NORTH MAHARASHTRA UNIVERSITY,

JALGAON

(NAAC Re-Accredited)
"A" Grade

FACULTY OF SCIENCE

SYLLABUS FOR

S.Y.B.Sc. (BOTANY)

To Be Implemented From

Academic Year 2016-17

SEMESTER- I

PAPER-I

BOT.-231: Bryophytes and Pteridophytes

PAPER-II

BOT.-232: Morphology of Angiosperms

PAPER-III PRACTICAL COURSE

BOT. 233: Practicals Based on BOT.-231 and BOT.-232

SEMESTER - II

PAPER-I

BOT.-241:Plant Physiology

PAPER-II

BOT.-242: Taxonomy of Angiosperms

PAPER-III PRACTICAL COURSE

BOT.-243 Practicals based on BOT.-241 and BOT.- 242

Semester-I

Paper-I :BOT.-231: Bryophytes and Pteridophytes [60 Lectures]

Objectives:

1. *To study the morphological diversity of Bryophytes and Pteridophytes.*
2. *To study economic importance of the Bryophytes and Pteridophytes.*
3. *To study the evolution of Bryophytes and Pteridophytes.*

Chapter-1: Introduction to Bryophytes **06**

1.1 General Characters of Bryophytes
1.2 Economic Importance of Bryophytes
1.3 Alternation of Generation

Chapter-2: Classification of Bryophytes with reasons up to classes with example of each class according to G. M. Smith (1955) **04**

Chapter-3: Study of Life Cycle of *Riccia* **10**

3.1 Classification with reasons
3.2 Occurrence
3.3 External and Internal morphology of Gametophyte.
3.4 Reproduction: a) Vegetative b) Sexual
3.5 Structure of sex organs (Development not expected)
3.6 Fertilization
3.7 Structure of sporophyte (Development is not expected)
3.8 Structure and Germination of spore

Chapter-4: Study of Life Cycle of *Funaria* **10**

4.1 Classification with reasons
4.2 Occurrence
4.3 External and Internal morphology of Gametophyte.
4.4 Reproduction: a) Vegetative b) Sexual
4.5 Position & structure of sex organs (Development not expected)
4.6 Fertilization
4.7 Structure of sporophyte (Development is not expected)
4.8 Dehiscence of capsule, Structure and Germination of spore

Chapter-5: Introduction to Pteridophytes **06**

5.1 General Characters of Pteridophytes
5.2 Economic Importance of Pteridophytes
5.3 Alternation of generation

Chapter-6: Classification of Pteridophytes up to classes giving reasons with at least two examples of each class according to G.M. Smith. **04**

Chapter-7: Study of Life Cycle of *Selaginella* **10**

7.1 Classification with reasons
7.2 Occurrence
7.3 External morphology of sporophyte
7.4 Internal morphology of sporophyte
7.5 Reproduction:a) Vegetative b) Sexual
7.6 Structure of strobilus (Cone)
7.7 Structure of Microspores and Megaspores
7.8 Germination of Micro and Megaspores
7.9 Structure of male gametophyte with sex organ and female gametophyte
7.10 Fertilization

Chapter-8: Study of Life Cycle of*Adiantum* w.r.t. **10**

8.1Classification with reasons
8.2 Occurrence
8.3 External morphology of sporophytes
8.4 Internal morphology of sporophytes
8.5 Reproduction a) Vegetative b) sexual
8.6 Structure of sorus, sporangium.
8.7 Structure and germination of spore
8.8 Structure of gametophyte with sex organs
8.9 Fertilization
8.10 Structure of embryo

References:

1. Campbell H. D., 1940. The Evolution of land plants (Embryophyta). University of Press, Stanford.
2. Chopra R. N. and P. K. Kumar. 1988. Biology of Bryophytes. Wiley Eastern Ltd. New Delhi.
3. Gangulee Das and Dutta. College Botany Vol.1, Central Book Depot. Culcutta.
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5. Shaw, J. A. and Goffinet B., 2000, Bryophyte Biology, Cambridge University Press.
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11. Chandra S. & Srivastava M. 2003, Pteridology in New Millenium, Khuwer Academic Publishers.
12. Eames, A. J. 1979, Morphology of Vascular Plants, Lower group. Wiley International edition, New Delhi.
13. Parihar N. S. 1977, Biology and Morphology of Pteridophytes, Central Book Depot, Allahabad.
14. Rashid A. 1976, An Introduction to Pteridophyta, Vikas Publ. Co. New Delhi.
15. Sporne, K. R. 1967, Morphology of Pteridophytes- Hutchinson University Library Landon
16. Vasishta B.R. 1993, Pteridophyta, S. Chand and Co. New Delhi.

SEM-I

Paper-II -BOT.-232: Morphology of Angiosperms [60 Lectures]

Objectives:

1. *To study the habit of the angiosperm plant body.*
2. *To study the vegetative characteristics of the plant.*
3. *To study the reproductive characteristics of the plant.*
4. *To study the plant morphology.*

Chapter-1: Introduction **02**

1.1 Definition, scope and importance of morphology

Chapter-2: Study of Root. **06**

2.1 Definition

2.2 General characters of and functions of root.

2.3 Types of roots:

A] Tap Root System

B] Adventitious roots system.

2.4 Modifications of root.

A] Modifications for storage: conical, napiform, fusiform tuberous, moniliform, fasciculated roots

B] Modification for support: Prop and Stilt root

C] Modification for assimilation: Epiphytic root, Assimilatory roots

D] Modification for breathing: Pneumatophores

E] Modification for absorption: Parasitic roots

Chapter-3: Study of Stem **08**

2.1 Definition

2.2 General Characters and functions of stem

2.3 Types of stem –Weak, strong.

2.4. Modification of stem:

A] Underground Modification: Rhizome, Tuber, Bulb, Corm,

B] Sub aerial Modifications: Runner, Stolon, Offset, Sucker.

C] Aerial Modification: Phylloclade, Cladode, Tendrils and spines.

Chapter-4: Study of Leaf **10**

1.1 Definition

1.2 Parts of Typical leaf

1.3 Stipules and its types- Free lateral, Adnate, Interpetiolar, Intra-petiolar, Ochreate and Foliaceous.

1.4 Types of leaf- a) Simple b) Compound and its subtypes.

1.5 Venation and its types.

1.6 Phyllotaxy and its types.

1.7 Modification of leaf- Spines, Tendril, Pitcher.

Chapter-5: Study of Inflorescence **08**

5.1. Definition and parts of inflorescence

5.2. Types of Inflorescence

A] Racemose inflorescence and its types:

B] Cymose inflorescence and its types:

I] Solitary

II] Uniparous

III] Biparous

IV] Multiparous

C] Special types of inflorescence:

I] Cyathium

II] Verticillaster

III] Hypanthodium

Chapter-6: Study of Flower **16**

6.1 Definition

6.2 Parts of typical flower

6.3 Types of flower: a) Hypogynous b) Epigynous c) Perigynous

6.4 Calyx: Types of Calyx – Caducous and persistent

6.5 Corolla: Types of Corolla- a) Polypetalous regular and irregular b) Gamopetalous regular and irregular.

6.6 Perianth: Polyphyllous and Gamophyllous.

6.6Aestivation: Types of aestivation

6.7 Androecium:

A] Anther filament attachment: Basifixed, Dorsifixed, Adnate, Versatile.

B] Cohesion and Adhesion of stamens

C] Modifications- Petaloid stamens, Pollinia.

6.8 Gynoecium

A] Types of style – Terminal, Lateral, and Gynobasic.

B] Types of Stigma – Capitate, Bifid, Trifid, Discoid, Feathery.

C] Types of ovary based on number of carpel

D] Apocarpus, Syncarpus.

E] Ovary: Superior, Inferior and half superior.

F] Types of placentation

Chapter-7: Study of Fruit **10**

7.1. Definition

7.2. Types of fruits

A] Simple fruits I] Dry Fruits

a) Dehiscent – Legume, Follicle, Capsule [loculicidal, septicidal, septifragal]

b) Schizocarpic- Lomentum, Cremocarp.

c) Indehiscent – Caryopsis, Achene, Cypsella.

II] Fleshy Fruits – Drupe, Berry, Hesperidium.

B] Aggregate Fruits – Etaerio of berries, Etaerio of follicles, Etaerio of Achenes.

C] Composite fruits: Sorosis, Syconus.

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1. Gangulee, H. C., J. S. Das & C. Dutta, 1882. College Botany (5th Eds.) New Central Book Agency Calcutta
2. George, H. M. Lawrence, 1951. Introduction to Plant taxonomy. Mac Millan comp. Ltd., New York.
3. Ganguly, H.C. & K. S. Das (1986) College Botany Vol.-.I (6th Edition), New Centra Book Agency, Calcutta, India.
4. Ganguly, H.C., K.S.Das and C.T.Datta (1968) College Botany Vol.I , New Central Book Agency, Calcutta, India.
5. Kumar, N.C.(1992) An Introduction to Taxonomy of Angiosperm. Himalaya Publishing House, Bombay, India.
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7. Naik, V.N. (1984) Taxonomy of Angiosperms. Tata McGraw-Hill Publishing Company Ltd. New Delhi, India.
8. Sharma, O.P. (1997) Plant Taxonomy. Tata McGraw-Hill Publishing Co. Ltd. New Dehli, India.
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10. Singh, V. and D.K. Jain (1992) Taxonomy of Angiosprms.Rastogi Publication, Meerut, India.
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12. SusilkumarMukerjee (1984) College Botany Vol III Published by J.N. Sen. B.S.I.New Central Book Agency Calcutta.

13. Vashistha, P.C. (1992) Taxonomy of Angiosperms. R. Chand & Co. Publishers, New Delhi, India

Semester- I

BOT. 233: BOTANY PRACTICAL COURSE

Based on BOT.-231 and BOT.-232

Practical based on BOT.-231

Practical -1: Study of diversity of Bryophytes w.r.t systematic position and morphology:

A] *Marchantia* B] *Anthoceros* C] *Sphagnum*

Practical -2: Study of life cycle of *Riccia*

2.1 Classification with reasons

2.2 External morphology of gametophyte

2.2 V. S. of thallus

2.3 V. S. of thallus passing through sex organs (P. S.)

2.4 V. S. of sporophyte (P.S.)

Practical-3: Study of Life cycle of *Funaria*

3.1 Classification with reasons

3.2 External morphology of gametophyte

3.3 T. S. of axis

3.4 V. S. of antheridial head (P. S.)

3.5 V. S. of archegonial head (P. S.)

3.6 V. S. of sporophyte (P.S.)

3.7 Mounting of spores & peristomial teeth.

Practical -4: Study of diversity of Pteridophytes w.r.t systematic position and morphology:

A] *Psilotum* B] *Lycopodium* C] *Equisetum* D) *Marsilea*

Practical-5: Study of Life cycle of *Selaginella*

5.1 Classification with reasons

5.2 External morphology of sporophyte

5.3 T. S. of Stem

5.4 V. S. strobilus (P. S.)

5.5 Mounting of spores & ligules

Practical -6: Study of Life cycle of *Adiantum*

6.1Classification with reasons

6.2 External morphology of sporophyte

6.3 T. S. of Rachis

6.4 V. S. of Sorus (P. S.)

6.5 Mounting of spores

Practicals Based on BOT.-232

Practical-7: Morphology of root and stem modification as per theory**.**

Practical-8: Morphology of Leaf a) Phyllotaxy b) Modifications as per theory.

Practical-9: Study of types of Inflorescence

Practical-10: Study of Flower morphology

A) Calyx: Types of calyx

B) Corolla: Forms of Corolla

C) Types of aestivation

Practical-11: Study of Flower morphology

A) Androecium: Adhesion and Cohesion

B) Gynoecium: Types of Placentation

Practical -12: Study fruit Morphology: as per theory

A] Simple Fruits

B] Aggregate fruits

C] Composite fruits

Semester-II

Paper I -BOT.-241: Plant Physiology

AIMS & OBJECTIVES:

1. *To know importance and scope of plant physiology.*
2. *To study plants and plant cells in relation to water.*
3. *To study the process of photosynthesis in higher plants with particular emphasis on light and dark reactions, C3 and C4 pathways.*
4. *To study respiration in higher plants with particular emphasis on aerobic and anaerobic respiration.*
5. *To study movement of sap and absorption of water in plant body.*
6. *To study the plant movements.*

Chapter-1: Introduction: 02

1.1 Introduction, scope and Importance

Chapter-2: Plant cell and water relation: 10

2.1 Properties of water: physical and chemical

2.2 Diffusion: Definition, mechanism of Diffusion with suitable example, Diffusion Pressure, Graham's Law of Diffusion and significance of Diffusion

2.3Osmosis**:**Introduction Definition, mechanism of osmosis with suitable osmometer, Osmotic pressure, Wall pressure and Turgor pressure, DPD and its relationship with OP, TP,WP, Type of solution-Isotonic, hypotonic and hypertonic solution.
Types of osmosis-endo and exosmosis, Plasmolysis and deplasmolysis significance.

2.4. Imbibition: definition, mechanism, Imbibition pressure, Importance of imbibition

Chapter-3: Absorption of water 07

3.1. Introduction

3.2. Importance of water in plant

3.3. Mechanism of water absorption: Active and Passive Absorption. Theories of active absorption-
Osmotic theory and Non Osmotic theory, Mechanism of Passive Absorption, factors affecting the process.

Chapter-4: Ascent of sap 08

4.1 Introduction, Definition

4.2 Path of solute

4.3 Mechanism of ascent of sap

Theories: a) Vital theories- Pulsating theory, Relay pump theory
b) Root pressure theory
c) Physical theory-Dixon and Jolly's Theory.

Chapter 5: Transpiration 08

5.1 Introduction, Definition

5.2 Types of transpiration

5.3 Structure of stomata

5.4 Mechanism of opening and closing of stomata.

5.5 Theories of transpiration: a) Stewards theory b) K^+ Pump theory

5.6 Significance of transpiration.

5.7 Factors affecting transpiration

Chapter-6: Photosynthesis 11

6.1 Introduction and Definition

6.2 Photosynthetic pigments: Chlorophylls, Carotenoids, Phycobillins and their role.

6.3 Red drop and Emmerson effect, Two Pigment System

6.3 Mechanism of Photosynthesis

(a) Light reaction: Cyclic and Non-cyclic Photophosphorylation

(b) Dark Reaction: C3 and C4 cycle

6.4. Difference between C3 and C4 cycle

6.5. Factors affecting the process of photosynthesis

Chapter-7: Respiration 11

7.1 Introduction and definition

7.2 Types of Respiration: Aerobic and Anaerobic

7.3 Respiratory quotient

7.4 Mechanism of Aerobic Respiration:

(a) Glycolysis

(b) Kreb's Cycle

(c) ETS

7.5 Anaerobic Respiration: Alcoholic respiration

7.6 Bioillumination

7.7 Factors affecting the process of Respiration

Chapter-8: Plant Movements 03

8.1 Introduction

8.2 Types:

(a) Tropic movements: Phototropic, Hydrotropic and Geotropic

(b) Tactic Movements: Phototactic, Thermotactic and Chemotactic

(c) Nastic movement: Nyctanastic, Seasmonastic and Thigmonastic

Reference Books:

1. Amar singh (1977) Practical Plant Physiology. Kalyani Publication, New Delhi, Ludhiyana, India.
2. Jain, V.K. (1997) Fundamentals of Plant Physiology. S.Chand& Company Ltd. New Delhi, India.
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5. Meyer, B.S. & D.B. Anderson (1952) Plant Physiology.Affiliated East-west Press Pvt.Ltd., New Delhi, India.
6. Mukharji&Ghose, A.K.(1996) Plant Physiology. Tata MacGraw Hill Publishing company Ltd. New Delhi, India.
7. Pandey &Sinha (1999) Plant Physiology.Vikas Publishing House Pvt. Ltd. New Delhi, India.
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10. SundaraRajan (2000) College Botany (Plant Physiology and Molecular BiologyVol.IV, Himalaya Publishing House, New Delhi, India.
11. Varma, V. (1984) Introduction to Plant Physiology .Emkay Publications, New Delhi.
12. Varma, V. (1995) A Text Book of Plant Physiology and Biochemistry. S. Chand & Company. New Delhi, India.

Semester-II,

Paper-II -BOT.-242 Taxonomy of Angiosperms

Aims and Objectives:

1. *To study the diversity of angiosperms.*
2. *To study the comparative account among the families of angiosperms.*
3. *To study the economic importance of the angiosperm plants.*
4. *To study the distinguishing features of angiosperm families.*

Chapter-1: Taxonomy: **05**

1.1 Definition, objectives and importance of taxonomy

1.2 Distinguishing features of angiosperms

1.3 Functions of Taxonomy: Identification, Classification and Nomenclature.

Chapter-2: Classification: **05**

2.1 Criteria used for the classification

2.2 Types of classification a) Artificial b) Natural c) Phylogenetic classification

2.3 Binomial Nomenclature.

Chapter-3: Systems of classification: **05**

3.1. Introduction

3.2 Outline of Bentham and Hooker's system of classification up to series

3.3 Merits and Demerits of classification

Chapter-4: Study of plant families **35**

Study of following families with respect to the Systematic position, Morphological characters, floral formula and floral diagram, Distinguishing features, Economic importance,

1] Malvaceae	2] Papilionaceae [Fabaceae]	3]Acanthaceae
4] Solanaceae	5] Nyctaginaceae	6] Euphorbiaceae
7] Cannaceae	8] Liliaceae	

Chapter-5: Botanic Gardens **06**

5.1 Definition

5.2 Functions of Botanical Garden

5.3 Types of Garden: Formal and In-formal

5.4 Salient features of a] Indian Botanical Garden, Kolkata
b] National Botanic Garden, Lucknow
c] Royal Botanic Garden, Kew (England)

Chapter-6: Herbarium Technique **04**

a. Definition
b. Techniques of Herbarium
Collection, Pressing and Drying, Poisoning, Mounting and Labelling.

Reference Books:

1. Ganguly, H.C. & K. S. Das (1986) College Botany Vol.-.I (6th Edition), New CentraBookAgency, Calcutta, India.
2. Ganguly, H.C., K.S.Das and C.T.Datta (1968) College Botany Vol.I , New Central BookAgency, Calcutta, India.
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10. Subramanyam, N.S. (1997) Modern Plant Taxonomy.Vikas Publishing house, New Delhi,India.
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BOT.-243 Botany Practical based on BOT.-241 and BOT.- 242

Practical Based on BOT.- 241

Practical 1: To determine the DPD by using the potato tuber

Practical 2: To determine the rate of transpiration by varying

(a) Light intensity

(b) Wind velocity

Practical 3: To determine the rate of photosynthesis by varying

(a) Light intensity

(b) Light quality

Practical 4. Determination of RQ using Ganong's respirometer

Practical 5&6: Demonstration experiments:

(a) Osmosis by curling experiment

(b) Imbibition pressure

(c) Thistle funnel

(d) Ringing experiment.

(e) Relative transpiration

(f) CO2 Necessary for photosynthesis

(g) Kuhen's Tube experiment

(h) Cyclosis in *Hydrilla*

Practical Based on BOT.- 242

Practical-7 to 10: Study of Plant families w.r.t Systematic position, Morphological characters, floral formula and floral diagram of any six families according to the syllabus. [At least one family from each class: Polypetalae, Gamopetalae, Apetalae and Monocotyledonae)

Practical-11: Preparation of artificial key based on vegetative or/and reproductive characters.

Practical-12: Demonstration of Herbarium Technique

a) Drying and Pressing

b) Poisoning

Equivalence: Theory and Practicals

Class: S. Y. B. Sc.

Subject : Botany

Paper	Old Course (W.E.F. From 2013-14)	Paper	New Courses (to be implemented from June 2016
BOT.-231	Morphology and Taxonomy of Angiosperms	BOT.-232	Morphology of Angiosperms
BOT.-232	Plant Physiology	BOT.-241	Plant Physiology
SEM-II			
BOT.-241	Plant Anatomy	BOT.-242	Taxonomy of Angiosperms
BOT.-242	Applied Botany	BOT.-231	Bryophytes and Pteridophytes
PRACTICAL			
BOT:203	Based on BOT.-231, BOT.-232, BOT.-241 and BOT.- 242	BOT:233	Based on BOT.231, BOT.-232,
		BOT: 243	Based On BOT.-241 and BOT.- 242