

U.G. 1st Semester

Paper: BOT101C (Core) Non Vascular Cryptogams & Lichens

Credits: 5 = 3+0+2 (48 Lectures)

Theory: 48 Lectures

Unit-1- Algae General Features:-

Lectures-8

General characteristics, ecology and distribution, range of thallus organization, reproduction, classification, origin and evolution of sex and economic importance of algae

Unit -2- Algae Life Cycle:-

Lectures-10

Life cycles of Cyanophyceae- *Microcystis*, *Anabaena* ; Chlorophyceae- *Chlorella*, *Volvox*, *Oedogonium*, *Chara*, Bacillariophyceae- (General account–Diatoms) Phaeophyceae- *Ectocarpus*, Rhodophyceae- *Batrachospermum*, *Polysiphonia*.

Unit 3:Fungi : Introduction.

Lectures-06

Definition, general characteristics; thallus organization; cell structure; nutrition; classification; phylogeny and economic importance

Unit 4: Fungi: Life Cycle

Lectures-08

General characteristics of the sub divisions and life cycle of

Mastigomycotina: *Phytophthora*, *Albugo*.

Zygomycotina: *Rhizopus*

Ascomycotina: *Saccharomyces*, *Aspergillus*, *Penicillium*, and *Peziza*.

Basidiomycotina: *Ustilago* and *Agaricus*

Deuteromycotina: *Alternaria*, *Colletotrichum*, *Cercospora* and *Fusarium*

Unit -5 : Lichen

Lectures-3

Occurrence; General characteristics and range of thallus organization; Reproduction and economic importance of lichens.

Unit-6: Bryophytes

Lectures-13

Characteristic features, amphibian nature, classification, alternation of generation, origin and evolution of sporophyte, economic importance of bryophytes.

Structure, reproduction and life history of *Riccia*, *Marchantia*, *Anthoceros*, *Sphagnum*, *Polytrichum* and *Funaria*.

Practicals: (2 Credits)

Algae : Study of vegetative and reproductive structure through temporary preparations and permanent slides of the following algal types-*Microcystis*, *Anabaena* , *Chlorella*, *Volvox*, *Oedogonium*, *Chara*, *Diatoms*, *Ectocarpus* , *Batrachospermum*, *Polysiphonia*.

Fungi : Study of vegetative and reproductive structure through temporary preparations of the following fungal types-*Albugo*, *Rhizopus*, *Aspergillus*, *Penicillium*, *Peziza*, *Puccinia*, *Agaricus*, *Alternaria*.

Lichens: Study of growth forms of lichen (Crustose, Foliose and Fruticose) on different substrata. Study of thallus and reproductive structures of lichen

Bryophytes: Study of the gametophyte and sporophytes of *Riccia*, *Marchantia*, *Anthoceros*, *Sphagnum* and *Funaria*.

Practicals should be supported by practical record/slides and specimens

Suggested Readings:

Algae :

- Bold, H.C. and Wayne, M.J. Introduction to Algae (2nd edition). Prentice Hall, New Jersey.
- Fritsch, F. E. (1961), Structure and reproduction in algae, Vol- I, & II Cambridge University.
- Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
- Sambamurty, A. A Text Book of Algae. I.K. International Pvt. Ltd., New Delhi.
- Sharma, O.P. (2011). Text book of Algae. Tata Mc Graw Hill Education Pvt. Ltd., New Delhi.
- Vashishta B.R., Sinha A. K., V. P. Singh .Botany for Degree student- Algae. S. Chand and Company

Fungi:

- Mehrotra R.S. and Aneja K.R. (1990). An Introduction to Mycology, Wiley, Eastern Limited, New Delhi. Press, London.
- Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan Publishers India Ltd.
- Sharma, O.P. (2011). Fungi and allied microbes. Tata McGraw Hill Pvt Ltd., New Delhi.
- Webster, J. and Weber, R. (2007). Introduction to Fungi, Cambridge University Press, Cambridge. 3rd edition.
- Vashishta B.R., Revised by Sinha A. K., (2003), Botany for Degree student- Part II-Fungi . S. Chand and Company.

Lichen:

- Nash, T. H. 1996. Lichen Biology. Cambridge University Press, London
- Gupta, P and Sinha G P. (2018), The Lichen Flora of Assam, Scientific Book Publications.

Bryophytes:

- Chopra, R. N and Kumar, P. K. (1988). Biology of Bryophytes. New Age International Publishers, New Delhi.
- Goffinet B and Jonathan Shaw, A. (2009). Bryophyte Biology. Cambridge University Press, New York.
- N. S. Parihar, (2013). An Introduction to Embryophyta. Vol. I Bryophyta, Surjeet Publication, New Delhi.
- Rashid, A. (1998). An Introduction to Bryophyta. Vikas Publishing House, Pvt. Ltd., New Delhi.
- Watson, E. V. (2015). The structure and life of Bryophytes. Scientific Publication, Jodhpur, India

Paper: BOT102C (Core)
Instrumentation and Laboratory Techniques
Credits: 5=3+0+2 (48 Lectures)

Theory: 48 Lectures

Unit-1: Microscopy and Imaging techniques:

Lectures-08

- Camera lucida types and principle; principles and application of microscopy(light microscopy; fluorescence microscopy; confocal microscopy). Electron microscopy (principles and applications of transmission and scanning electron microscopy). Chromosome banding, FISH, chromosome painting.

Unit-2: Basic laboratory instruments:

Lectures-08

- Principles and applications of hot air oven, incubators, autoclave, and laminar air flow chamber, Different types of centrifuge, pH meter.
- Spectrophotometry: Principle and its application in biological research. Microtome techniques,

Unit-3: Chromatography

Lectures-08

- Principles & applications; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ion-exchange chromatography; Affinity chromatography

Unit-4: Basic Laboratory Techniques:

Lectures-08

- Basic plant and microbe culture media and methods of sterilization, concept of solutions, indicators, pH and buffers. Preparation of normal, molal, molar, ppm and percent solutions;
- Field and herbarium techniques, preservation of museum and herbarium specimens, preservation techniques for special types of plant (bryophytes, aquatic plants, succulents and xerophytes, palm, canes and bamboos)

Unit-5: Plant microtechniques

Lectures-06

- Staining procedures, classification and chemistry of stains. Cytogenetic techniques- (Pre-treatment, maceration, smear & squash); dissection, peeling and whole mount , serial sectioning – double/ multiple staining. Histochemical Techniques – Localisation of specific compounds.

Unit -6: Data analysis and presentation techniques

Lectures-10

- Statistics: data, population, samples, parameters; Representation of Data: Tabular, Graphical; Measures of central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variation, standard deviation critical difference, Chi-square test for goodness of fit.
- Scientific writing and its representation: Numbers, units, abbreviations and nomenclature used in scientific writing. Writing references, power-point presentation, poster presentation. Scientific writing and ethics (Introduction to copyright, academic misconduct/plagiarism).

Practicals: (2 Credits)

- Spore measurement by micrometry,
- Camera lucida diagram of stomata and spore.
- Basic aseptic techniques,

- Preparation of solutions (normal, molal, molar, ppm and percent solutions) of known concentrations using pure samples and stock solutions.
 - Preparation of reagents, fixatives, stains and Indicators,
 - Preparation of permanent slides (double staining).
 - Measurement of pH using pH metre (water and soil).
 - Preparation of buffers (phosphate/ acetate buffer).
 - Microtomy.
- Local field visit and submission of report.
- Practicals should be supported by practical record and field report

Suggested Readings

- Harborne JB (1998). Phytochemical Methods A Guide to Modern Techniques of Plant Analysis : JB. Springer.
- Plummer, D.T. (1996). An Introduction to Practical Biochemistry. Tata McGraw-Hill Publishing Co. Ltd. New Delhi. 3rd edition.
- Ruzin, S.E. (1999). Plant Microtechnique and Microscopy, Oxford University Press, New York. U.S.A.
- Wilson, K. & Walkar, J (Eds) (2000) Practical Biochemistry: Principles & Techniques, Cambridge University Press.

Paper: BOT103M (Modular)
Plants and Human Welfare
Credits: 4=3+1+0 (48 Lectures)

Theory: 48 Lectures

Unit-1: Introduction

Lectures-08

- History (development of botany as a scientific discipline), scope and importance, different branches of Botany (an idea): Plant anatomy and morphology, Plant Ecology, Plant Physiology, Plant Pathology, Plant taxonomy, Genetics, Economic Botany; Botany and its relation with other disciplines of science.

Unit-2 Plants and Environment

Lectures-06

- Interaction of plants with the environment, plants as sink of CO₂, plants as pollution indicators, phytoremediation, sustainable development and social forestry.

Unit-3: Role of plants in relation to Human Welfare;

Lectures-08

- Plants as sources of - food, beverages, medicine, fibres, dyes and fuel (Petrocrops), Microbes in Human Welfare, Importance of forestry their utilization and commercial aspects –Avenue trees & Ornamental plants of India .

Unit-4: Plants as indigenous resources

Lectures-08

- Ethnic plant wealth-wild edible plants, ethnomedicinal plants, bamboos and rattans of NE India

Unit -5: Plants and Ecotourism.**Lectures-08**

- Role of plants in parks and landscaping , botanical gardens, flower gardens, orchid gardens, fruit gardens, medicinal plant gardens; an opportunity for communities to reap the benefits from ecotourism.

Unit-6: Management of Plant Biodiversity:**Lectures-10**

- Organizations associated with biodiversity management- IUCN, UNEP, UNESCO, WWF, NBPGR; Biodiversity legislation and conservations.

Suggested Readings

- Ijaz, F., et al.,(2017) "The role of plants i n human welfare." J Tradit Med Clin Natur 6, 214 .
- Irfan ali khan & Atiya khanum (2000) - Antidiabetic plants of India, ukaaz publications, Hydherabad, India.
- Irfan Ali Khan & Atiya Khanum (2000). Role of biotechnology in medicinal and aromatic plants - Volume III, Ukaaz Publications, Hydherabad, India.
- Krishnamurthy, K.V.(2004). An Advanced Text Book of Biodiversity-Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi.