

NATIONAL UNIVERSITY



Syllabus Subject: **Botany**

Three Years B.Sc. Pass Course
Effective from the Session: 2013–2014

National University
Subject: Botany
Syllabus for Three Year B.Sc. (Pass) Course
Effective from the Session: 2013-2014

Paper Code	Paper	Paper Title	Marks	Credits
First Year				
113001	Paper-I	Microbiology, Physiology, Mycology	100	4
113003	Paper-II	Higher Cryptogams, Gymnosperms, Plant Pathology	100	4
Second Year				
123001	Paper-III	Angiosperms, Economic Botany, Anatomy, Embryology, Paleobotany	100	4
123003	Paper-IV	Biodiversity, Conservation, Ecology, Environmental science & Cytology	100	4
Third Year				
133001	Paper-V	Plant Physiology, Phytochemistry Agronomy and Horticulture	100	4
133003	Paper-VI	Genetics, plant Breeding, Evolution, Biotechnology and Biostatistics.	100	4
133004	Paper-VII	Practical	100	4
		Total =	700	28

Detailed Syllabus

First Year

Paper Code	Paper	Paper Title	Marks	Credits
113001	Paper-I	Microbiology, Physiology, Mycology	100	4

Microbiology

Marks: 40

- (i) Introduction, contribution of eminent scientists in the field Microbiology.
- (ii) Introduction, characteristics and reproduction of Prions, Viroids, Rickettsia and Mycoplasma.
- (iii) Viruses: Definition, biological nature, physical and chemical structure, multiplication, transmission and economic importance.
- (iv) Bacteria: Introduction, classification, structure, multiplication and economic importance.

Phycology

Marks: 30

- (i) Habit and habitats, classification, general structures, reproduction and economic importance of Algae.
- (ii) Salient feature of Cyanophyceae, Chlorophyceae, Xanthophyceae, Bacillariophyceae, Phaeophyceae and Rhodophyceae.
- (iii) Life histories of *Anabaena*, *Oedogonium*, *Vaucheria*, *Sargassum* and *Polysiphonia*.

Mycology:

Marks: 30

- (i) Introduction, general characteristics, classification, structure and economic importance of Fungi.
- (ii) Life histories of *Synchytrium*, *Pythium*, *Saccharomyces*, *Penicillium*, *Puccinia*, *Agaricus* and *Fusarium*.
- (iii) Lichens: Habit and habitats, classification, structure and importance.

Paper Code	Paper	Paper Title	Marks	Credits
113003	Paper-II	Higher Cryptogams, Gymnosperms, Plant Pathology	100	4

A. Higher Cryptogams

Marks: 40

Bryophyta

- (i) Introduction, salient features of Hepaticopsida, Anthoceropsida and Bryopsida with examples.
- (ii) Life history of *Marchantia*, *Pelia*, *Anthoceros* and *Sphagnum*.

Pteridophyta

- (i) Introduction, salient features of Psilopsida, Lycopsida, Sphanopsida and Pteropsida with examples.
- (ii) Life histories of *Lycopodium*, *Selaginella*, *Ophioglossum* and *Marsilea*.

B. Gymnosperms

Marks : 20

- (i) Introduction, general characteristics, modern classification and economic importance.
- (ii) Life histories of *Cycas* and *Gnetum*

C. Plant Pathology:

Marks: 40

- (i) Introduction, scope and importance of plant diseases.
- (ii) Classification of plant diseases.
- (iii) Stages in the development of plant diseases: Inoculation, penetration, infection, growth and reproduction, dissemination, overwintering and oversummering of the pathogens.
- (iv) Causal organisms, symptoms, etiology and control measures of the following plant diseases:
 - a) Brown spot of rice, b) Late light of potato, c) Stem rust of wheat, d) Stem rot of jute e) Tikka disease of ground nut.

Second Year

Paper Code	Paper	Paper Title	Marks	Credits
123001	Paper-III	Angiosperms, Economic Botany, Anatomy, Embryology, Paleobotany	100	4

Angiosperms

Marks: 40

- b) Morphology of flowers, types of inflorescence and fruits.
- c) Definition, scope, units of Classification, nomenclature, preparation of herbarium sheets; Artificial (Linnaeus), natural (Benthum and Hooker.) and phylogenetic. (Engler and Prantle) systems of classification, merits and demerits of these systems.
- d) Magnoliopsida (Dicot): Nymphaeaceae, Rutaceae, Cucurbitaceae, Apocynaceae, Rubiaceae and Lamiaceae.
- e) Liliopsida (Monocot): Amaryllidaceae and Aracaceae

Economic botany

Marks: 20

- a) Scientific and local names, parts used and importance of 10 plants of each of the following group: food grains, pulses, medicines, rubber, oil, spices and timber yielding plants.
- b) Tea and rubber: Cultivation and processing.

Anatomy**Marks: 15**

- a) Origin and differentiation of apical meristem, tissues and tissue systems.
- b) Distribution of mechanical tissues, normal secondary growth in dicot stem and dicot root and root-stem transition.

Embryology**Marks: 15**

- a) Introduction, sporogenesis and gametogenesis, fertilization.
- b) Development of embryo and endosperm in dicot plant, seed and fruit formation.

Palaeobotany**Marks: 10**

- (a) Definitions and scope of Palaeobotany,
- (b) Types of fossils and fossilization processes.
- (c) Geological era; appearance and extinctions of the life forms in different geological periods.

Paper Code	Paper	Paper Title	Marks	Credits
123003	Paper-IV	Biodiversity, Conservation, Ecology, Environmental science & Cytology	100	4

Biodiversity and Conservation**Marks: 20**

- (i) Definition and elements of biodiversity; causes and losses of biodiversity; rare, vulnerable, threatened and endangered species of Bangladesh.
- (ii) Definition and types of conservation, principles of conservation, advantages and disadvantages of *in situ* and *ex-situ* conservation; conservation in botanic gardens and seed banks; role and activity of IUCN, WWF and CITES.

Ecology**Marks: 40**

- (i) Definition and scope of ecology, climatic, topographic and biotic factors.
- (ii) Salient features of hydrophytes, xerophytes and halophytes.
- (iii) Plant succession: Causes and types, hydrosere, xerosere.
- (iv) Structure and function of ecosystems (Sundarban forest).
- (v) Food chain, food web and ecological pyramids.
- (vi) Phytogeographical regions of Bangladesh.

Environmental Science**Marks: 20**

- i) Definition and components of the environment
- ii) Pollution: Air, water and sound pollution, causes and effects of pollution on plants and animals and their remedies.
- iii) Green house effect: Sources and effects of green house gases, ozone layer depletions.
- iv) Population growth and its impact on nature

Cytology**Marks 20**

- (i) Introduction, definition and scope of Cytology, concept of prokaryotic and eukaryotic cells.
- (ii) Ultra structure of eukaryotic cell; detailed structure and function of cell organelles (chloroplast, mitochondria, ribosome, endoplasmic reticulum and nucleus).
- (iii) Physical and chemical structure of chromosome.
- (iv) Meiotic cell division and its significance.

Third Year

Paper Code	Paper	Paper Title	Marks	Credits
133001	Paper-V	Plant Physiology, Phytochemistry Agronomy and Horticulture	100	4

Plant Physiology

Marks: 40

- (i) Absorption of water: Mechanism of absorption of water and nutrients by roots and ascent of sap.
- (ii) Essential mineral elements: Essential elements, deficiency symptoms in plants.
- (iii) Photosynthesis: Pigment systems, photophosphorylation and the fixation of CO₂ through C₃ and C₄ pathways, factors affecting the rate of photosynthesis.
- (iv) Respiration: Mechanism of aerobic and anaerobic respiration and fermentation, respiratory quotient, factors affecting respiration.
- (v) Plant growth regulators: Classification with examples, application of plant growth regulators
- (vi) Physiology of flowering: Photoperiodism and vernalization.
- (vii) Dormancy of seeds: Nature, causes and removal of seed dormancy, viability of seeds.

Phytochemistry

Marks: 30

- (i) Nitrogen metabolism: Nitrogen fixation and nitrogen cycle.
- (ii) Carbohydrates: Classification, common carbohydrates found in plants.
- (iii) Amino acids: Classification, structure and synthesis of amino acids.
- (iv) Vitamins: Definition, origin, types and deficiency diseases caused by Vitamin-A, B, B₂ and C
- (v) Enzymes: Definition, nomenclature, classification with examples, mechanism of action.

Agronomy and Horticulture

Marks: 30

- (i) Definition and scope of Agronomy and Horticulture, classification of field crops.
- (ii) Seeds: Characteristics of a good seed, procurement, quality of seeds, seed treatment.
- (iii) Fertilizers: Definition, classification of fertilizers, composition, dosage, application time and procedure.
- (iv) Crop rotation: Significance, common weeds and their control.
- (v) Preparation of seed bed, sowing and seedling growth; pre-and post-transplanting care.
- (vi) Cultivation of tomato, mango and rose.

Paper Code	Paper	Paper Title	Marks	Credits
133003	Paper-VI	Genetics, plant Breeding, Evolution, Biotechnology and Biostatistics.	100	4

Genetics

Marks: 30

- (i) Mendelism, exceptions of Mendel's laws.
- (ii) Linkage and crossing over; Linked genes and recombination of linked gene.
- (iii) Biochemical structure of DNA and RNA; replication of DNA
- (iv) Mutation: Definition, types of mutation and mutagens, detection of mutation in *Drosophila* by CIB method.

- (v) Sex determination: Different methods of sex determination with examples (XX-XO type, XX-XY type)
- (vi) Polyploids and their economic importance plant breeding and evolution

Plant Breeding and Evolution

Marks: 30

- (i) Introduction: Definition, scope and objectives of Plant Breeding.
- (ii) Hybridization: Objectives and techniques of artificial hybridization.
- (iii) Breeding techniques in self pollinated crops: Methods, merits and demerits of pure line selection and pedigree method.
- (v) Theories of evolution, Darwins theory, Lamarck's theory and mutation theory of evolution.

Biotechnology

Marks: 20

Definition, scope, importance and achievements of biotechnology.

Plant tissue culture: Direct and indirect methods of *in vitro* culture, culture medium, production of disease free plants and commercial aspects of tissue culture.

Biogas technology: Production methods and uses.

Biofertilizers: Definition, production methods and uses.

Biostatistics

Marks: 20

- (i) Definition and scope of biostatistics, idea of continuous and discontinuous variables, concept of population and sample.
- (ii) Parameters of measures of central tendency (mean, mode, medium) and dispersion (range, variance, standard deviation and co-efficient of variation).

Books Recommended:

Microbiology:

1. Brock, T.D., W.S. David and T.M. Michael : 1984. Biology of Microorganisms. Prentice-Hall Engle Wood, Cliffs, New Jersey.
2. Dubey, R. C. and D. K. Maheshwari : 1999. A text book of Microbiology. S. Chand and Co. Ltd.
3. Frobisher, M., R.D. Hinsdill, K. T. Grabtree and C.R. Goodheart: 1947. Fundamentals of Microbiology (9th ed.). W.B. Saunders Co. London.
4. Pelczer, M.J., E.C. Chan and N.R. Krieg: 1993. Microbiology: Concepts and Application. McGraw Hill Book Co. Inc. New York.
5. Tortora, G.J., B.R. Funke and C. L. Case: 1997. Microbiology (6th ed.) Addison Wesley Longman, Inc., California.
6. Bmjvg, Gg. iwdKzj, wgwni jvj mvnv Ges
Gg. G. evmvi : 2004. AbyRxe weÁvb, nvmvb eyK nvDR, XvKv|
7. Lvb. G. G. : 2000. gvB†µvev†qvjwR, †`vjb Pvcv, KvRx cÖKvkbx, XvKv|

Phycology:

1. Bold, H.C. and M.J. Wynne : 1978. Introduction to the Algae, Prentice Hall, India.
2. Chapman, V. J. and D. J. Chapman: 1983. The Algae, Macmillan, London.
3. Fritsch, F.E. : 1946. The Structure and Reproduction in Algae. Vol. I, Cambridge Univ. Press, London.
4. Lee, R.R. : 1989. Phycology, Cambridge Univ. Press, U.K.

5. Prescott. C.W. : 1968. The Algae: A review. Thomas Nelson, London.
6. Smith, G.W. : 1950. The Fresh Water Algae of the United States. McGraw Hill Book Co. Inc., New York.
7. Van dan Hoek, C.D.G. Mann and H. M. Johns: 1966. Algae: An Introduction to Phycology, Cambridge Univ. Press.
8. Lvb. G. G. : 2000. gvB†µvev†qvjwR, †`vjb Pvcv, KvRx cÖKvkbx, XvKv|

Mycology:

1. Alexopoulos, C.J., C.W. Mims and M. Blackwell : 1996. Introductory Mycology (4th ed.), Wiley, Eastern Ltd. Calcutta, India.
2. Hawker, Liliam, E : 1967. Fungi, Hutchinson Univ. Library, Cambridge Univ. Press, London.
3. Moore-Landecker, Elizabeth : 1982. Fundamentals of the Fungi. Prentice-Hall. Inc., New Jersey, USA.
4. Webster, J. : 1980. Introduction to Fungi. Cambridge Univ. Press, London, UK.
5. Lvb. G. G. : 2000. gvB†µvev†qvjwR, †`vjb Pvcv, KvRx cÖKvkbx, XvKv|

Bryophyta and Pteridophyta:

1. Eams, A. J. : 1964. Morphology of Vascular Plants. Tata McGraw-Hill Pub. Co. Ltd. Bombay.
2. Parihar, N. S. : 1955. An Introduction to Embryophyta, Vol. I & II, Central Book Depot, Allahabad.
3. Smith, G. M. : 1955. Cryptogamic Botany. Vol. II McGraw-Hill Co. Inc., New York, London.
4. Vashista, P. C. : 1993. Botany for Degree Students: Pteridophyta. S. C. Chand & Co. Ltd. Ramnagar, New Delhi.

Gymnosperms:

1. Arnold, C. R. : 1977. An Introduction to Palaeobotany. Tata McGraw Hill Pub. House, New Delhi.
2. Biswas, C. and B. M. Johri: 1997. The Gymnosperms. Norasa Pub. House, New Delhi.
3. Coulterm, J. M and C. J. Chamberlain: 1964. Morphology of Gymnosperms. Central Book Depot, Allahabad, India.
4. Mukherji, H. : 1997. Plant Groups. New Central Book Agency, Ltd. Calcutta.
5. Parihar, N. S. : 1995. An Introduction to Embryophyta Vol. I & II. Central Book Depot. Allahabad
6. Sharma, O. P. : 1980. Gymnosperms – A treatise, Progati Parkashan, Meerut, India.
7. Smith, G.M. : 1955. Cryptogamic Botany. Vol. II. Bryophyta & Pteridophyta, McGraw Hill Co. London.
8. Vashishta, P.C. : 1994. Botany for Degree Students. Vol. V. Gymnosperms. S. Chand and Co. Ltd. Ramnagar, New Delhi.

Plant Pathology:

1. Agrios, G.N. : 1997. Plant Pathology (4th ed.) Academic Press, London.

2. Fahy, P. C. and G.J. Persley : 1983. Plant bacterial disease. A diagnostic guide, Academic Press, London.
3. Mehrotra, R.S. : 1980. Plant Pathology. Tata McGraw-Hill Pub. Co., Ltd. New, Delhi.
4. Rangaswami, G. : 1972. Diseases of crop plants in India. Prentice-Hall of India Private Ltd., New Delhi.
5. Singh, R.S. : 1978. Plant Diseases. Oxford & IBH Pub. Co., New Delhi.
6. Lvb. G. G. : 2000. gvB†µvev†qvjwR, †`vjb Pvcv, KvRx cÖKvkbx, XvKv|

Angiosperms:

1. Davis, P. H and V.H. Heywood : 1963. Principles of Angiosperm Taxonomy. Oliver Boyd, Edinburgh and London.
2. Hooker, J.D. : 1887-1897. Flora of British India, Vols. 1-7.
3. Jeffrey, C. : 1986. An Introduction to Plant Taxonomy (2nd edition), Cambridge Univ. Press.
4. Kapoor-Vijay, P. and James White (ed.): 1992. Conservation Biology: The Commonwealth Sciences Council.
5. Khan. M.S. and M. Halim : 1967. Aquatic Angiosperms of Bangladesh, BARC, Dhaka.
6. Khan. M.S. (ed.). : 1973-1993. Flora of Bangladesh; fascicles 1-51, BARC, Dhaka.
7. Lawrence, G.H.M. : 1951. Taxonomy of Vascular Plants. The Macmillan Co. New York.
8. Prain, D. : 1903. Bengal Plants. Vols. 1-2, Botanical Survey of India, Calcutta.
9. nvmvb, Gg.G. Ges Gg. †K. Avjg : 1997.Dw™Ç` †kªYx web`vm ZËj (3q ms`<iY), nvmvb eyK nvDR, XvKv|

Plant Anatomy and Embryology:

1. Cutter, E.G : 1969. Plant Anatomy. Part I & II. Edward Arnold Pub., UK.
2. Eames, A.J. and L.H. MacDaniels : 1947. An Introduction to Plant Anatomy. McGraw Hill Pub. Co., New York.
3. Esau, K. : 1953. Plant Anatomy, John Wiley & Sons, Inc., New York.
4. Fahn, A. : 1969. Plant Anatomy, Pergamon Press.
5. Maheswari, P. : 1950. An Introduction to the Embryology of Angiosperms. Tata McGraw-Hill Pub. Co. Ltd. Bombay, New Delhi.

Economic Botany:

1. Albert, F. H. : 1972. Economic Botany. Tata McGraw Hill Pub. Co. Ltd., New Delhi.
2. Cotton, C.M. : 1990. Ethnobotany – Principles & Application.
3. Hill, A. F. : 1951. Economic Botany, Tata McGraw Hill Pub. Co. Ltd., New Delhi.
4. Jain, S. K. : 1997. Indian Ethnobotany, Tata McGraw Hill Pub. Co. Ltd., New Delhi.
5. Pandey, B. P : 1978. Economic Botany, S. Chand and Co., New Delhi.
6. nvmvb, Gg. G. : 1996. evsjv†`†ki †fIR Dw™Ç`, Avkivwdqv eB Ni, evsjvevRvi,

XvKv|

7. Avn†g`, mvgmywib : 1996. evsjv†`†ki †jvKR e†bšlwa, nvmvb eyK nvDR,
evsjv evRvi, XvKv|

Plant Ecology & Environmental Science:

1. Bannister, P. : 1976. Introduction of Physiological Plant Ecology. Black well Scientific Publications.
2. Kershaw, K.A. : 1973. Quantitative and dynamic Plant Ecology, Edward Arnold Ltd.
3. Kumar, H.D. : 1995. General Ecology, Vikash Pub. House, India.
4. Kumar, H.D. : 1995. Modern concepts of Ecology, Vikash Pub. House, India.
5. Odum, E.P. : 1971. Fundamentals of Ecology, Toppan Co. Ltd. Japan.
6. Poole, R.W. : 1974. An Introduction of Quantitative Ecology, McGraw-Hill Book Co., New York.
7. Sharma, P.D. : 1995. Ecology and Environment, Rastogi Pub.
8. Shukla and P.S. Chandel : 1991. Plant Ecology and Soil Science, S.Chand & Co., India.

Cytology:

1. Dupraw E. J. : 1970. DNA and Chromosomes, Holt, Rinehart and Winston, New York.
2. Gupta, M.L. and M.L. Jangir : 1998. Cell Biology: Fundamentals and Applications, Agro Botnika, New Delhi.
3. Sharma, A. : 1976. The Chromosomes. Oxford & IBH Pub. Co., New Delhi.
4. Wilson, G. B. and J. H. Morrison: 1966. Cytology, Litton Educational Pub. Inc., New York.
5. Rvgvb, Gg. G. : 1975. †Kvlwe``v, evsjv GKv†Wgx, XvKv|
6. mywnZ ,n : 1978. mvB†UvjwR, cwđg e½ ivR` cy`—K cl©`|

Plant Physiology:

1. Goodwin, T.W. and E. I. Mereer: 1983. Introduction to Plant Biochemistry (2nd ed.). Pergamon Press.
2. Hess, D. : 1975. Plant Physiology. Springer International Student Edition.
3. Pandey, S.N. and B.L Sinha: 1990. Plant Physiology (2nd ed.) Vilkash Pub House Pvt. Ltd.
4. Salisbury, F. B. and C. Ross : 1969. Plant Physiology. Wardsworth Pub. Co. Inc., Belmont, California.
5. Kg©Kvi : 2000. Dw™Ĉ` kixi weÁvb, nvmvb eyK nvDR, XvKv|

Phytochemistry:

1. Goodwin, T. W. and E. I. Mereer : 1983. Introduction to Plant Biochemistry (2nd ed.). Pergamon Press.
2. Jain, J.L Chand : 1983. Fundamentals of Biochemistry (2nd ed.). S. and Co. Ltd. New Delhi.

3. Srivastava, H.S. : 1990. Elements of Biochemistry. Rastogi Publication Meerut.
4. Varner, J.E. and J. Bonner : 1965. Plant Biochemistry. Acad. Press, New York, London.

Genetics:

1. Benjamin Lewin : 2000. Gene 2000. Oxford University Press and Cell Press.
2. Gordner, E. J. : 1960. Principles of Genetics. John Wiley and Sons, Inc. New York, London.
3. Singleton, W.R. : 1967. Elementary Genetics. D. Von Nostrand Co., Inc., Canada.
4. Sinnot, E. W., L.C. Dunn and Th. Dobzlaansky: 1985. Principles of Genetics. (5th ed.). McGraw-Hill Book Co. Inc., New York, London.
5. Snustad, D.P. et al. : Principles of Genetics, John Willey & Son, Inc.
6. Strickberger, M.W. : 1996. Genetics. MacMillan Pub. Co. Inc., New York, London.
7. Whilehouse, H. L. K. : Towards an Understanding of the Mechanism of Heredity, Edward Arnold. England.
8. Bmjvg , G. Gm. : 1984. eskMwZ we``vi g~j K_v, evsjv GKv†Wgx, XvKv|
9. AvLZvi“%vgvb : eskMwZ we``v, evsjv GKv†Wgx, XvKv|

Plant Breeding:

1. Allard, R.W. : 1999. Principles of Plant Breeding. (3rd ed.). John Wiley & Sons, Inc., New York.
2. Chaudhury, H.K : 1978. Elementary Principles of Plant Breeding. Oxford & IBH Pub. Co., New Delhi.
3. Dana, S. : 2001. Plant Breeding, Naya Udyog, Calcutta.
4. Simonds, N.W. : 1979. Principles of Plant Improvement, Longman Group Ltd. London
5. Singh, B.D. : 1995. Plant Breeding-Principles and Methods, (5th ed.). Kalyani Publishers, New Delhi.
6. Sinha, U. and S. Sinha: 1977. Cytogenetics, Plant Breeding and Evolution, Vikas Publ. House, Pvt. Ltd. New Delhi.
7. fy&Bqv, Gg. Gm. ikx`: 1992. Dw™Ç` cÖRbb,evsjv GKv†Wgx, XvKv|

Practical

Marks: 100

1. Morphological and microscopic examination of Bacteria, Algae and Fungi included in the syllabus.
2. Morphological and microscopic examination of Bryophytes, Pteridophytes and Gymnosperms included in the syllabus.
3. Anatomy of root, stem (primary and secondary) with single staining technique.
4. T.S. of Anther and ovary.
5. Preparation of root tip squash using acetocarmine to observe and identify different stages of mitosis.
6. Morphological and anatomical adaptations of plants in different ecological conditions.
7. Preparation of lactophenol and cotton blue. Working out of the plant diseases included in the syllabus.
8. Working out of locally available angiosperms and members of the angiospermic families included in the syllabus. Technique of preparation of herbarium sheets.
9. Preparation of compost and seed bed. Raising seedling, vegetative propagation by cutting, budding and layering. Practices of pruning and training in garden plants.

- Transplantation of rice and vegetables.
10. Setting up of the physiological experiments on osmosis, photosynthesis and respiration in order to know the working principles and expected results.
 11. Determination of emasculation and crossing technique.
 12. Study of plant population by quadrat method.
 13. i) Identification: fertilizers, seeds, vegetables and fruits.
 ii) Museum specimens and permanent slides.
 iii) Botanical names of available local plants.
 iv) Economic products included in the syllabus.
 v) Plants of morphological and ecological interest
 14. Excursion shall be performed in order to study and collect plants from natural habitats, records of field trips should be maintained properly.
 15. Practical note book should be maintained properly and regularly signed by course teacher.
 16. Practical class records duly signed by course teacher and herbarium sheets as well as other collections have to be submitted on the day of practical examination.
 17. Viva-voce will be held during the practical examination.

Paper Code	Paper	Paper Title	Marks	Credits
133004	Paper-VII	Practical	100	4

01.	Bacteria/Algae/Fungi/Plant Pathology	10
02.	Bryophytes/Pteridophytes/Gymnosperms	10
03.	Taxonomy	12
04.	Anatomy (Secondary growth of dicot stem and root)	12
05.	Cytology/Plant Breeding/Physiological experiments	10
06.	Ecological adaptations (two specimens)	04
07.	(i) Identification: (5 specimens)	10
	(ii) Botanical names of 2 angiosperms	02
08.	Collections	05
09.	Practical Note Book and Excursion report	10
10.	Viva-voce	15