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**Semester-II**

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## Course Code: BC203T
## Core Course III: Mycology and Phytopathology

*The objective of this course is to expose the students on the fungal world, different fungal diseases; their economic importances etc.*

**(Credits: Theory-4, Practical-2)**

**THEORY**
**Lectures: 60**

**Unit 1: Introduction to fungi** **(6 lectures)**

General characteristics; Affinities with plants and animals; Thallus organization; Cell wall composition; Nutrition; Classification.

**Unit 2: Chytridiomycota, Zygomycota, Ascomycota and Basidiomycota** **(23 lecture)**

Characteristic features; Ecology and significance; Thallus organisation; Reproduction; Life cycle with reference to *Synchytrium, Rhizopus* .

General characteristics (asexual and sexual fruiting bodies); Ecology; Life cycle, Heterokaryosis and parasexuality; Life cycle and classification with reference to *Saccharomyces, Aspergillus*, *Penicillium, Alternaria, Neurospora* and *Peziza.*

General characteristics; Ecology; Life cycle and Classification with reference to black stem rust on wheat *Puccinia* (Physiological Specialization), loose and covered smut (symptoms only), *Agaricus*; Bioluminescence, Fairy Rings and Mushroom Cultivation.

**Unit 3: Allied Fungi and Oomycota** **(7 lectures)**

General characteristics; Status of Slime molds, Classification; Occurrence; Types of plasmodia; Types of fruiting bodies.

General characteristics; Ecology; Life cycle and classification with reference to *Phytophthora, Albugo.*

**Unit 4: Symbiotic associations** **(4 lectures)**

Lichen – Occurrence; General characteristics; Growth forms and range of thallus organization; Nature of associations of algal and fungal partners; Reproduction; Mycorrhiza-Ectomycorrhiza, Endomycorrhiza and their significance.

**Unit 5: Applied Mycology** **(10 Lectures)**

Role of fungi in biotechnology; Application of fungi in food industry (Flavour & texture, Fermentation, Baking, Organic acids, Enzymes, Mycoproteins); Secondary metabolites

(Pharmaceutical preparations); Agriculture (Biofertilizers); Mycotoxins; Biological control (Mycofungicides, Mycoherbicides, Mycoinsecticides, Myconematicides); Medical mycology.

**Unit 6: Phytopathology** **(10 lectures)**

Terms and concepts; General symptoms; Geographical distribution of diseases; Etiology; Symptomology; Host-Pathogen relationships; Disease cycle and environmental relation; prevention and control of plant diseases, and role of quarantine.

Bacterial diseases – Citrus canker and angular leaf spot of cotton. Viral diseases – Tobacco Mosaic viruses, vein clearing. Algal disease- Cephalurous, Fungal diseases – Early blight of potato, Black stem rust of wheat, White rust of crucifers.

## Course Code: BC203P
## Core Course III - Practical: Mycology and Phytopathology
### Practical

1. Introduction to the world of fungi (Unicellular, coenocytic/septate mycelium, ascocarps & basidiocarps).

2. *Rhizopus*: study of asexual stage from temporary mounts and sexual structures through permanent slides.

3. *Aspergillus* and *Penicillium*: study of asexual stage from temporary mounts. Study of Sexual stage from permanent slides/photographs.

4. *Peziza*: sectioning through ascocarp.

5. *Alternaria:* Specimens/photographs and temporary mounts.

6. *Puccinia*: Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; sections/ mounts of spores on wheat and permanent slides of both the hosts.

7. *Agaricus*: Specimens of button stage and full grown mushroom; sectioning of gills of *Agaricus*, fairy rings and bioluminescent mushrooms to be shown.

8. Study of phaneroplasmodium from actual specimens and /or photograph. Study of *Stemonitis sp*orangia.

9. *Albugo:* Study of symptoms of plants infected with *Albugo*; asexual phase study through section/ temporary mounts and sexual structures through permanent slides.

10. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) on different substrates. Study of thallus and reproductive structures (soredia and apothecium) through permanent slides. Mycorrhizae: ectomycorrhiza and endomycorrhiza (Photographs)

11. Phytopathology: Herbarium specimens of bacterial diseases; Citrus Canker; Angular leaf spot of cotton, Viral diseases: TMV, Vein clearing, Fungal diseases: Early blight of potato, Black stem rust of wheat and White rust of crucifers.

## Suggested Readings

1. Agrios, G.N. (1997) Plant Pathology, 4th edition, Academic Press, U.K.
2. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley & Sons (Asia) Singapore. 4th edition.
3. Webster, J. and Weber, R. (2007). Introduction to Fungi, Cambridge University Press, Cambridge. 3rd edition.
4. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan Publishers India Ltd.
5. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.

## Course Code: BC204T
## Core Course IV: Archegoniate

*The objective of this course is to expose the students on Bryophyte, Gymnosperms and Fossil Plants*

**(Credits: Theory-4, Practical-2)**

**THEORY**

**Lectures: 60**

**Unit 1: Introduction (4 lectures)**

Unifying features of archegoniates; Transition to land habit; Alternation of generations.

**Unit 2: Bryophytes (6 lectures)**

General characteristics; Adaptations to land habit; Classification; Range of thallus organization.

**Unit 3: Type Studies- Bryophytes (12 lectures)**

Classification (up to family), morphology, anatomy and reproduction of *Riccia, Marchantia, Pellia, Porella, Anthoceros, Sphagnum ,Funaria and Polytrichum*; Reproduction and evolutionary trends in

*Riccia, Marchantia, Anthoceros* and *Funaria* (developmental stages not included). Ecological and economic importance of bryophytes with special reference to *Sphagnum*.

**Unit 4: Type Studies- Pteridophytes (14 lectures)**

Classification (up to family), morphology, anatomy and reproduction of *Psilotum*, *Selaginella*, *Equisetum* and *Ophioglossium, marselia* (Developmental details not to be included).Apogamy, and apospory, heterospory andseed habit, telome theory, stelar evolution; Ecological and economic importance.

**Unit 5: Gymnosperms (18 lectures)**

General characteristics, classification (up to family), morphology, anatomy and reproduction of *Cycas*, *Pinus* , *Ginkgo* and *Gnetum* (Developmental details not to be included); Ecological and economic importance.

**Unit 6: Fossil plants (6 lectures)**

Process of fossilization; Early land plants (*Psilophyton* and *Rhynia*), Cycadeoidea, Sphenophyllum

## Course Code: BC204P
## Core Course IV - Practical: Archegoniate

1. ***Riccia*** – Morphology of thallus.
2. ***Marchantia***- Morphology of thallus, whole mount of rhizoids & Scales, vertical sectionof thallus through Gemma cup, whole mount of Gemmae (all temporary slides), vertical section of Antheridiophore, Archegoniophore, longitudinal section of Sporophyte (all permanent slides).

3. ***Anthoceros***- Morphology of thallus, dissection of sporophyte (to show stomata, spores,pseudoelaters, columella) (temporary slide), vertical section of thallus (permanent slide).
4. ***Pellia, Porella***- Permanent slides.
5. ***Sphagnum***- Morphology of plant, whole mount of leaf (permanent slide only).
6. ***Funaria***- Morphology, whole mount of leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, longitudinal section of capsule and protonema.
7. ***Polythricum***- Morphology of thallus, dissection of sporophyte
8. ***Psilotum***- Study of specimen, transverse section of synangium (permanent slide).
9. ***Selaginella***- Morphology, whole mount of leaf with ligule, transverse section of stem, whole mount of strobilus, whole mount of microsporophyll and megasporophyll (temporary slides), longitudinal section of strobilus (permanent slide).
10. ***Equisetum***- Morphology, transverse section of internode, longitudinal section of strobilus, transverse section of strobilus, whole mount of sporangiophore, whole mount of spores (wet and dry) (temporary slide), transverse section of rhizome (permanent slide).
11. ***Cycas***- Morphology (coralloid roots, bulbil, leaf), whole mount of microsporophyll, transverse section of coralloid root, transverse section of rachis, vertical section of leaflet, vertical section of microsporophyll, whole mount of spores (temporary slides), longitudinal section of ovule, transverse section of root (permanent slide).
12. ***Pinus***- Morphology (long and dwarf shoots, whole mount of dwarf shoot, male and female cones), transverse section of Needle, transverse section of stem, longitudinal section of / transverse section of male cone, whole mount of microsporophyll, whole mount of Microspores
    (temporary slides), longitudinal section of female cone, tangential longitudinal section &radial longitudinal sections stem (permanent slide).
13. ***Ginkgo***- Morphology (stem, male & female cones), transverse section of stem, vertical section of ovule (permanent slide)
14. ***Gnetum***- Morphology (stem, male & female cones), transverse section of stem, vertical section of ovule (permanent slide)
15. **Botanical excursion.**

**Suggested Readings**

1. Vashistha, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India.
2. Bhatnagar, S.P. & Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
3. Parihar, N.S. (1991). An introduction to Embryophyta: Vol. I. Bryophyta. Central Book Depot. Allahabad.
4. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi.
5. Vanderpoorten, A. & Goffinet, B. (2009) Introduction to Bryophytes. Cambridge University Press