

P.G. 1st Semester

Paper: BOT701C (Core) Non Vascular Cryptogams

Credits: 4 = 3+1+0 (48 Lectures)

Algae: Lectures -15

Unit 1:

- Classification of algae- comparative survey of important system : Fritsch- Smith-Round
- Ultrastructure of algal cells: cell wall, flagella, chloroplast, pyrenoid, eye-spot and their importance in classification. Structure and function of heterocysts, pigments in algae and Economic importance of algae.

Unit 2:

- General account of thallus structure, reproduction, relationships and evolutionary trends in the following groups - Cyanophyta, Chlorophyta, Xanthophyta, Bacillariophyta, Phaeophyta and Rhodophyta

Fungi & Lichen : Lectures - 18

Unit-3:

- Present status of fungi, classification, Modes of life, Thallus organization, Reproduction, Evolution of sex, Heterothallism, Parasexuality and compatibility, Nutrition, Evolution phylogeny and Economic importance of fungi.

Unit-4:

- Comparative account of thallus structure, reproduction and life cycle pattern of—
 - o Myxomycotina: Plasmodiophorales
 - o Mastigomycotina:Chytridiales, Saprolegniales and Perenosporales
 - o Zygomycotina:Mucorales
 - o Ascomycotina: Endomycetales, Protomycetales, Taphrinales, Erysiphales, Eurotiales, Sphaeriales, and Pezizales
 - o Basidiomycotina: Uredinales, Ustilaginales, Lycoperdales, Nidulariales, Phallales, Agaricales, Aphylophorales
 - o Deuteromycotina: Sphaeropsidales, Melanconiales, Moniliales and Mycelia sterilia.

Lichen: Thallus structure, Classification, reproduction and Economic importance

Bryophytes: Lectures - 15

Unit-5:

- Classification of bryophytes, origin, evolution and fossil history of bryophytes, primitive versus advanced characters, evolution of sporophyte, spore germination, protonemal differentiation, bud formation, parthenogenesis, apogamy, apospory and regeneration. Comparative morphology and developmental anatomy of hepaticae, Anthocerotae and Musci.

Unit-6:

- Ecology- Habitats, water relations (Ectohydric, endohydric and myxohydric bryophytes); Bryophytes as pollution indicators; Economic importance of bryophytes. Bryo-geographical regions of India with reference to North- Eastern India.

Suggested readings (Algae):

- Bilgrami K.S. and Saha L.C. 2007. A Text Book of Algae. CBS Publishers & Distribution
- Bold and Wynnee. 1985. Introduction to algae – Structure and reproduction. Prentice – Hall, India
- Kumar, H. D. 1990. Introductory phycology, Affiliated East West Pvt Ltd., Bangalore, India.
- Round, F. E. 1973. Biology of algae. Edward Arnold Publishers, London
- Sambamurty, A.V.S.S. 2005. A Text Book of Algae. I.K. International Pvt.Ltd., New Delhi.
- Sharma.O.P. 2011. Algae. Tata McGraw Hill Education Pvt. Ltd., New Delhi.

Suggested readings (Fungi):

- Ainsnorth G.C 1973. The Fungi Vol IV A, IV B Academic Press.
- Alexopoulos C.J, Mims C.W. and Blackwel M.I 1996. Introductory Mycology. John Wiley and Sons Inc.
- Burnett J.H. 1968. Fundamentals of Mycology. Edwards Arnold Publication.
- Hawker L.E. 1967. An Introduction to Fungi Cambridge Press.
- Mehrotra R.S and Aneja R.S 1998. An introduction to Mycology. New Age Intermediate.
- Sharma, O.P. (1989): Textbook of Fungi
- Webster J. 1985. Introduction to Fungi. Cambridge University Press.

Suggested readings (Bryophytes):

- A.H.E Smith .Bryophyte Ecology
- Hait, Bhattacharya, Ghosh. A textbook of Botany. Vol 1
- Shaw AJ and B Goffinet (2000) Bryophyte Biology. Cambridge University Press.
- Vashishta ,B.R.–Bryophyta-Part III

Paper: BOT702C (Core)

Vascular Plants

Credits: 4 = 3+1+0 (48 Lectures)

Pteridophytes:

Unit-1: Lectures-10

- Theories of origin and interrelationship of pteridophytes; Classification , Diversity of life cycle pattern, apospory and apogamy, heterospory and seed habit, Evolution of Sorus; Evolutionary trends & Economic importance of pteridophytes.
- Ecology & distribution of ferns of N. E India with special reference to Assam.
- Morphology, anatomy and reproduction of Psilopsida, Lycopsida, Sphenopsida and Pteropsida.

Unit-2: Lectures - 6

- Fossils Pteridophytes: Morphology, anatomy and reproductive characteristics and affinities of major fossil groups- Psilophytales, Lepidodendrales, Zosterophyllales, Sphenophyllales, Calamitales, Cladoxylales and Coenopteridales.

Gymnosperms:

Unit-3: Lectures-08

- Geological time-scale and correlated predominant gymnosperm flora; Salient structural features and affinities of fossil gymnosperms - Pro-gymnosperms, Pteridospermales, Bennettitales, Pentoxylales, Cordaitales.

Unit-4: Lectures-08

- Diversity and distribution, Morphology, anatomy and reproduction of Cycadales; Coniferales, Ginkgoales; Taxales; Ephedrales; Gnetales.

Angiosperm:

Unit-5: Lectures-08

- Range of vegetative and reproductive structure and their modification in angiosperms; ideas on the origin and evolution of roots, stem and leaf. A critical study of the current ideas on the origin of angiosperms.

Unit-6: Lectures-08

- Origin and evolution of inflorescence and flower, co-evolution of flower vis-à-vis pollinators, special type of inflorescence, origin and evolution of stamens, origin and evolution of carpels, different types; types of ovary, evolution of placentation types, inferior ovary- foliar and axial concepts.

Suggested readings:

Pteridophytes:

- Agashe S.N.(1995). *Paleobotany*. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
- Arnold A.C. (2005). *An Introduction to Paleobotany*. Agrobios (India). Jodhpur.
- Eames E.J. (1983). *Morphology of Vascular Plants*. Standard University Press.
- Gangulee and Kar(2006). *College Botany*. New Central Book Agency.
- Rashid A.(1999). *An Introduction to Pteridophyta*. VikasPublishing House Pvt. Ltd. New Delhi.

Gymnosperms

- Bhatnagar, S.P. and Moitra A. 1996. Gymnosperms. New Age International Private Limited, New Delhi;
- Biswas, C. and Johri, B.M. 1997. The Gymnosperms, Narosa Publishing House, New Delhi;
- Coulter, J.M. and Chamberlain, C.J. Morphology of Gymnosperms, Central Book Depot, Allahabad;
- Maheshwari, P. and Vasil, V. Gnetum CSIR (Monographs);
- Sharma, O.P. 1996. Gymnosperms, PragatiPrakashan, Meerut;
- Vashishta, P.C. 1999. Gymnosperms, S.Chand& Company Ltd. New Delhi;

Angiosperm:

- David, P.H. and Heywood, P.H(1963). *Principles of Angiosperms taxonomy*. Oliver and Boys, London.
- Eames A. J(1981) Morphology of angiosperms, McGraw Hill Publisher, New York.
- Hutchinson, J(1964). *Genera of flowering plants*.Cambridge University Press, London.
- Jain, S.K. and Rao, R.R(1977). *A Hand Book of Field and Herbarium Methods*. Today and Tomorrow Publications, New Delhi.
- Mabberley, D.J(2017). *The Plant Book*. Cambridge University Press, London.

- Mitra, J.N (1964) Taxonomy of angiosperm, Oxford and IBH publishers, New Delhi
- Takhtajan, A(1969) *Origin and dispersal of Flowering Plants*. Oliver and Boyd Edenberg

Paper: BOT703C (Core)
Angiosperm Taxonomy & Ethnobotany

Credits: 4 = 3+1+0 (48 Lectures)

Unit-1: Lectures-08

- Historical development of plant taxonomy, systems of classification- artificial, natural and phylogenetic; phenetic and phylogenetic systems, cladistics in taxonomy; taxonomic hierarchy concept of taxa, species, genus and family, infraspecific categories, use of computer in taxonomy; changing trends in plant taxonomy.

Unit-2: Lectures-08

- Plant nomenclature- history of nomenclature, detailed study of salient features and major provisions of ICN including effective and valid publication, rule of priority and its limitations, typification, rejection of names and names of hybrid, biocode.

Unit-3: Lectures-08

- Plant collection, exploration, importance of botanic garden and herbaria in taxonomic studies, important botanic garden and herbaria in the world and India, Indian flora- its past and present position with particular reference to N. E. India; Botanical Survey of India-organisation and activities

Unit-4 Lectures-08

- Phylogeny, floral evolution and economic importance of selected families (mostly Indian distribution) of the following orders- Magnoliales, Ranunculales, Lamiales, Asterales, Orchidales, Zingiberales and Poales.

Unit-5: Lectures-08

- Ethnobotany- Nature, scope, History, Objectives and as an intra & inter-disciplinary science; Cross cultural study; disciplines and sub-disciplines of ethnobotany; The relevance of ethnobotany in the present context: Life style, Material Culture and Indigenous Technology. Ethnic groups and Ethnobotany:

Unit-6 Lectures-08

- Ethnic groups and Ethnobotany: Ethnic groups and their life styles, Material Culture and Indigenous Technology and Medico-ethnobotanical resources in India with special reference to NE states. Socio-economy and other aspects of Ethnobotany with reference to:
 - Food,
 - Intoxicants and Beverages,
 - Ropes and Binding Materials
 - Resins and Oils
 - Cosmetics
 - Ornamentals
 - Fodder
 - Medicinal and Aromatic properties.

Suggested Readings:

Angiosperm Taxonomy:

- Hutchinson, J. 1964. *Genera of flowering plants*. Cambridge University Press, London.
- Jain, S.K. and Rao, R.R. 1977. *A Hand Book of Field and Herbarium Methods*. Today and Tomorrow Publications, New Delhi.
- Naik, V.N. 1984. *Taxonomy of Angiosperms*. Tata McGraw Hill, New Delhi.
- Singh, G. 2012. *Plant Systematics: Theory and Practice*. Completely revised and enlarged. 3rd edition. Oxford & IBH, New Delhi.
- Sivarajan, V.V. and Robinson, N.K.P. 1991. *Introduction to the principles of plant taxonomy*. Oxford IBH, New Delhi.

Ethnobotany:

- Cotton C.M. 1997. *Ethnobotany – Principles and applications*. John Wiley and sons – Chichester.
- Faulks, P.J. 1958. *An introduction to Ethnobotany*, Moredale Pub. Ltd., London.
- Jain S.K., (ed.) 1981. *Glimpses of Indian Ethnobotany*, Oxford and I B.H., New Delhi.
- Jain S.K., 1995 *Manual of Ethnobotany*, Scientific Publishers, Jodhpur.
- Martin, G.J. 1996, *Ethnobotany, A methods manual*, Chapman & Hall, London.
- Schultes, R.E. 1995. *Ethnobotany*, Chapman and Hall.

Paper: BOT704C (Core)
Plant Ecology, Biodiversity and Conservation Biology
Credits: 4 = 3+1+0 (48 Lectures)

Unit-1: Introduction:

Lectures-08

- Scope and concept of plant ecology; relation of plant ecology with other disciplines; principles of ecology; light, water and fire as ecological factors; origin and development of soil; soil horizons and profile.

Unit-2: Population Ecology:

Lectures-08

- Concept; population characteristics: density, natality, mortality, dispersion, population size, age structure, biotic potential, life tables; population dynamics: population increase, population growth curves; population regulation; Life history strategies: r and K selection, population genetics (Bottleneck and Founder Effect).

Unit-3: Community Ecology:

Lectures-08

- Nature and concept of biotic community, characteristics of communities (analytical and synthetic); community structure and attributes; classification of communities; ecotone and edge effect; concept of ecological niche. Ecological succession: types; mechanisms; changes involved in succession; examples of succession.

Unit-4: Ecosystem Ecology:

Lectures-06

- Structure and function of ecosystems; energy flow and mineral cycling (C,N, P& S); primary production; methods of measurement of primary productivity; development and evolution of ecosystems.

Unit-5: Phyto-geography:and applied ecology:

Lectures-08

- Definition, principles and objectives of phytogeography; descriptive and dynamic phytogeography; continuous and discontinuous plant distribution; routes and barriers to plant migration; Centers of origin (Primary and secondary centers); Endemism – types and

endemism in Indian flora. Environmental pollution (green house gases, ozone hole, sea level rise); ecological restoration; environmental problems of N.E. India.

Unit-6: Biodiversity and Conservation Biology:

Lectures-10

- Biodiversity – types, levels, threats, value and uses ; distribution and gradients of biodiversity, agrobiodiversity outlines, megadiverse nations; biodiversity hotspots with special emphasis on Indian hotspots, conservation strategies, IUCN Red list of threatened species; extinction of species, IUCN protected area management categories, Biodiversity and Ecosystem services (BES), status of biodiversity conservation in India; role of organisations in the conservation of biodiversity – IUCN, WCED, UNEP, NBPGR, CBD.

Suggested Readings:

- Bharucha, F.R.(1983) - *A textbook of plant geography of India*, Oxford University Press, 179 pages
- Cain, S.A . (1944) : *Foundations of Plant Geography*, Harper & Brothers, N.Y.
- Chapman, J. L. and Reiss, M. J. (1992). *Ecology – Principles and Applications*, Cambridge University Press, Cambridge, UK
- Good, R. (1997) : *The Geography of flowering Plants (2nd Edn.)*, Longmans, Green & Co., Inc., London & Allied Science Publishers, New Delhi -495pp.,
- Krishnamurthy, K.V. *A textbook of Biodiversity*, Science Publishers Inc.,Enfield, New Hampshire, USA.
- Mishra, K. C. *Manual of Plant Ecology* - Oxford & IBH
- Sharma, P. D. (2009). *Ecology and Environment*, Rastogi Publications, Meerut, India
- Shukla, R.S. & Chandel P.S.(1991): *Plant Ecology & Soil Science*, S.Chand & Co., New Delhi.
- Townsend, C.R., Begon, M. and Harper, J.L. 2003. *Essentials of Ecology* (2nd Edn.) Blackwell Publishing, Oxford.

Paper: BOT705L (Lab)

A. Non Vascular Cryptogams & Vascular Plants

B. Angiosperm Taxonomy & Ethnobotany and Plant Ecology, Biodiversity & Conservation Biology

Credits: 4 = 0+0+4

A. Non Vascular Cryptogams & Vascular Plants (2 Credits)

- **Algae:** Study and identification of available specimen (at least two) in each of the following classes: Cyanophyta, Chlorophyta, Xanthophyta, Bacillariophyta, Phaeophyta and Rhodophyta.
- **Fungi:** Thallus organization, Spore producing organs, Tissue differentiation and accessory structures of following –Myxomycotina, Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina
- **Bryophytes:** Study and identification of available specimen (at least two) in each of the following classes: Hepaticopsida, Anthocerotopsida, and Bryopsida

Pteridophytes:

- Study of major groups of fossil pteridophytes.
- Study of available living members of pteridophytes.
- Study of soral characters of ferns available in N.E. region.
- Study of epidermal morphology of some important ferns.

Gymnosperm:

- Comparative study of the vegetative, reproductive parts and anatomy of the following: *Zamia, Araucaria, Cupressus, Cedrus, Ginkgo, Taxus* and *Ephedra*.

Angiosperms Morphology:

- Study of epidermal morphology: hair, trichomes, venation, stomata.
- Morphology of different types of inflorescence.
- Morphological study of primitive and advanced flowers.
- Morphology of different types of ovary and placentation types.

B. ANGIOSPERM TAXONOMY & ETHNOBOTANY AND PLANT ECOLOGY, BIODIVERSITY & CONSERVATION BIOLOGY: (2 Credits)

Taxonomy

- Taxonomic study of angiospermic plants with analytical drawings, botanical description and identification up to the rank of species.
- Collection and preparation of herbarium specimens to be submitted along with field note book so as to get acquainted with herbarium techniques. At least 20 herbarium specimens of common plants to be prepared and submitted.
- Handling of floras, manuals and herbarium for identification of plants.
- Field studies.

Ethnobotany:

- Field trips within and nearby areas, compilation of field notes and identification, field notes, visual and digital records and preparation of herbarium, specially of the following categories (1 each) – oils, medicines for asthma, skin diseases, diarrhoea, family planning.

Plant Ecology, Biodiversity and Conservation Biology:

- Determination of abundance, density, and frequency of plant community by quadrat method.
- Determination of the minimum size of the quadrats necessary to study herbaceous communities by 'species area curve' method.
- Determination of the minimum number of quadrats necessary to study herbaceous communities.
- Determination of community coefficient of two sites by quadrat method.
- Determination of the basal area of a plant species in the study area.
- Determination of phytomass.
- Study of phytoplanktons.
- Study of seed dispersal of plant species.
- To prepare a map and study the Centers of origin of cultivated plants (Primary and secondary centers).
- Study of endemic vascular plants in Indian flora (at least ten)