M. Sc BOTANY: I SEMESTER – THEORY SYLLABUS

BOT: HCT 1.1 ALGAE, FUNGI, BACTERIA AND VIRUSES		64 hours
1	**Algae:** Introduction and contributions of Phycology, General characters and classification of algae (Fritsch, 1945 and Van den Hoek 1995); Distribution of algal communities-freshwater, marine and terrestrial; algae from usual environments. Thallus ultrastructure organisation, reproduction and life cycle patterns of Cyanophyceae (Microcystis, Nostoc, Oscillatoria and Scytonema), Chlorophyvceae (Chlorella, Spirogyra, Volvox, Desmids and Coleochatae), Charophyceae (Chara and Nitella), Xanthophyceae (Vaucheria and Botrydium), Bacillariophyceae (Pennales and Centrales), Phaeophyceae (Ectocarpus , Porphyra and Sargassum) Rhodophyceae (Batrachospermum and Polysiphonia). Economic importance of algae. Biochemicals from algae: enzymes, vitamins, antibiotics, sterols and liposomes.	16 h
2	**Fungi:** General characteristics and classification, morphological, structural diversity and reproduction in Myxomycotina (Stemonitis), Mastigomycotina (Saprolegnia) Zygomycotina (Mucor and Rhizopus), Ascomycotina (Yeast, Aspergillus, Peziza), Besidiomycotina (Puccinia, Agaricus, Lycoperdon) Deuteromycotina (Cercospora, Alternaria and Rhizoctonia). Homothallism and Heterothallism, Economic importance of fungi: Agriculture- biofertilizers and biopesticides, Pharmaceuticals-antibiotics and hormones, Industrial- organic acids and mushroom cultivation, Nutrition- edible fungi. Lichens: General characteristics and classification, ecological significance and Economic importance,	16 h
3	**Bacteria:** General characters, classification, Ultrastructure of bacterial cell, Reproduction in Bacteria: Fission, sexual reproduction (genetic Recombination) – Conjugation, Transformation and Transduction. Bergey's Manual of Systematic Bacteriology, Role of Bacteria in Agriculture and Nitrogen fixation. Bacterial diseases: Citrus canker, Black arm, boll rot and blight of Cotton, Bacterial leaf blight of paddy. Bacterial Plasmids and their characteristics. Spirochaetes, Rickettsiae and Chlamydiae.	16 h
4	**Viruses:** General characters, Morphological and structural diversity, classification, nomenclature and ultrastructure of TMV and Bacteriophages, Reproduction, Infection and multiplication of Phage (Lytic cycle). Viroids and Prions. Viral diseases: TMV, YBMV and PRSV (Papaya ring spot). Mycoplasma: General Characters, Ultrastructure studies and classification. Mycoplasma diseases and management: Little leaf of *Vinca rosea*, Grassy shoot of Sugarcane. Phytoplasma – a brief account. Mycoplasma like organisms (MLOs).	16 h

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1. Bold and Wynee. 1985. Introduction to algae – structure and reproduction. Prentice – Hall, India.
2. Desikachary. 1959, Cyanophyta, ICAR. New Delhi.
3. Dixon. 1973. Biology of Rhodophyta. Oliver and Boyd, London.
4. Dodge JD. 1973. The Fine Structure of Algal Cells, Academic Press, INC. London.
5. Fritsch FE. 1961, Structure and reproduction in algae, Vol - I, & II Cambridge University Press, London.
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7. Burnell JH and Trinci APJ. 1979. Fungal walls and hyphal growth, Cambridge University Press. Cambridge.
8. Chandhniwala. 1996. K.M. Infectious fungi, Anmol Publications, Pvt. Ltd.
9. Bergey, D. H (1923). Bergey's manual of determinative bacteriology: a key for the identification of organisms of the class schizomycetes. The Williams & Wilkins Company. Baltimore:
10. Contract, F. H., Kimball, P.C. and Jay, L. 1998. Virology. Prentice Hall, Englewood Cliff, New Jersey.
11. Dimmock, N. J., Easton A. J. and Leppard K. N. 2007. Introduction to Modern Virology (VI Ed.), Blackwell Publishing, UK.
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13. Powar CB and Daginawala. 1991. General Microbiology, Vol – I and Vol – II Himalaya publishing house, Bombay.
14. Dubey RC and Maheshwari DK. 2002. A Text book of Microbiology, S.C.Chand and Company, Ltd. Ramnagar, New Delhi.
15. Ananthnarayan R and Panikar JCK. 1986. Text book of Microbiology. Orient Longman ltd. New Delhi.

BOT: HCT. 1.2 BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS		64 hours
1	**Bryophyta:** General Characters, Classification (Rothmuler), origin and distribution, Morphological, structural diversity and reproduction in Marchatiales (Marchantia), Jungermanniales (Porella), Metzgeriales (Aneura), Anthoceratales (Anthoceros), Sphagnales (Sphagnum), Bryales (Funaria and Polytrichum). Ecology and economic importance of Bryophytes. Fossil Bryophytes. Economic importance: with special reference to chemical constituents, bryophytes as indicator of pollution, Succession of bryophytes. Evolutionary trends in Sporophytes and gametophytes of Bryophytes.	16 h
2	**Pteridophyta:** General characters, Classification, origin and distribution, Morphological, structural diversity and reproduction in Psilotales (Psilotum), Lycopodiales (Lycopodium), Selaginnelales (Selaginella), Equisetales (Equisetum). Fossil Pteridophytes: Psilophytales, Lepidodendrales and Calamitales.	16 h
3	**Pteropsida:** Vegetative habits, anatomy and reproduction in Ophioglossales, Osmundales, Filicales, Marsiales and Salviniales; Stelar evolution in Pteridophytes; Heterospory and seed habit; Telome concept; Economic importance of Pteridophytes; Recent developments in Pteridophytes.	16 h
4	**Gymnosperms:** Introduction, classification and distribution; Morphology, anatomy and Reproduction in Cycadales - Cycas and Zamia, Ginkgoales - Ginkgo biloba, Coniferales - Pinus and Araucaria, Gnetales- Gnetum and Ephedra; General account of vegetative and reproductive organs of Pteridosperms; Pentoxylales and Bennettitales-their affinities; Economic importance of Gymnosperms; Endangered and endemic taxa and their conservation.	16 h

REFERENCES:

1. Puri, P. 1980. Bryophytes. Atma Ram and Sons, Delhi.
2. Parihar, N. S. 1996. Bryophytes. Central Book Depot, Allahabad.
3. Bernard Goffinet and Jonathan Shaw, A. 2009. Bryophyte Biology. Cambridge University Press, New York.
4. Parihar, N. S. 1996. Biology and Morphology of Pteridophytes. Central Book Depot,

   Allahabad.
5. Sporne, K. R. 1991. The Morphology of Pteridophytes. B.I. Publishing Pvt. Ltd., Bombay
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8. Manju C Nair, Rajesh K.P. and Madhusudanan P.V. Bryophytes of Waynad in Western Ghats. Malabar Natural History Society, Kozikode.
9. Andrews, H. N. 1961. Studies in Paleobotany, John Wiley, New York.
10. Bhatnagar, S. P. and Moitra, A. 1996. Gymnosperms. New Age International Ltd., New Delhi.
11. Chamberlain, C. J. 1986. Gymnosperms – Structure and Evolution, CBS Publishers, New Delhi.
12. Chopra, G. L and Verma, V. 1988. Gymnosperms. Pradeep Publications, Jalandar.
13. Harris, T. M. 1973. Cycas and the Cycadales, Central Book Depot, Allahabad.
14. Shukla, A. C. & Misra, S. P. 1975. Essentials of Paleobotany. Vikas publishing house Pvt., Ltd., New Delhi.
15. Sporne, N. E. 1965. The Morphology of Gymnosperms. Hutchinson and Company (Publishers) Ltd., U. K.

BOT: HCT. 1.3 PLANT SYSTEMATICS AND PHYTOGEOGRAPHY		64 hours
1	**Taxonomy:** Pre-Darwinian, Post Darwinian, Phylogenetic systems of classification- Cronquist, Takthajan and Thorne and APG systems of classification; Herbarium: Brief account on the herbaria of World and India, Preparation of herbarium specimens, Maintenance and importance of Herbaria; Botanical gardens- A brief account on the botanical gardens of India & World- their importance; Botanical Survey of India.	16 h
2	**Plant Nomenclature**: Principles, procedures, rules and recommendations; ICN- Principles, priority, valid publication, effective publication and citation; ICNCP- Classification, documentation and registration of cultivated plant species; Taxonomic study of Nymphaeaceae, Magnoliaceae, Casuarinaceae, Caryophyllaceae, Euphorbiaceae, Fabaceae, Malvaceae, Capparaceae, Asteraceae, Rubiaceae, Apocynaceae, Lamiaceae, and Arecaceae. Araceae, Liliaceae, Arecaceae, Poaceae.	16 h
3	**Principles of Phytogeography**: Origin of islands and continents- Pangea, Panthalasa, Laurasia, Gondwana land; Plate tectonics and continental drift; theory of tolerance; Endemism; Major terrestrial biomes in the world. Phytogeographical regions of the World & India; General characters of flora of India; Native taxa; Naturalization of exotic taxa.	16 h
4	**Floristics:** Six major floristic regions of world; Australian Kingdom, Cape Kingdom, Antarctic Kingdom, Palaeotropical Kingdom, Neotropical Kingdom, Boreal Kingdom; Floristic regions of India; eight floristic regions: the western Himalayas, the eastern Himalayas, Assam, the Indus plain, the Ganga plain, the Deccan, Malabar and the Andamans. Plant distribution and migration- Contism, dricontinism and endemic distribution; Age and area hypothesis; Wills theory; Vicaridess and theory of tolerance.	16 h

REFERENCES:

1. A dictionary of flowering plants and ferns: Airy-Show, H.K (Cambridge,1983)
2. An introduction to plant nomenclature: Bennet, S.S.R. (Dehradun 1979)
3. The evolution and classification of flowering plants: Cronquist, A (London 1968)
4. An introduction to plant taxonomy: Jeffery, C (Cambridge Univ Press 1982)
5. Taxonomy of Angiosperms: Jhori, B.M. & Bhatnagar, S P (Narosa, New Delhi. 1994)
6. Plant Systematics: Jones, S. B. & Luchsinger, A. E. (McGrew Hill 1979)
7. Taxonomy of vascular plants: Lawrence, G H M (Mac Millen, London 1951).
8. Taxonomy of angiosperms: Naik, N (1984)
9. Vegetation of the Earth- Ecological systems of the geo-biosphere: Heinrich Walter (2002)
10. An Advance text book on biodiversity: Krishnamurthy KV (IBH, New Delhi, 2003)

BOT: SCT. 1.4.1 BIODIVERSITY AND CONSERVATION		64 hours
1	**Biodiversity:** Definition, concept and importance of biodiversity; Species biodiversity, genetic diversity, ecosystem diversity; Rio de Jeneiro Earth Summit 1992, biodiversity and agenda 21; Biodiversity of the World, India and Karnataka; Hotspots of World and India; Mega biodiversity centres of World and India.	16 h
2	**Loss of biodiversity:** Casual factors of threat, impact of habitat loss and habitat fragmentation; Categories - rare, endangered, vulnerable, threatened and extinct plant species; Red Data Book; Environmental impact assessment and sustainable development.	16 h
3	**Biodiversity conservation:** Objectives, implication and action plans; International and National organizations for conservation of natural resources; in situ conservation- protected areas, biosphere reserves, national parks, sanctuaries and sacred groves; ex situ- conservation, botanical gardens, gene banks, medicinal & herbal gardens.	16 h
4	**Legal aspects of biodiversity conservation**: Policy, priority setting and future strategies with emphasis to India and Raichur region.	16 h

REFERENCES:

1. Global Biodiversity Assessment: Heywood V M and Watson RT (Cambridge Univ Press, 1985).
2. Biodiversity: Implications for global security: Swaminathan MN & Jain RS (Macmillan, 1982).
3. Understanding biodiversity, life sustainability and equity: Kothari (1987).
4. Essentials of Conservation Biology: Longman, Richard B, Primack (1993)
5. Global Biodiversity Assessment: Heywood VH & Watson RT (1995).
6. Natural Products from Plants: Peter B, Kaufman *et al.* (1999).
7. Biodiversity and its Conservation in India: Negi S S (1993).
8. Introduction to environment impact assessment: Glasson J, Therivel R & Chadwick A(UCL, London 1995).
9. Red Data Book of Indian Plants vols I-III: Nayar MP & Sastry ARK (1987, 1989, 1990).
10. The Useful Plants in India: CSIR (1986).

BOT: SCT. 1.4.2 MICROBIAL TECHNOLOGY		64 hours
1	**Microbial Technology:** Introduction to microbiology, Spontaneous generation theory, Biogenesis theory, Branches of Microbiology and Scope of microbiology. Factors influencing soil microbial population; Biology of symbiotic and non-symbiotic nitrogen fixation, preparation of different types of inoculants- nitrogen fixers, phosphate solubilizers, PGPR- plant growth promoting rhizobacteria; Cyanobacteria and other bacteria, and their applications in agriculture; Microbes in GM crop production; Microbes as biocontrol agents – *Baculoviruses, Bacillus thurinigiensis, Bacillus sphaericus, Bacillus popilae*; Microbe derived inhibitors	16 h
2	**Microbes in industry:** Antibiotic resistance in bacteria; Industrial production of organic compounds - ethanol, acetone, citric acid, lactic acid, amino acids; Microbial enzymes-amylase, protease, pectinase and lipase; Microbes in food and dairy - Pasteurization, sterilization of milk, fermented dairy products, Foods made by microbial activity-cheese making, pickles; Microbes in food spoilage, food poisoning, food infection; Microbial toxins and their impact on human health; Probiotics and their importance in health care, production of SCP and their nutritional value; Edible mushrooms and their cultivation.	16 h
3	**Immunology:** An overview of immune system, Scope of immunology, Phagocytes, Natural killer cells, mast cells, basophils, Dendritic cells and other cells of the inmate immune system. Immunity: Types: Innate immunity: (nonspecific) physical, biochemical and genetic factors involved in governing innate immunity, molecules of inmate immunity – complement, acute phase proteins and interferons; Acquired immunity: (specific) natural, artificial, passive immunity, Humoral or antibody mediated immunity, cell mediated immunity	16 h
4	Immune responses during bacterial, parasitic and viral infections, congenital and acquired immunodeficiency syndrome; Vaccines. **Antigens:** nature and types. Antibodies – Structure of lgG. Classes of antibodies and their functional diversity b) Human blood types and Rh factors c) Antigen-antibody reactions-salient features. Agglutination reaction – Widal test, Neutralisation test, Opsonisation. Precipitation reaction-VDRL Test. Immunotechniques – RIA, ELISA. Complement system (in brief) – complement fixation test	16 h

REFERENCES:

1. Michel J, Pelczar Jr.EC and Krieg CR. 2005. Microbiology, Mc.Graw-Hill, New Delhi.
2. Powar CB and Daginawala. 1991. General Microbiology, Vol – I and Vol – II Himalaya publishing house, Bombay.
3. Dubey RC and Maheshwari DK. 2002. A Text book of Microbiology, S.C.Chand and Company, Ltd. Ramnagar, New Delhi.
4. Reddy S and Ram. 2007. Microbial Physiology. Scientific Publishers, Jodhpur, 385pp.
5. Sullia SB and Shantharam S. 1998. General Microbiology. Oxford and IBH publishing Co.Pvt.Ltd. New Delhi.
6. Schlegel HG. 1986. General Microbiology. Cambridge University Press. London, 587pp.
7. Sharma R. 2006. Text book of Microbiology. Mittal Publications. New Delhi. 305pp.
8. Sharma PD. 1999. Microbiology and Plant Pathology. Rastogi publications. Meerut, India.
9. Roger S, Ingrahan Y, Wheelis JL, Mark L and Page PR. 1990. Microbial World 5th edition. Prentice-Hall India, Pvt. Ltd. New Delhi.
10. Waste Water Microbiology 2nd Ed: G Bitton
11. Environmental Biotechnology: S N Jogdand
12. Industrial Microbiology: Agrawal and Parihar
13. Handbook of microalgal culture: Biotechnology and Applied Phycology: Amos Richmond (2004).
14. Microalgae: Biotechnology and Microbiology: Wolfgang Becker E. (1994).
15. Soil Microbiology Science: Subba Rao, N S (1999)
16. Biosurfactants: Kosaric, N (Marcel Dekker Inc 1993)
17. Sullia SB. and Shantharam S. 2005. General Microbiology, Oxford and IBH, New Delhi.
18. Vasanthkumari R. 2007. A textbook of Microbiology, BI Publications Pvt. Ltd., New Delhi.

PRACTICALS

BOT : CPP. 1.5 (HCT-1.1) Diversity of Viruses, Bacteria, Algae and Fungi

1. Preparation of stains and fixatives.
2. Study of morphology and reproductive structures of Fungi (Aspergillus, Septate and nonseptate fungi).
3. Staining Bacteria: Simple, Negative and Gram staining.
4. Study of Algae: Characterization and identification- Oscillatoria, Spirogyra, Chara, Sargassum, Polysiphonia.
5. Culturing of algae in laboratory.
6. Study of Bacterial motility by hanging drop method.
7. Microbial count using Haemocytometer.
8. Media preparation and isolation of Fungi from soil by serial dilution plate method.
9. Study of local plant disease caused by viruses and bacteria.

Note: Every student has to submit 5 specimens/herbaria at the practical examination in addition to cerified practical record.

BOT: CPP. 1.6 (HCT - 1.2) Diversity of Bryophyta, Pteridophyta and Gymnospermae.

1. Thallus structure, anatomy and reproductive features of Marchantia, Anthoceros, Porella, Funaria and Polytrichum.
2. Habit, anatomy and reproductive features of Psilotum, Lycopodium, Selaginella, Equisetum, Ophioglossum and Osmunda.
3. Habit anatomy and reproductive features of Pteris, Marselia, and Salvinia.
4. Habit anatomy and reproductive features of Zamia, Ginkgo, Araucaria, Podocarpus, Agathis, Ephedra and Gnetum.
5. Types of fossils and fossiliferous rocks.
6. Study of available fossil specimen and slides of Pteridophytes and Gymnosperms.

Note: Submission of Herbarium specimen (05).

BOT: HCP. 1.7 (HCT - 1.3) Plant Systematics and Phytogeography

1. Description of plants using technical terms
2. Identification of plants to family level.
3. Identification of plants to species level using flora
4. Preparation of Dichotomous key for identification
5. Listing of endangered species
6. Floristic regions of India.
7. Evolutionary concepts
8. Drawing maps of continental drift
9. Listing plants of GUG campus
10. Studying species distribution and its measurements
11. Examples of exotic / invasive species

Note: Submission of 5 Maps / Photographs /herbaria during practical examination

BOT: SCP. 1.8.1 (SCT - 1.4.1) Biodiversity and Conservation.

1. Field survey of important plants of the region.
2. Study of the characters and threatened plants included in the theory.
3. Survey of important timber yielding trees of the region.
4. Determination of the minimum size of the quadrat suitable for an area using
5. 'Species area curve' method.
6. Determination of Importance Value Index (IVI) of the plant species in the communityby quadrant method.
7. Study of Phytogeographic maps of world and India.
8. Map of Hot spots, Continental drift.
9. Study of Endangered plants species of Gulbarga region.

BOT: SCP. 1.8.2 (SCT - 1.4.2) Microbial Technology

1. Method of sterilization, preparation of media and stains.
2. Isolation of bacteria, fungi and actinomycetes, cyanobacteria and VAM
3. Production and estimation of Citric acid by Aspergillus niger
4. Extraction and Chromatographic separation of secondary metabolites from bacteria and fungi.
5. Estimation of extracellular amylase activity
6. Estimation of extracellular protease activity
7. Sterilization methods
8. Demonstration of microbial antagonism
9. Determination of spore concentration (Heamocytometer)
10. Immunoelectrophoresis
11. Isolation and characterization of Phosphate solubilizers
12. Estimation of antimicrobial activity using standard (NCCLS/CLSA) guidelines