

## **BOTANY**

### **Syllabi of Sem. 1<sup>st</sup>. and 2<sup>nd</sup>. Of Botany under UG Programme in Medical for the academic sessions 2020-21,2021-22and 2022-23**

#### **Course objectives and learning outcomes of Botany as one of the subjects in UG Programme in Medical**

##### **Course Objectives:**

- 1** The course aims at familiarizing the students with microbes like Bacteria, Viruses, Fungi and lower green cryptogams like Algae, Bryophytes & Pteridophytes.
- 2** To create the understanding by observations and comparative study of representative members of phylogenetically important groups so that students get a broad understanding of evolution.
- 3** To study morphology, anatomy and reproduction through typological study shall elevate a knowledge base in understanding plant diversity, life forms, life cycles and economic importance of lower groups of plants and microbes.
- 4** To acquaint students with the outer and inner basic structure and reproduction of bacteria, Viruses, Algae, Fungi, Bryophytes and Pteridophytes.
- 5** To introduce students with the various types of Lichens, their characteristics and economic importance.
- 6** To introduce students with various plant diseases causal organisms and their control.

##### **Course learning outcomes:**

Students shall become aware of various groups of organisms like Bacteria, Viruses, Algae, Fungi, Bryophytes and Pteridophytes.

Through field study they will be able to see these plants growing in nature and can become aware of the Phytodiversity seen in nature. They can create digital/ reports with captured photographs of plants in their natural habitat or pictures with some rare organ/ phenomena associated with plants.

Students will have understanding of the classification, characteristic features, cell structure, growth and reproduction in viruses, Bacteria, Various groups of Algae, Fungi, Bryophytes and Pteridophytes.

Understand the economic and pathological importance of Fungi, Bacteria and viruses.

### Teaching Learning Process:

Visual media shall be used for teaching so that the students get a feel of the subject and the subject is made interesting which will enhance the teaching learning process.

**BOTANY**  
**Semester- I**  
**(For examination to be held in the years 2020, 2021, 2022)**  
**Microbiology, mycology and Cryptogams**

**Theory**

**Course code: UBOTC 101**

**Credits: 04**

**Duration of Exam: 3hrs**

**Maximum Marks: 100**

**External Examination: 80 Marks**

**Internal Assessment: 20 Marks**

**Unit- I            Microbes and Microbiology**

- 1.1 Characteristics of Viruses, General structure with respect to Viroids and Prions. DNA (T-phages) and RNA (TMV) Viruses.
- 1.2 Bacteria- Ultra structure, nutrition and reproduction (binary/endospore), General account of Mycoplasma and Archaeobacteria.
- 1.3 Genetic recombination in bacteria (transformation, transduction and conjugation).
- 1.4 Economic importance of bacteria in agriculture, industry, medicine and diagnostics issues.

**Unit-II            Fungi**

- 3.1 General characteristic and classification of fungi (Ainsworth 1971), Economic importance of fungi (medicine and food), General account of Lichens.
- 3.2 Important features of Mastigomycotina; Life history of *Pythium* and *Allomyces* (Concept of true and false fungi).
- 3.3 Important characteristics of Zygomycotina and Ascomycotina; Life histories of *Rhizopus*, *Saccharomyces*, *Aspergillus* and *Morchella*.
- 3.4 Important characteristics of Basidiomycotina and Deuteromycotina; Life histories of *Puccinia*, *Agaricus*, *Colletotrichum* and *Cercospora*.

**Unit- III            Algae**

- 2.1 General characteristics and trends in classification of algae with respect to (Fritsch 1935), range of thallus organization.

- 2.2 Important features of Chlorophyceae and Xanthophyceae; life histories of *Volvox*, *Oedogonium*, *Chara* and *Vaucheria*.
- 2.3 Important features of Phaeophyceae and Rhodophyceae; life histories of *Ectocarpus* and *Batrachospermum*.
- 2.4 Economic importance of algae (agriculture, food, industry, algal blooms and toxins).

#### **Unit- IV Bryophytes**

- 4.1 General characteristics, classification (Smith, 1995) and alternation of generations.
- 4.2 Structure and reproduction of Hepaticae with reference to *Marchantia*.
- 4.3 Structure and reproduction in Anthocerotae and Musci with reference to *Anthoceros* and *Funaria*.
- 4.4 Bryophytes as amphibians of plant kingdom, evolution of sporophytes, importance of bryophytes in preventing soil erosion, monitoring and controlling pollution and horticulture.

#### **Unit- V Pteridophytes**

- 5.1 General characteristics, Classification (Sporne, 1975), stelar system and alternation of generations, Heterospory and seed habit, ecological and economic importance.
- 5.2 Important characteristics of Psilopsida and Lycopsidea; Structure and reproduction in *Psilotum*, *Lycopodium* and *Selaginella* (excluding development).
- 5.3 Important characteristics of Sphenopsida; Structure and reproduction in *Equisetum* (excluding development).
- 5.4 Important characteristics of Pteropsida; Structure and reproduction in *Adiantum* and *Marsilea* (excluding development).

#### **Note for paper setters**

**External End Semester Examination (Total marks: 80)**

**Time duration: 3 hours**

The question paper will have 3 sections, Section I: Five (5) short answer questions representing all units i.e at least one from each unit of 3 marks each = 15 marks (All compulsory). Section II: Five (5) medium answer questions of 7 marks each= 35 marks (All compulsory). Section III: Five (5) long answer questions covering all the units. The candidate will be required to answer only two question of 15 marks each= 30 marks.

**Internal assessment (Total marks 20)**

**Time duration 1 hour**

**Suggested readings:**

1. Alexopolous, C.J and Mims, C.W: introductory Mycology. John Wiley and Sons
2. Bilgrami, K. S and Saha L.C. 1992.A Textbook of Algae.CBS Publishers and Distributors, Delhi.
3. Dube, H. C. 1990.An Introduction to Fungi. Vikas Publishing House Pvt. Ltd., Delhi.
  
4. Parihar, N. S. 1996. The Biology and Morphology of Pteridophytes. Central Book Distributors, Allahabad.
5. Puri, 1980. Bryophyta: Broad prospective. Atma Ram & Sons, Delhi.
6. Rashid A. 1976.An Introduction to Pteridophytes-Diversity and Differentiation. Vikas Publishing House.
7. Smith, G.M. 1971. Cryptogamic Botany. Vol-I: Algae & Fungi. Tata McGraw Hill Publishing Co., New Delhi.
8. Smith, G.M. 1971. Cryptogamic Botany. Vol.II: Bryophytes & Pteridophytes. Tata McGraw Hill Publishing Co., New Delhi.
9. Sporne, k. R. 1970. The Morphology of Pteridophytes. Hutchinson Univ. Library, London.
10. Sumbali, G. and Mehrotra, R. S. 2009. Principles of Microbiology. The McGraw Hill Education Pvt. Ltd.New Delhi.
11. Sumbali G. 2010. The Fungi. 2<sup>nd</sup> Edn. Narosa Publishing House, New Delhi.
  
12. Kumar, H.D, (1990). Introductory Phycology. Affiliated. East. West, Press, Delhi.
  
13. Pelczar, M. J. (2001). Microbiology. 5<sup>th</sup>Ed, Tata McGraw-Hill Co, New Delhi.

**BOTANY**  
**(Semester-I)**  
**Practicals**

**(For examination to be held in the years 2020, 2021, 2022)**

**Title: Plant Biodiversity (Microbes, Algae, Fungi, Bryophytes & Pteridophytes).**

**Course code: UBOTC- 102**

**Maximum Marks-50**

**Credits: 02**

**External Examination: 25 Marks**

**Duration of Exam: 3hrs**

**Internal Examination: 25 Marks**

**Suggested laboratory Exercises**

1. Study of the genera included under algae and fungi.
2. Study of morphology, reproductive structures and anatomy of the examples cited in theory under Bryophyta and Pteridophyta.
3. Observation of disease symptoms in the hosts infected by fungi, viruses and mycoplasma.
4. Section cutting of diseased material (Wheat rust, Berberis leaves, Tikka disease) and identification of the pathogens as per theory syllabus.
5. Gram staining of bacteria.
6. Study of crustose, foliose and fruticose type of lichens.

**Note for the distribution of 50 marks in practical Examination:**

**1. Internal Assessment**

- a. Day to Day performance in the laboratory: 12 marks.
- b. Test: 8 marks
- c. Regularity of Attendance: 5 marks

**2. External Assessment: 25 marks**

**BOTANY**  
**Semester II**  
**(For examination to be held in the years 2020, 2021, 2022)**

**Title: Characteristics and Systematics of Seed Plants**  
**Theory**

**Course code: UBOTC- 201**

**Maximum marks: 100**

**Credits: - 4**

**External Examination: 80 Marks**

**Duration of Exam: 3 hrs**

**Internal assessment: 20 Marks**

**Unit- I: Seed plants- Origin, Evolution and Characteristics**

- 1.1 Fossilization- Process and types, age of fossils and their importance
- 1.2 General account of pro-gymnosperms, Characters of Cycadeoidales.
- 1.3 General account of Williamsonia and *Cycadeoidea*.
- 1.4 Fossil angiosperms- a general account

**Unit- II: Classification, Morphology and Reproduction in Gymnosperms**

- 2.1 General characters of gymnosperms; classification of gymnosperms as proposed by Sporne (1965).
- 2.2 Morphology, anatomy and reproduction of *Cycas* (excluding development).
- 2.3 Morphology, anatomy and reproduction of *Pinus* (excluding development).
- 2.4 Morphology, anatomy and reproduction of *Ephedra* (excluding development).

**Unit- III: Angiosperm- Identification and Nomenclature**

- 3.1 History of angiosperm taxonomy- classical and modern, species concept and speciation.
- 3.2 Taxonomic identification: taxonomic keys (single access & multi-access) and literature (floras, monographs and journals)
- 3.3 Herbarium: Functions of herbarium, significance and some important herbaria of India & world, virtual herbarium.
- 3.4 Botanical nomenclature –principles and rules, taxonomic ranks, type concept and principle of priority.

**Unit- IV: Classification and tools in Angiosperms Taxonomy**

- 4.1 General trends in classification of Angiosperms.
- 4.2 Salient features of the natural system of classification (Bentham and Hooker) and Phylogenetic system of classification (Takhtajan) with merits and demerits.
- 4.3 Brief concept of clades and Angiosperm Phylogeny Group (APG III) classification.
- 4.4 Contribution of anatomy, embryology and cytology to the study of taxonomy.

## **Unit- V: Diversity of Angiosperms**

- 5.1 Morphological diversities of families: Ranunculaceae, Brassicaceae, Malvaceae and Asteraceae.
- 5.2 Morphological diversities of families: Fabaceae, Apiaceae and Acanthaceae.
- 5.3 Morphological diversities of families: Apocynaceae, Solanaceae, Lamiaceae and Euphorbiaceae.
- 5.4 Morphological diversities of families: Liliaceae and Poaceae.

### **Note for Paper setters**

**External End Semester Examination (Total marks: 80)**

**Time duration: 3 hours**

The question paper will have 3 sections, Section I: Five (5) short answer questions representing all units i.e. at least one from each unit of 3 marks each = 15 marks (All compulsory). Section II: Five (5) medium answer questions of 7 marks each= 35 marks (All compulsory). Section III: Five (5) long answer questions covering all the units. The candidate will be required to answer only two question of 15 marks each= 30 marks.

**Internal Assessment (Total marks 20)**

**Time duration 1 hour**

### **Suggested readings:**

1. Bhatnagar, S.P. and Moitra, A. 1996. Gymnosperms. New Age International Limited. New Delhi.
2. Davis, P.H. and Heywood, V.H. 1963. Principles of Angiosperms.
3. Gifford, E.M. and Foster, A.S. 1988. Morphology and Evolution of vascular plants. W.H. Freeman and company, New York.
4. Jeffery, C. 1982. An introduction to plant taxonomy. Cambridge University Press, London.
5. Jones, S.B. and Luchsinger, A.F. 1986. Plant Systematics. 2<sup>nd</sup> EDN. Mc Graw Hill Book Co., New York.
6. Radford, A.E. 1986. Fundamentals of Plant Systematics. Harper and Row, New York.
7. Singh, G. 1999. Plant Systematics: Theory and practice. Oxford and IBH Pvt.ltd. New Delhi.
8. Sporne, K.R. 1965. The morphology of Gymnosperms. Hutchinson and Co. Ltd., London.
9. Stace, C.A. 1989. Plant taxonomy and Biosystematics. 2<sup>nd</sup> Edn., Edward Arnold, London.
10. Steward, W.M. 1983. Paleobotany and the Evolution of plants Cambridge University Press, Cambridge.

**BOTANY**  
**(Semester-II)**

**Title: Characteristics and Systematics of Seed plants. (Practicals)**

**Course code UBOTC-202**

**Credits: 02**

**Duration of Exam: 3hrs**

**Maximum Marks: 50**

**External Examination: 25 Marks**

**Internal Assessment: 25 Marks**

**Angiosperms** locally available genera/species of following families should be included. This list is only indicative. Teachers may select plants available in their locality.

1. Ranunculaceae: *Ranunculus, Delphinium*.
2. Brassicaceae: *Brassica, Alyssum, Iberis, Coronopus*.
3. Malvaceae: *Hibiscus, Abutilon*.
4. Asteraceae: *Tagetes, Ageratum*.
5. Fabaceae: Faboideae: *Lathyrus, Cajanus, Melilotus, Trigonella*, Caesalpinioideae; *Cassia, Caesalpinia*, Mimosoideae: *Prosopis, Mimosa, Acacia*.
6. Apiaceae: *Coriandrum, Foeniculum, Anethum*.
7. Acanthaceae: *Adhatoda, Peristrophe*.
8. Apocynaceae: *Vinca, Thevetia, Nerium*.
9. Asclepiadaceae; *Calotropis*.
10. Solanaceae: *Solanum, Withania, Datura, Petunia*.
11. Euphorbiaceae: *Euphorbia, Phyllanthus*.
12. Lamiaceae: *Ocimum, Salvia*.
13. Chenopodiaceae: *Chenopodium, Beta*.
14. Liliaceae: *Asphodelus, Asparagus, Allium*.
15. Poaceae: *Zea mays, Triticum aestivum, Oryza sativa*.
16. Mounting of properly dried and pressed specimens of at least five wild plants with herbarium label.

**Gymnosperms:**

***Cycas***

1. Morphology, armour of leaf bases on the stem, very young (circinate venation) and old foliage leaves, scale leaves, bulbils, male cone, microsporophyll, mature seed.
2. Study through the permanent slides- normal root (T.S), stem (T.S) and ovule (L.S).

3. Study through the hand sections or dissections of coralloid root (T.S), rachis (T.S), leaflet (V.S) and pollen grains (W.M)

### ***Pinus***

1. Habit, long and dwarf shoots showing cataphylls and scale leaves, V.S of leaf, T.S of wood showing growth rings, male cones of 1<sup>st</sup> year, 2<sup>nd</sup> and 3<sup>rd</sup>, female cones, winged seeds.
2. Study through permanent slides- root (T.S), female cone (L.S), ovule (L.S) and embryo (W.M) showing polycotyledonous condition.
3. Study through hand sections or dissections – young stem (T.S), old stem (wood) (T.L.S and R.L.S), needle (T.S), male cone (L.S and T.S) and pollen grains (W.M).

### ***Ephedra***

1. Habit and structure of male and female cones.
2. Permanent slides- female cone (L.S).
3. Hand sections or dissections- root (T.S), node (L.S), internode (T.S), macerated stem to see the vessel structure, epidermal peel mount of vegetative parts to study the stomata; male cone (T.S and L.S) and pollen grains (W.M).

Note: In addition to laboratory exercises, study of plant diversity in nature is required, for which a field trip should be organized.

### **3. Internal Assessment**

Day to Day performance in the laboratory: 12 marks. Test: 8 marks

Regularity of Attendance: 5 marks

4. **External Examination:** 25 marks