) Root pressure.

2 *Ascent of sap*

- a) Physical theories—Transpiration pull and Cohesion of water
- b) Vital theories - Root pressure.

- 3 *Loss of water from plants*
- a) Transpiration—cuticular, lenticular and stomatal—Mechanism—factors affecting Transpiration—significance of transpiration
 - b) Guttation 20 hrs.
- II *Mineral nutrition*
- a) Gross chemical Analysis—Essential elements major and minor elements
 - b) Role of essential elements
 - c) Culture methods—solution culture and sand culture—Hydroponics
 - d) Mechanism of mineral absorption
 - 1 Passive absorption—ion exchange—Donnan membrane Equilibrium
 - 2 Active absorption—carrier concept
- III *Enzymes—structure—properties—nomenclature and classification—Enzyme action—activators, cofactors, and coenzymes.* 3 hrs
- IV *Photosynthesis*
- 1 Photo synthetic apparatus
 - 2 Light—solar spectrum and its importance
 - 3 General Equation—Biological importance
 - 4 Mechanism of Photo synthesis—Raw materials—Light reaction—source of O_2 liberated—two pigment systems—cyclic and noncyclic photo-phosphorylations. Dark reaction—calvincycle Factors affecting—law of limiting factors.
 - 5 Products of photosynthesis—PGAL—Monosaccharides (glucose and fructose)—Disaccharides (sucrose) Polysaccharides (starch) 14 hrs.
- V. *Respiration*
- 1 Definition and general Equation
 - 2 Aerobic Respiration—Mechanism—Glycolysis Krebs cycle—Electron transport—terminal oxidation oxidative phosphorylation—factors affecting aerobic respiration.
 - 3 Anaerobic respiration—Alcoholic fermentation
 - 4 Biological significance—Energy relations of respiration.
 - 5 Respiratory Quotient and its significance. 14 hrs.
- VI *Nitrogen Metabolism*
- 1 Proteins—structure properties sources of Nitrogen Reduction of nitrates—Amino Acid synthesis—Protein synthesis (only peptide formation need be taught—No genetic code) break down of proteins.
 - 2 Nitrification Nitrogen fixation and denitrification—Nitrogen cycle—Rotation of crops.
- VII. *Fat Metabolism*
Definition—Types of fatty acids—synthesis of fatty acids from

acetyl co-enzyme - synthesis of Glycerol from dihydroxyacetone.
phosphate—fat break down Importance of fats. 5 hrs

VIII. *Translocation of solutes :*

Pathway of movement - Mechanism of Phloem transport
1 Pressure flow theory (2) Phloem streaming theory 4 hrs.

IX. *Growth and development*

- 1 Definition - phases of growth - measurement of growth factors affecting growth.
 - 2 Growth regulators Auxins, Gibberellins and Kinins Practical application.
 - 3 Photoperiodism and vernalisation (Brief treatment only) 10 hrs,
- X. Plant movements—Tropic and Nastic movements only 5 hrs.

Practical experiments for Demonstration

- 1 Thistle funnel osmoscope
- 2 Pfeffer's osmoscope
- 3 Potato or papaya petiole osmoscope.
- 4 Imbibition pressure by germinating seeds
- 5 Tissue tension
- 6 Root pressure
- 7 Suction force due to Transpiration
- 8 Foliar transpiration by using belljar
- 9 Transpiring surface 4 leaf experiment
- 10 Potometer—Farmer's, 'Ganong's
- 11 Darwin's porometer
- 12 Relation between Absorption and Transpiration
- 13 Evolution of oxygen in photosynthesis
- 14 Necessity of chlorophyll, light and carbondioxide in photosynthesis.
- 15 Measurement of photosynthesis by Wilmot's Bubbler
- 16 Simple respiroscope
- 17 Respirometer and Measurement of R. Q.
- 18 Anaerobic Respiration
- 19 Fermentation
- 20 Geotropism and phototropism using Klinostat
- 21 Hydrotropism
- 22 Measurement of growth—Arc and lever Auxonometers

B—Ecology - Lecture 30 hrs. practical 30 hrs.

- I Ecosystem the basic structural and functional unit of biosphere
- Components of the ecosystem.
 - a) Biotic—Autotrophs - producers—micro and macro
Heterotrophs - consumers—micro and macro—decomposers.
 - b) Abiotic (1) Materials—water, minerals atmospheric gases
(2) Energy—Light, stored energy in chemical bonds
- Flow of materials—Biological cycles

- Flow of energy - food chain, food web, trophic relationships, principles of thermodynamics, law of ten percent, simple energy flow diagram 10 hrs.
- II Ecological factors : Edaphic, climatic, biotic.
- Edaphic factors :-Mineral matter, organic matter, Types of soil - colloids (Humus and clay), cation exchange-soil PH-soil as a dynamic system (very brief)
- Climatic (a) Light - effect of light other than on photosynthesis factors. Stratification, photoperiodism.
- (b) Temperature - Difference in vegetation patterns—Tundra, Desert.
- (c) Water - Influencing vegetation—groups like hydrophytes, Mesophytes, Xerophytes—ecological adaptations in hydrophytes and xerophytes.
- Biotic factors : Inter relationships between organisms—symbiosis, commensalism, mutualism, parasitism, epiphytes, insectory—grazing. 15 hrs.
- III. Ecological succession—Definition and kinds—Hydrosere and xerosere. 4 hrs.
- IV. Applied Ecology (a) Conservation of Nature and Natural resources soil, water, forest, threatened plants and animals
- b) Environmental pollution—Kinds, causes dangers - Pollution control.

Practicals

- 1 Study of aquarium as an ecosystem
- 2 Examination of pond water to identify producers and consumers
- 3 Construction of food chain from given organisms
- 4 Identification and study of symbiosis, parasitism and commensalism.

Books for reference

- 1 General Biochemistry by Fruton & Simmonds—Asia publishing House 1958.
- 2 The Bio chemistry of Green plants by David W. Krogmann
Prentice-Hall of India—1979
- 3 Plant Physiology by Meirion Thomas—J & A Churchil Ltd.
London
- 4 Plant Phssiology by Miller E. C.—Mc Graw Hill Co. New York
1938.
- 5 Plant Physiology by B. S. Meyer and Anderson D. Van Nostrang
Co. 1960
- 6 Laboratory Plant Physiology " " " " 1966
- 7 Plant Physiology by Devlin R. M.—van Nortrand East West
Edn. 1966.
- 8 Cell Physiology by Giese A. C.—W. B. Saunders Co. 1962

- 9 Plant Growth and development by Leopold A. C. McGraw Hill Book Co. 1964
- 10 An introduction to Plant Physiology by Curtis O. F. & D. G. Clerk Mc Graw Hill Book Co. 1950
- 11 Introduction to Plant Physiology by Lewit -C. V Mosly-1969.
- 12 Plant Physiology by F. B. Salisbury & C. Ross—Prentice/Hall of India 1974.
- 13 Introduction to plant Physiology by G. R. Noggle & G. J. Fritz-Prentice Hall of India 1977
- 14 Plant Physiology by Amar Singh -Asia Publishing House 1967
- 15 Mineral Nutrition in plants by Trong -Oxford & IBH 1967
- 16 Photosynthesis by Rabinowich Govindjee - Wiley Easter 1970
- 17 The physiology of Growth & Development by Wilkins McGraw Hill—1969
- 18 Principles of Plant Physiology by Bonner & Galston - Freeman & Co. 1962
- 19 Text Book of plant Physiology by Verma V.—Emkay publishing 1976
- 20 Text Book of plant Physiology of Kochar P. L. Atmaram & Sons 1965
- 21 Out lines of Plant Physiology -By Rao Partha & Rao Chand & Co. 1977
- 22 Plant Physiology by Pandey & Sinha Vikas Publishing 1976.
- 23 Essentials of Plant Physiology by Stafford Heineman 1958
- 24 The Structure and function of Emzymes by Berhard—W. Benjamin
- 25 Nitrogen Metabolism in Plants by Webster-Harper Vol. I 1962
- 26 Respiratory metabolism in plants by Beevers Harper Vol. II 1969
- 27 College Botany Vol. I by Gangule Das & Dutta Central Book Agency
- 28 Physiology By I. M. Scaria & Mathew Thamarakad, Kerala Bhasha Institute
- 29 Concepts of Ecology By Kormondy—Prentice/Hall
- 30 Ecological work book by Misra R. Oxford IBH 1968.
- 31 Indian Manual of plant Ecology—By Misra & Puri
- 32 Fundamentals of Ecology by Odumn—Saunders & Co.
- 33 Plants and Environments By Daubenmire -Willy Eastern 1968
- 34 Text book of Plant Ecology By Verma V.- Embkay Publns. 1975
- 35 Soil -Plant Relationships By C. A. Black -Wiley Eastern 1968
- 36 Ecology E. P. Odum—Prentice Hall
- 37 Fundamentals of Ecology E. P. Odum Saunders & Co.,
- 38 Text Book of Plant Ecology—Verma, Emkay Publications
- 39 Ecology—Ambasht
- 40 Modern Concepts in Ecology - H. D. Kumar, Vikas Books
- 41 Ecology Michael Allaby—Hamlyn Book
- 42 Paristhi Vighanam N. Balakrishna Nair, Kerala Bhasha Institute
- 43 Ecology—Dev, Rastogi, Publications

- 44 Paristhithi Sumrekshnam - K. N. P. Kurup
Kerala Sastra Sahytha Parishath
- 45 Threatened Plants - S. K. Jain & Sastry, Botanical Survey of
India
- 46 Silent spring - Rachael Carlson

BOTANY MAIN—PAPER VI

Cytology, Genetics, Plant Breeding & Evolution

1 CYTOLOGY (45 hours lectur & 30 hours practical)

- 1 The Cell:- Ultra structure and functions of the following organelles. Cell membrane, Endoplasmic reticulum, Ribosomes, Mitochondria, Plastids, Golgi, Lysosomes 4 hrs
- 2 Cytoplasm - Hyaloplasm - Vacuole - Cell sap 1 hr.
- 3 Nucleus—Nuclear envelope - Nucleolus 2 hrs.
- 4 Nucleic acids - (a) RNA types, structure, and chemical organization 4 hrs.
(b) DNA—structure, Watson Crick model, Replication 4 hrs.
- 5 Nuclear Divisions - Mitosis Meiosis 9 hrs
- 6 Chromosomes—Morphology—fine structure Chemical organization 4 hrs
- 7 Special types of chromosomes - Salivary gland chromosomes 2 hrs
- 8 Chromosomal aberrations - Deletion, Duplication, Translocation, and Inversion 5 hrs
- 9 Chromosome number and ploidy 6 hrs
- 10 Radiation Cytology: (a) Ionizing and non-ionizing radiations
(b) Isotopes and their applications;
(c) Biological, Physiological, Mutational and chromosomal effect; Radiation hazards 4 hrs.

2 GENETICS (90 hrs. lecture & 30 hrs. Practical)

- 1 Genetics - Heredity—Variation—Inheritance - terms explained 1 hr.
- 2 Gregor Johann Mendel—short life sketch—his experiments with pea characters chosen - his observations and conclusions—formulation of the fundamental principles of Heredity - Monohybrid and Dihybrid crosses, Reciprocal and Test crosses - Mendelian Ratios - Mandel's success 8 hrs.
- 3 Genetics after Mendel - Modifications in Mendelion Ratios:
 - a) 1: 2: 1, Incomplete dominance - Flower colour in Mirabils 1 hr.
 - b) Gene Interactions - 12: 3: 1 ratio Dominant Epistasis—fruit colour in Summer squash 2 hrs.
 - c) 9: 3: 1 Recessive epistasis coat colour in mice 1 hr.

- d) 9: 6: 1 Quantitative Inheritance—ear size in corn 1 hr.
 e) 9: 7 Complementary genes flower colour in Lathyrus 1 hr.
 f) 13: 3 Inhibitory genes Leaf colour in Paddy 1 hr.
 g) 9: 3: 3: 1 Non-epistatic interaction—Comp pattern in fowls 1 hr.
- 4 Multiple Alleles (a) Blood groups in man; (b) Self sterility in Nicotiana 5 hrs.
- 5 Chromosome theory of Heredity 5 hrs.
- 6 Sex anomalies (a) XX-XY system, (b) XX-XO system 5 hrs.
- 7 Sex anomalies (a) Klinefelter syndrome, (b) Turner syndrome 4 hrs.
- 8 Sex-linked Inheritance:
 a) Colour blindness in Man;
 b) Eye-colour in Drosophila 4 hrs
- 9 Holandric genes 1 hr.
- 10 Lethal genes—(a) Albinism in Corn;
 a) Haemophilia in the human 2 hrs.
- 11 Linkage and crossing over-its genetic importance 5 hrs.
- 12 Extra nuclear Inheritance –general account - Plastid inheritance in Mirabilis 5 hrs.
- 13 DNA as genetic material--Genetic code 7 hrs.
- 14 Gene action—one gene one enzyme hypothesis - protein synthesis-Operon concept - Steps in artificial synthesis of a gene 12 hrs.
- 15 Mutations - (a) mutations - molecular basis of mutation,
 (b) Spontaneous mutations,
 (c) Induced mutations, Mutagenic agents 10 hrs.
- 16 Microbial genetics - (a) Bacterial Transformation—Conjugation, and Transduction
 (b) Bacteriophages structure and reproduction of their genetic material 8 hrs.

3 PLANT BREEDING (15 hours lecture)

- 1 Objectives in Plant Breeding 1 hr.
 2 Methods of Crop Improvement (a) Plant introduction and Acclimatization 1 hr.
 (b) Selection - Mass selection—Pure line selection--Clonal selection 3 hrs.
 (c) Hybridization 2 hrs.
 3 Heterosis - its exploitation in plant breeding 2 hrs.
 4 Mutation breeding and polyploidy breeding 4 hrs.
 5 Breeding for disease resistance 1 hr.
 6 Seed improvement, its maintenance and testing 1 hr.

4 Evolution (30 hours lecture)

- 1 Origin of life-abioc synthesis of organic matter, experiments of of Miller and Sydney Fox-Chemical and biological phases of evolution parallel and convergent evolution — Progressive and and retrogressive evolution 10 hrs.
- 2 Evidences of Evolution — (a) Fossil evidence—geological eras—fossil forms, (b) Morphological evidence, (c) Anatomical evidence, (d) Vestigeal organs, (e) Geographical distribution (f) Comparative Physiology, (g) Adaptive Radiations 4 hrs.
- 3 Theories of Evolution-Lamarck, Darwin, Weismann and De Vries 8 hrs.
- 4 Neo-Darwinism-Mechanism of Evolution-Isolation-Genetic drift Mutation speciation 8 hrs.

Practical:

- 1 Students should make acetocarmine squash preparations of onion root tips and identify the different stages of mitosis.
- 2 They should work out simple genetic problems in monohybrid and modified ratios.

Books for Reference:

- 1 Cohn-1964 Elements of Cytology — Harcourt Brace & World
- 2 Wilson G. B. & Morrison J. H. — East West Press 1973
- 3 Swanson-1960 Cytology and Cytogenetics-Prentice Hall
- 4 De Roberties et all-1965-Cell Biology-Saunders
- 5 Lowoy & Siekevitz-1963 Cell Structure and Function-Holt Rinehart and Wintson.
- 6 Sinnott, Dunn and Dobzhansky-1958 Principles of Genetics — McGraw Hill
- 7 Singleton-1962 Elamentary Genetics-Van Nostrand.
- 8 Levice-1967 Introduction to Genetics and Cytogenetics-John Wiley.
- 9 Levine K. P. Genetics-Holt, Rinehart & Winston.
- 10 Rilley-1967 Introduction to Genetics and Cytogenetics John Wiley.
- 11 T. G. Raveendranath — Principles of genetics — Kerala—Bhasha Institute.
- 12 Mathew Thamarakkad — Gene action — Kerala Bhasha Institute.
- 13 Winchester-1969 Genetics Oxford.
- 14 Altenberg-1970 Genetics Oxford
- 15 Swanson — The Cell-Prentice Hall
- 16 Herskowitz — 1962 Genetics Little Brown
- 17 Gardner — 1962 Genetics-John Willey
- 18 Snyder — David 1957 — The Principles of Heredity Health

- 19 Crow-1963 — Genetics Notes Purgess Publishing Co.
- 20 Allard 1960 — Principles of Plant Breeding-Oxford
- 21 Hayes et al-methods of Plant Breeding-Oxford
- 22 Briggs and Knowles 1937 — Introduction to Plant Breeding — Reinhold
- 23 Monroc W. strick Bergev — Genetics-Mecmillan & Co.
- 24 Chaudhari-Elementary Principles of Plant Breeding-Oxford
- 25 Krishnaswami & Parthasarathy 1965-Cytogenetics and Plant Breeding-Varadachary
- 26 K. Rajappan 1978 Principles and methods of Plant Breedings.
- 27 W. J. C. Lawrence — Plant Breeding-Edward Arnold 1968
- 28 Bhandari. — Practical in Plant Breeding-Oxford & IBH Publishing Co.,
- 29 Savage-1963 Evolution-Holt Rinehart & Winston.
- 30 Oparin 1957 — The Origin of Life-Academic press.
- 31 Huxly 1963 — Evolution The modern Synthesis-Allen & Unwin.
- 32 Stebbins 1950 — Variation and Evolution in Plants-Oxford
- 33 Dobzhansky 1968 — Genetics and Origin of Species —
- 34 Haldane 1960 — The causes of Evolution Cornel University Press
- 35 Parinamam — Kerala Bhasha Institute

The student should do field work under supervision for a minimum period of ten days to gain first hand knowledge of plants growing under different environmental conditions and submit a record of field work in the form appended below:—

No. for the plant :
 Name of the Plant :
 Family :
 Locality :
 Habit :
 Other features of interest :

At the end of the field book a brief note on the vegetation of the place visited should be given.

He should also prepare after field study under supervision a herbarium containing a representative collection of not less than 50 plants correctly identified.

Laboratory records, record of field work and herbarium should be certified by the Head of the Department and submitted on the first day of the practical examinations. Marks allotted for the Herbarium will be awarded to candidates only on production of a certificate from the Head of the Department to the effect that the student has done field work under supervision for a minimum period of ten days.

First Year B. Sc. Degree Examination

Subsidiary — Botany

SYLLABUS

(Effective from June 1981 admissions)

(Total 60 lecture + 60 Prl. hrs.)

Paper I (Cryptogams, Gymnosperms, Plant Physiology and Plant Pathology)

- 1 *Cryptogams and Gymnosperms* (30 lecture + 45 practical)
General classification of plant kingdom—Main features of structure, life history and evolutionary relationships of the following groups in general and the General in particular. (Developmental details need not be taught)

A *Thallophyta:*

Bacteria	Brief general account		
Algae	Cyanophyceae	Nostoc	
	Chlorophyceae	Chlamydomonas, Volvox, Oedogonium, Cladophora.	
	Phaeophyceae	Ectocarpus	
	Rhodophyceae	Polysiphonia	10 hrs.
Fungi	Phycomycetes	Pythium	
	Ascomycetes	Peziza	
	Basidiomycetes	Puccinia	5 hrs.
	Lichens	Usnea	1 hr.

- B Bryophyta Riccia and Funaria 4 hrs
C Pteridophyta Selaginella and Pteris 6 hrs
D Gymnosperms Pinus 3 hrs

- 2 *Plant Physiology:* (25 lecture + 12 practical)

Water relations of Plants — Active and passive absorption — Transpiration — Ascent of Sap, (Transpiration pull, and cohesion theory only) 5 hrs.

Mineral nutrition — Chemical composition of plants — mineral elements necessary for plant growth (micro and macronutrient elements) — Their general roles 2 hrs

Enzymes — Brief account and their mode of action 1 hr.

Photosynthesis — Calvin's cycle — factors affecting law of limiting factors 6 hrs

Respiration — Aerobic respiration — Glycolysis — Krebs cycle — fermentation 6 hrs

Nitrogen Metabolism — Amino acid formation — protein synthesis — Nitrogen fixation and Nitrification 2 hrs

Growth and movements — Brief account of growth and development — Hydrotropism, Geotropism and Phototropism.

Experiments for Demonstrations

- a) Thistle Funnel osmoscope expt
- b) Expt. to demonstrate root pressure
- c) Expt. to demonstrate suction force due to transpiration
- d) Expt. to demonstrate foliar transpiration (bell jar Expt)
- e) Expt. to show relation between transpiration and absorption
- f) Expt. to measure rate of transpiration (Ganong's potometer)
- g) Expt. to measure rate of transpiration (Farmer's potometer)
- h) Expt. to demonstrate evolution of O_2 in photosynthesis
- i) Expt. with light screen
- j) Moll's experiment
- k) Expt. with variegated leaf
- l) Expt. with simple respiroscope
- m) Expt. to determine the value of R. Q. with Ganong's respiroscope
- n) Expt. to demonstrate anaerobic respiration
- o) Expt. with klinostat

3 *Plant Pathology*: (5 hrs. lecture + 3 hrs. practical)

Study of the following diseases with particular references to Pathogens, Symptoms, methods of spreading and control measures.

- a) Blast disease of Paddy
- b) Nut fall of Arecanut
- c) Bunchy top of Banana

5 hrs.

SECOND YEAR

BOTANY SUBSIDIARY PAPER II

Taxonomy, Anatomy, Ecology, Economic Botany, Genetics & Plant Breeding (Lecture 90 Hrs. + Practical 60 hrs.)

Taxonomy of Angiosperms (Lecture 30 Hrs. + Practical 30 hrs.)

Importance of classification—Binomial nomenclature—system of Bentham and Hooker—Study of the following Families 4 hrs.

Annonaceae, Rutaceae, Leguminosae, Umbelliferae, Compositae, Apocynaceae, Solanaceae, Euphorbeaceae, Liliaceae and Gramineae. 26 hrs.

Economic Botany—Lecture 10 Hrs. + Practical 5 hrs.)

Study of the economic importance of the plants with special reference to their economic products, morphology of the useful parts and uses.

Paddy, Wheat, Bengal gram, Green gram, Cotton, Tea, Coffee, Pepper, Cardamom, Rubber, Tapioca, Coconut, Catherandus (*Vinca rosea*) and Rawolfia. 10 hrs.

Anatomy—(Lecture 30 Hrs. Practical 15 hrs.)

Electron microscopic studies on plant cell wall-micellar and inter-

micellar system—Microfibrillar and Microcapillary system—Development of Cell wall—middle lamella—

Pits	— Simple and bordered	
Tissues	— Meristematic and permanent—Meristem—Meristem based on origin—primary and secondary. Meristem based on position—apical, intercalary and lateral—structure of mature root and stem apex.	
Xylem	— Structure and functions	
Phloem	— Structure and functions	
Epidermis	— Stomata—Structure, positions and functions	10 hrs.

Vascular bundles—types of vascular bundles—collateral, bicollateral, concentric and radial

2 hrs.

Primary structure of root and stem

2 hrs.

Growth in thickness in dicot stem, and dicot root—

Growth ring—spring and autumn wood—periderm—lenticel

8 hrs.

Leaf—structure—Dicot and Monocot leaf

4 hrs.

Ecology—(Lecture 10 Hrs. + Practicol 5 hrs.)

Principles of Ecology—Ecosystems—Biotic and abiotic

1 hr.

Ecological factors—Climatic, Edaphic and Biotic

4 hrs.

Plant succession—Hydrosere and xerosere

2 hrs.

Study of the following plant groups with special reference to their morphological, anatomical and Physiological adaptations—Hydrophytes, Xerophytes, epiphytes and parasites.

3 hrs.

Genetics and plant breeding (Lecture 10 Hrs. + Plant Breeding 5 Hrs.)

Heredity and variation

Laws of Mendel—Monohybrid & Dihybrid ratios—incomplete dominance.

Chromosome theory of heredity—Determination of sex—Sex Chromosomes.

Objectives in plant breeding—breeding methods—selection—Mass selection—pure line selection—Hybridisation

10 hrs.

PRACTICAL

Students have to submit on the day of the practical examination a laboratory Record of their Practical work certified as Genuine by the Head of the Department of Botany.

Students should be able to make, examine and identify micro-preparations of Cryptogamic and Gymnosperm specimens and their parts. They should be able to identify Pathological specimens by observing the symptoms. Students should be able to refer the flowering plants to their respective families, assigning reasons.

Students are expected to prepare stained transverse sections of monocot and dicot stems, roots and leaves. Students should be familiar with the economic products, source plants, and morphology of the useful parts. They should be able to explain with suitable diagrams the working of simple experiments set up to demonstrate the various physiological phenomena. Simple genetical problems in monohybrid and dihybrid ratios may be worked out for genetics practical (This need not be tested in the practical examination). They should be able to identify and explain ecological modifications of plant groups mentioned in the Syllabus.

Structure and function of stem - 10 hrs
 Structure and function of root - 10 hrs
 Vascular bundles - types of vascular bundles - collateral, bicollateral, concentric and radial - 2 hrs
 Primary structure of root and stem - 2 hrs
 Growth in thickness in dicot stem and dicot root - 8 hrs
 Growth ring, spring and autumn wood - secondary - 4 hrs
 Leaf - structure - Dicot and monocot leaf - 1 hr
 Ecology - (Lecture 10 hrs + Practical 2 hrs)
 Principles of Ecology - ecological factors - biotic and abiotic - 4 hrs
 Ecological factors - Climate, Light and Soil - 2 hrs
 Plant succession - 2 hrs
 Study of the following plant groups with special reference to their morphological, anatomical and physiological adaptations - 10 hrs
 Gymnosperms - 2 hrs
 Angiosperms - 2 hrs
 Genetics and plant breeding - 10 hrs + Plant Breeding 2 hrs
 Heredity and variation - 10 hrs
 Laws of heredity - Monohybrid & Dihybrid ratios - incomplete dominance - 10 hrs
 Chromosome theory of heredity - Determination of sex - 2 x 2 hrs
 Objectives in plant breeding - breeding methods - selection - Mass selection - pure line selection - Hybridization - 10 hrs

PRACTICAL

Students have to complete on the day of the practical examination a laboratory report of their practical work, compiled as follows by the head of the Department of Botany.
Students should be able to make drawings and identify various structures of Cystopteris and Elodea in the laboratory and their parts. They should be able to identify anatomical structures by observing the specimens. Students should be able to refer to the following plants to their respective families, assigning reasons.