# NORTH MAHARASHTRA UNIVERSITY,

# JALGAON

(NAAC Re-Accredited)

## SYLLABUS FOR

## S.Y.B.Sc.

## BOTANY

### FACULTY OF SCIENCE

## (With Effect From June, 2013)

**NORTH MAHARASHTRA UNIVERSITY, JALGAON**

**Syllabus For S. Y. B. Sc. Botany**

**BOT. 231: PAPER-I: MORPHOLOGY AND TAXONOMY OF ANGIOSPERMS**
**SEMESTER - I (Total Periods 60)**

**AIMS & OBJECTIVES:**

1. To study vegetative and floral plant parts, besides their modifications and functions.
2. To study ground plan of Angiospermic flowers.
3. To know functions of taxonomy and categories of classification.
4. To study Bentham and Hooker's system of plant classification in detail.
5. To study plant families covering different groups.

## Part –I : Morphology of Angiosperms

**Chapter-1: Introduction** (Lecture 01)

1.1 Definition and Scope

**Chapter-2: Root** (Lectures 03,Marks 02)

2.1 Definition, General characters and Functions of Root

2.2 Types of root system – Tap root and adventitious root system

**Chapter-3: Stem** (Lectures 03,Marks 02)

3.1 Definition, General characters and Functions of Stem

3.2 Types of Stem – Herbaceous and woody

**Chapter-4: Leaf** (Lectures 06,Marks 03)

4.1 Definition, Parts of typical leaf and functions of Leaf

4.2 Phyllotaxy: (a) Alternate (b) Opposite (c) Whorled

4.3 Types of leaf: Simple and Compound (subtypes expected)

4.4 Venation: Types of venation

**Chapter-5: Inflorescence** (Lectures 06,Marks 04)

5.1 Definition

5.2 Types of inflorescence: (a) Racemose and its types (b) Cymose and its types

**Chapter-6: Flower** (Lectures 10,Marks 06)

6.1 Definition and parts of typical flower

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

6.3 Types of calyx: Deciduous and persistent

6.4 Corolla: Types of Corolla

6.5 Aestivation: Types of aestivation

6.6 Androecium:

a) Anther filament relationship: Basifixed, Dorsifixed and Versatile

b) Cohesion and adhesion of stamens

6.7 Gynoecium:

a) Apocarpus, Syncarpus.

b) Ovary: Superior and inferior

c) Types of placentation

**Chapter–7: Fruit** (Lectures 07,Marks 05)

7.1 Definition

7.2 Types of fruits:

A) Simple

i) Dry: Dehiscent:(i) Capsule, (ii) Follicle, (iii) Legume; Indehiscent:(e.g. Caryopsis)

ii) Fleshy: Drupe

B) Aggregate:Etaerio of berries

C) Composite:Sorosis

## Part -II:Taxonomy of Angiosperms

**Chapter-8: Taxonomy** (Lectures 03,Marks 02)

8.1 Definition

8.2 Functions of Taxonomy :a) Identification b) Classification c) Nomenclature

8.3 Distinguishing features of Angiosperms

**Chapter-9: Classification** (Lectures 04,Marks 02)

9.1 Categories of Classification: Major and minor categories

9.2 Binomial Nomenclature

9.3 Types of Classification: a) Artificial b) Natural c) Phylogenetic

**Chapter–10: System of Classification** (Lectures 05,Marks 04)

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

10.2 Salient features, merits and demerits

**Chapter–11: Study of Families** (Lectures 12,Marks 10)

11.1 Study of the following plant families w.r.t. systematic position, morphological, distinguishing characters and economic importance:

1. Malvaceae 2. Papilionaceae (Fabaceae)
3. Rubiaceae 4.Solanaceae
5. Euphorbiaceae 6. Cannaceae

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Kumar, N.C.(1992) An Introduction to Taxonomy of Angiosperm. Himalaya Publishing House, Bombay, India.

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## BOT. 241: PAPER-I: PLANT ANATOMY

## SEMESTER - II (Total Periods 60)

**AIMS & OBJECTIVES:**

1. To know scope and importance of anatomy
2. To study various tissue systems.
3. To study normal and anomalous secondary growth in plants and their causes.
4. To give exposure to techniques in anatomy.

**Chapter-1**: **Introduction** (Lectures 02)

1.1 Definition, Scope and Importance

**Chapter-2**: **Plant Tissues** (Lectures 06,Marks 06)

2.1 Definition and types

2.2 Meristematic tissue and types

2.3 Permanent tissue and types:(a) simple (b) complex

**Chapter-3**: **Concept of Tissue System** (Lectures 18,Marks 18)

3.1 Epidermal Tissue System:

A. Definition, Structure and Function.

B. Cutinisation, Lignifications, Suberisation, Silicification.

C. Types of Epidermal Appendages:

a) Unicellular and Multicellular Trichomes.

b) Glandular and non-glandular Trichomes.

c) Stellate, Dendroid Trichomes and peltate scales.

D. Types of Stomata:

i. Ranunculaceous (Anomocytic)

ii. Cruciferous (Anisocytic)

iii. Rubiaceous (Paracytic)

iv. Caryophyllaceous (Diacytic)

v. Graminaceous.

3.2 Study of Mechanical Tissue System Based on Principles.

a. Inflexibility b. Inextensibility

c. Incompressibility d. Shearing stresses

3.3 Secretory Tissue Systems:

a. Digestive glands b. Nectaries

c. Resin ducts d. Laticiferous ducts

e. Hydathodes f. Oil ducts.

**Chapter-4**: **Primary Structure of Dicotyledonous (e.g. Sunflower)**

(Lectures 07,Marks 04)

4.1 Root

4.2 Stem

4.3 Leaf

**Chapter-5**: **Primary Structure of Monocotyledonous (e.g. Maize)**

(Lectures 07,Marks 04)

5.1 Root

5.2 Stem

5.3 Leaf

**Chapter-6: Comparative Anatomical Study of Dicotyledonous and Monocotyledonous** (Lectures 06,Marks 03)

6.1 Root

6.2 Stem

6.3 Leaf

**Chapter-7**: **Secondary Growth** (Lectures 10,Marks 05)

7.1 Secondary growth in Dicot. Stem e.g.Sunflower.

7.2 Secondary growth in Dicot. Root e.g Sunflower.

7.3 Secondary growth in Monocot. Stem e.g. *Dracaena*.

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Cutter, E. G. (1971) Plant Anatomy: Experiment and Interpretation Part-II, Organ. Edward Arnold, London, UK.

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Tayal, M.S. (1994) Plant Anatomy. Rastogi Publications, Meerut, India.

Vasistha, P.C. (1986) Plant Anatomy. Pradeep Publications, Jalandhar, India.

## BOT. 232: PAPER-II: PLANT PHYSIOLOGY

## SEMESTER - I (Total Periods 60)

**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, $C_3$ and $C_4$ 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** (Lectures 02)

1.1 Definition, Scope and Importance

**Chapter-2: Plant and Water Relations** (Lectures 10,Marks 06)

2.1 Diffusion: Definition, Mechanism of diffusion with suitable example, Graham's Law of diffusion, role of diffusion in plant life and diffusion pressure

2.2 Osmosis: Definition, Types of solution: Hypotonic, Isotonic and Hypertonic, Permeability of membranes, mechanism of osmosis with suitable Osmometer, exo and endosomosis, Plasmolysis and De-Plasmolysis, OP, WP, TP, DPD and its relationship.

2.3 Imbibitions: Definition, Phenomenon of imbibitions, Imbibitions Pressure

**Chapter-3: Water Absorption** (Lectures 07,Marks 04)

3.1 Importance of water

3.2 Physical and chemical properties of water

3.3. Concept of active and passive absorption

3.4. Osmotic and non-osmotic theory

3.5. Factors affecting water absorption: External and Internal.

**Chapter-4: Salt Absorption** (Lectures 05,Marks 03)

4.1. Importance of nutrients

4.2 Theories:

(a) Ion exchange:

(i) Contact exchange, (ii) Carbonic acid exchange

(b) Carrier concept: Bennet and Clerk's Theory

4.3 Factors affecting Salt Absorption

**Chapter-5: Ascent of Sap** (Lectures 03,Marks 02)

5.1 Paths of Solutes

5.2 Theories: (a) Pulsating theory (b) Dixon and Jolly's Theory

**Chapter-6: Transpiration** (Lectures 08,Marks 06)

6.1 Definition

6.2 Magnitude

6.3 Types of transpiration

6.4 Structure of stomata

6.5. Mechanism of opening and closing of stomata:

(a) Steward's Theory

(b) $K^+$ Pump Theory

6.6 Factors affecting the rate of transpiration

6.7 Significance of transpiration

**Chapter-7: Photosynthesis** (Lectures 11,Marks 09)

7.1 Introduction and Definition

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

Two Pigment Systems

7.3. Mechanism of Photosynthesis

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

(b) Dark Reaction: $C_3$ and $C_4$ cycle

7.4. Difference between $C_3$ and $C_4$ cycle

7.5. Factors affecting the process of photosynthesis

**Chapter-8: Respiration** (Lectures 11,Marks 08)

8.1 Introduction and definition

8.2. Types of Respiration: Aerobic and Anaerobic

8.3 Mechanism of Aerobic Respiration

(a) Glycolysis

(b) Kreb's Cycle

(c) ETS

8.4 Anaerobic Respiration: Alcoholic respiration

8.5 Bioillumination

8.7 Factors affecting the process

**Chapter-9: Plant Movements** (Lectures 03,Marks 02)

9.1 Introduction

9.2 Types:

(a) Tropic movements: Phototropic, Hydrotropic and Geotropic

(b) Tactic Movements: Phototactic, Thermotactic and Chemotactic

(c) Nastic movement: Nyctanastic, Seasmonastic and Thigmonastic

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Jain, V.K. (1997) Fundamentals of Plant Physiology.S.Chand& Company Ltd. New Delhi, India.

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## BOT. 242: PAPER-II: APPLIED BOTANY

## SEMESTER - II (Total Periods 60)

**AIMS & OBJECTIVES:**

1. To know importance and scope of botanical science in the industries.
2. To study role of microbial plants in fermentations process.
3. To study the process of cultivation of mushrooms and their nutritional value.
4. To study biofertilizers, their types and cultivation methods
5. To study technique of plant tissue culture and its application.
6. To study the role plants in forensic science.

**Chapter-1: Applied Botany** (Lectures 02)

1.1 Introduction, Scope and Importance

**Chapter-2: Fermentation Industry** (Lectures 11,Marks 08)

2.1 Introduction, Definition and Types: Aerobic and Anaerobic

2.2 Microbes involved in fermentation.

2.3 Industrial production of Ethanol, Penicillin w. r. to

i) Pure culture
ii) Substrate
iii) Sterilization
iv) Fermentation
v) Recovery of end product

**Chapter-3: Mushroom Cultivation** (Lectures 10,Marks 08)

3.1 Introduction

3.2 Edible and Non-Edible Mushrooms

3.3 Nutritional value of Mushrooms

3.4 Important edible Mushroom used for cultivation

3.5 Spawn and spawn making

3.6 Methods of cultivation of

i) *Agaricus* (Button mushroom)
ii) *Pleurotus*(Dhingri mushroom) / *Volvariella* (Paddy straw mushroom)

**Chapter-4: Organic Manures and Biofertilizers** (Lectures 12,Marks 08)

4.1 Organic Manures:

a) Introduction and importance

b) Types: Compost, Farm Yard Manure and Green manure

4.2 Biofertilizers:

a) Definition and Importance

b) Types of biofertilizers

c) Methods of cultivation of

I) Blue Green Algae. (BGA)

i) Preparation of culture media- De's medium (modified)

ii) Isolation and Inoculation

iii) Mass Cultivation of BGA (G. S. Venkatraman, 1963)

iv) Utilization of BGA in Agriculture

II) *Rhizobium* Culture

i) Isolation from root nodules of Leguminous plants

ii) Pure culture (YEMA Medium)

iii) Mass production

iv) Methods of application in Agriculture

v) Agronomic importance

**Chapter-5: Plant Tissue Culture** (Lectures 11,Marks 08)

5.1 Introduction and Definition

5.2 Concept of Totipotency

5.3 General steps involved in Plant Tissue Culture:

i) Murashige and Skoog's (M.S). Medium: Composition and Preparation

ii) Explants

iii) Surface sterilization

iv) Inoculation

v) Incubation

vi) Callus formation

vii) Subculture

viii) Organogenesis and formation of plantlet

ix) Hardening

5.4 Application of Plant Tissue Culture in Agriculture, Horticulture and Medicine

**Chapter-6: Adulteration in Plant Products** (Lectures 11,Marks 06)

6.1 Introduction and Definition

6.2 Standard characteristics, possible adulterants, detection tests for adulteration and hazardous effects of following;

a. Cereals:Bajra

b. Pulses: Chick pea (Gram)
c. Oils: Groundnut oil
d. Spices: Black Pepper, Red pepper and Turmeric
e. Beverages: Tea and Coffee

**Chapter-7: Forensic Botany** (Lectures 03,Marks 02)

7.1 Introduction, Definition, Scope and Importance.

7.2 Role of Following Plants in Forensic Botany

a) *Cannabis sativa* (Jute)
b) *Jatropha curcas* (Chandrajyot)
c) *Argemone mexicana*(Yellow poppy)
d) *Abrus precatorius*(Gunj)
e) *Datura metel* (Datura)

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## BOT. 203: BOTANY PRACTICAL COURSE

### Based on BOT.-231, BOT.-232, BOT.-241 and BOT.- 242

**Practical-1 :** A) Study of Leaf Phyllotaxy

B) Study of Inflorescence

**Practical-2&3 :** Study of Flowers

A) Calyx: Types of calyx

B) Corolla: Forms of Corolla

C) Androecium: Adhesion and Cohesion

D) Gynoecium: Types of Placentation

E) Study of Fruits: Simple, Aggregate and Composite

**Practical 5&6 :** Study of any four families as per theory syllabus with respect to Morphological characters, floral formula, floral diagram and systematic position. [At least one family from Polypetalae, Gamopetalae, Monochlamydae and Monocotyledonae]

**Practica l7 :** To determine the DPD by using the potato tuber

**Practica l8 :** To determine the molar concentration of solution at which incipient Plasmolysis takes place.

**Practica l9 :** To determine the rate of transpiration by varying

(a) Light intensity

(b) Wind velocity

**Practical 10 :** To determine the rate of photosynthesis by varying

(a) Light intensity

(b) Light quality

**Practical 11&12:** Demonstration experiments:

(a) Osmosis by curling experiment

(b) Imbibitions pressure

(c) Thistle funnel

(d) Ringing experiment.

(e) Relative transpiration

(f) $CO_2$ Necessary for photosynthesis

(g) Kuhen's Tube experiment

(h) Cyclosis in *Hydrilla*

**Practical 13 :** To study types of vascular bundles (P.S.)

**Practical 14 :** Study of primary structure in stem of dicot and monocot.

i) Sunflower

ii) Maize

**Practical 15 :** Study of primary structure in root of dicot and monocot. (P.S.)

i) Sunflower

ii) Maize

**Practical 16** : Study of secondary growth in Sunflower and *Dracaena* stem. (P.S.)

**Practical 17** : Study of trichome and stomata with the help of locally available material.

**Practical 18** : Study of secretory tissue and mechanical tissue system with the help of permanent slides.

**Practical 19** Cultivation of *Agaricus/Pleurotus/Volvariella*

**Practical 20** : Demonstration

(a) Mass culture of B.G.A. (Venkatraman)

(b) *Rhizobium* culture.

**Practical 21** : Principle and working of:

i) Laminar Air flow / Inoculation chamber

ii) Autoclave

**Practical 22** : Study of basic techniques of plant tissue culture

i) Preparation of explants

ii) Surface sterilization

iii) Inoculation

**Practical 23** : Detection of adulteration in plant products using suitable tests (Any four)

a. Cereal grains: Bajra
b. Pulse: Chick pea (Gram)
c. Oils: Groundnut oil
d. Spices: black pepper, red pepper, turmeric
e. Beverage: Tea and Coffee

**Practical 24 :** Give botanical name and use of following plant material in forensic science

(a) *Argemone mexicana* (b) *Abrus precatorius*

(c) *Jatropha curcas* (d) *Datura metel.*

**Note:** P.S.: Permanent slide

**N.B.** 1. Visit to plant tissue culture laboratories / fermentation industry / mushroom cultivation unit / biofertilizer production unit, etc. is compulsory. Scientific report of the visit should be submitted at the time of practical examination.

2. Botanical excursion and its report is compulsory

3. Duly certified journal is compulsory at the time of practical examination