**M.Sc. Botany**

**(**For The Academic Year **2020 - 2021** Only)

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| **1st Semester - Theory.** | |
| Core Paper 101 | Biology and Diversity of Algae and Bryophytes |
| Core Paper 102 | Biology and Diversity of Viruses, Bacteria and Fungi |
| Core Paper 103 | Cell Biology |
| Core Paper 104 | Ethnobotany, Medicinal and Aromatic Plants |
| **Practical** |  |
| Practical Paper - I | Corresponding to Paper 101 &102 |
| Practical Paper - II | Corresponding to Paper 103 &104 |

**M.Sc. Botany – Semester I**

**(**For The Academic Year **2020 - 2021** Only)

**Core Paper 101: BIOLOGY AND DIVERSITY OF ALGAE AND BRYOPHYTES**

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| **SECTION A** | |
| **01** | Criteria employed in classification of algae. Classification given by Fritsch, Bold and Wynne, Thallus organization, reproduction and life cycles in algae and Economic importance of algae |
| **02** | Range of thallus structure, reproduction, life histories of Chlorophyceae with special reference to the genera: *Chlamydomonas, Tetraspora, Volvox, Chlorella, Scenedesmus, Ulva, Cladophora, Fritschiella, Oedogonium, Spirogyra, Cosmarium, Caulerpa, Chara.* Salient features of Protochlorophyta; Xanthophyta: *Vaucheria*. Bacillariophyta: *Cyclotella, Navicula;* Phaeophyta: *Ectocarpus, Padina, Laminaria, Sargassum*. |
|  | **Assignment (not included in paper setting): Salient features of Rhodophyta: *Gracilaria, Polysiphonia*; Cyanophyta: *Nostoc, Lyngbya, and Spirulina*. Extraction of Agar agar and alginic acid, Cultivation of economically important seaweeds, Mass culture of micro algae, Waste land reclamation, Bio-fouling and Bio-remediation through the Algae.** |
| **SECTION B** | |
| **03** | Classification of Bryophytes given by Smith, Campbell. Ecological and economic importance of Bryophytes. Conduction in Bryophytes. |
| **04** | General characters Morphology, structure, reproduction and life history of Hepatocopsida: Marchantiales: *Marchantia*; Jungermaniales: *Pellia*, *Porella*;. General characters Morphology, structure, reproduction and life history of Anthocertopsida: Anthocerotaceae ,*Anthoceros*; Notothylaceae - Notothylas |
|  | **Assignment** **(not included in paper setting): General characters Morphology, structure, reproduction and life history of Bryopsida: Sphagnales: *Sphagnum*; Funariales: *Funaria*; Polytrichales: *Polytrichum.*** |

**Practical**

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| **Exhibit / Experiment** | |
| **1.** | Examination of vegetative and reproductive morphology of Chlorophyceae: *Chlamydomonas, Tetraspora, Volvox, Chlorella, Scenedesmus, Ulva, Cladophora, Fritschiella, Oedogonium, Spirogyra, Cosmarium, Caulerpa, Chara.* |
| **2.** | Examination of vegetative and reproductive morphology of Bacillariophyceae: *Cyclotella*, *Navicula*;Phaeophyceae: *Ectocarpus, Dictyota, Padina, Laminaria, Sargassum.* |
| **3.** | Examination of vegetative and reproductive morphology of Rhodophyceae: *Gelidium, Gracilaria, Polysiphonia*. |
| **4.** | Examination vegetative and reproductive morphology of Xanthophyceae: *Vaucheria*Cyanophyceae: *Nostoc, Lyngbya, Spirulina*. |
| **5.** | Field work to get acquaintance with the algae of Visakhapatnam coast and fresh water algae in and around Visakhapatnam. |
| **6.** | An examination of the external features and internal structure and reproductive organs  of: *Riccia*, *Targionia*, *Monoclea*, *Plagiochasma*. |
| **7.** | An examination of the external features and internal structure and reproductive organs of the genera: *Fimbriaria*, *Marchantia*, *Pellia*, *Porella.* |
| **8.** | An examination of the external features and internal structure and reproductive organs of: *Anthoceros*, *Notothylus*, *Andreaea*, *Funaria*, *Polytrichum*. |

**Reference Books**

|  |  |
| --- | --- |
| **1.** | Lee RW. 2007. **Classification of Algae.** |
| **2.** | Kumar HD. 1988.**Introductory Phycology.** AffiliatedEast West Press Pvt. Ltd., New Delhi. |
| **3.** | Round FE. 1986. **The Biology of Algae**. CambridgeUniversity Press, New York. |
| **4.** | Bold HC and Wyne MJ. 1978. **Introduction to the Algae.** Prentice-Hall, New Jersey. |
| **5.** | Presscot GW. 1969. **The Algae- a Review**.Houghton Mifflin Company, Boston. |
| **6.** | Morris I. 1967. **An Introduction to the Algae.**CambridgeUniversityPress, UK. |
| **7.** | Chapman VJ.1962. The Algae.Macmillan and Co Ltd., London. |
| **8.** | Lewin RA. 1962. **Physiology and Biochemistry of Algae.**Academic Press, New York. |
| **9.** | Round FE. 1962. **Ecology of Algae**. CambridgeUniversity Press, New York |
| **10.** | Smith GE (ed) 1950. **Fresh Water Algae.** Elsevier Science, USA. |
| **11.** | Fritsch FE.1945. **The Structure and Reproduction of Algae Vols. 1& II**. CambridgeUniversityPress, New York. |
| **11.** | Chopra RN and Kumra PK. 1988. **Biology of Bryophytes.** New Age International (P) Ltd. Publishers, New Delhi. |
| **12.** | PariharNS. 1991. **Bryophyta**. Central Book Depot, Allahabad. |
| **13.** | Puri P. 1980. **Bryophytes**.Atmaram and Sons, Delhi. |
| **14.** | Smith GM. 1955. **Cryptogamic Botany Vol.II.** Tata McGraw Hill Publishing Co. Ltd., New Delhi. |
| **15.** | KashyapS. 1929. **Liverworts of the Western Himalayas and Punjab Plains Part I and Part II.** University of Panjab, Lahore, Pakistan. |

**M.Sc. Botany - Semester I**

**(**For The Academic Year **2020 - 2021** Only)

**Core Paper 102: BIOLOGY AND DIVERSITY OF BACTERIA, VIRUSES AND FUNGI**

**Theory**

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| **SECTION A** | |
| **1.** | General account of archaebacteria, eubacteria and cyanobacteria. Classification of eubacteria. Ultrastructure, nutrition, reproduction and economic importance of bacteria. |
| **2.** | Morphology and chemical composition of Actinomycetes, Spirocetes, Rickettsiae and Mycoplasmas. Classification of viruses. Ultrastructure and chemistry of viruses. Replication and transmission of viruses. History, origin and evolution of plant viruses. Plant viral diseases. |
|  | **Assignment (not included in paper setting): Microbial Ecology: quorum sensing, gentrification, phosphorous solubilization, nitrogen fixation.** |
| **SECTION B** | |
| **3.** | Classification and phylogeny of fungi. Molecular aspects in classification. Thallus organization in fungi. Ultrastructure of fungal cell. Unicellular and multicellular organization. Cell wall composition. Fungal diseases in plants and humans. |
| **4.** | General account of Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, Deuteromycotina. Reproduction in fungi: vegetative, asexual and sexual. Heterothallism, heterokaryosis and parasexuality. Nutrition in fungi: saprobic, biotrophic, and symbiotic. |
|  | **Assignment (not included in paper setting):** **Fungi in industry: medicine, food, pest and weed management (biocontrol agents). Mushroom cultivation. Fermentation methods. Mycorrhiza.** |

**Practical**

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|  | **Exhibits/ Experiments** |
| **1.** | Tools of microbiology: Care and use of the microscope, Spectrophotometer, PH meter, Micrometer, Hemocytometer, Autoclave, Centrifuge, Biological safety cabinets, Inoculation needle and loop, Incubator, Colony counter & Lyophilizer. |
| **2.** | Differential staining: Gram staining. |
| **3.** | Differential staining: Acid fast staining. |
| **4.** | Study of bacterial growth: To prepare the growth curve of bacteria. |
| **5.** | Study of cyanobacteria: Isolation and cultivation of cyanobacteria. |
| **6.** | Isolation of rhizobia from root nodules. |
| **7.** | Cultivation of viruses in embryonated eggs. |
| **8.** | Isolation of fungi by Petri plate exposure method. |
| **9.** | Morphological study of: *Stemonitis*, *Saprolegnia*, *Mucor*, *Morchella*, *Aspergillus, Agaricus, Cyathus, Synchitrium, Helminthosporium.* |
| **10.** | Symptomatology and anatomical study of some diseased specimens: white rust, powdery mildew, green ear of bajra, rust of wheat, rust of linseed, Tikka disease of ground nut, red rot of sugarcane, blast of rice, citrus canker, tobacco mosaic disease. |

**References Books**

|  |  |
| --- | --- |
| **1.** | Kaursethi I and Surinder KW 2011. **Text Book of Fungi and their Allies.** Macmillan publishers, New Delhi, India. |
| **2.** | Ram Reddy S & Reddy SM 2007. **Essentials of Virology.** Scientific publishers, Jodhpur, India. |
| **3.** | Sharma K 2005. **Manual of Microbiology Tools and Techniques.** Ane Book, New Delhi, India. |
| **4.** | Matthew RH 2004. **Plant virology.** 4th edition. Academic press an imprint of Elsevier, California, USA. |
| **5.** | Prescott *et al.* 2003. **Microbiology**. McGraw Hill Education, New York. |
| **6.** | Aneja KR 2003. **Experiments in Microbiology, Plant pathology and Biotechnology**. New Age International publishers, New Delhi. |
| **7.** | Verma HN 2003. **Basics of plant Virology.** IBH publishing co. Pvt. Ltd., New Delhi. |
| **8.** | Mehrotra KS and Aneja KR 2003. **An Introduction to Mycology**. New Age International Publishers, New Delhi. |
| **9.** | Sullia SB and Shantharam S 2001. **General Microbiology**. Oxford and IBH publishing Co. Pvt. Ltd, New Delhi. |
| **10.** | Reddy SM and Ram Reddy S 2000. **Microbiology a Laboratory Manual**. BSC Publishers and Distributors, Hyderabad. |
| **11.** | Flint SJ, Enquist LW, Krug RM, Racaniello VR, Skalka AM 2000. **Principles of Virology, Molecular Biology, Pathogenesis and Control.** ASM press, Washington DC. |
| **12.** | Rao AS 1999. **Introduction to Microbiology**. Prentice Hall of India Pvt. Ltd., Delhi. |
| **13.** | Alexopoulus CJ, Mims CW, Blackwell M 1996. **Introductory Mycology**. 4th edition. Replika press, North Delhi. |
| **14.** | Paul S 1995. **Bacteria in Biology, Biotechnology and Medicine**. 5th edition. John Wiley and son Ltd., UK. |
| **15.** | Pelczar, Chan and Krieg 1993. **Microbiology.** 5th edition. McGraw Hill Education, New York. |
| **16.** | StainerRT, Ingraham JL, Wheelis ML and Painter PR 1987.**General Microbiology**. 5th Edition. Macmillan, London. |
| **17.** | Smith KM 1968. **Plant viruses**. Elsevier, New York. |
| **18.** | Rangaswamy G 1962. **Bacterial Plant disease in India**. Asia Publishing House, Bombay. |

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**This syllabus is for (2020 – 2021) academic year only**

**M.Sc. Botany - Semester I**

**Core Paper–103: CELL BIOLOGY OF PLANTS**

**Theory**

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| **SECTION A** | |
| **1.** | The cell theory. Origin and development of cell biology as a separate branch. Dimensions of size and weight: micron to angstrom, microgram to pictogram. Ultra structure and organization of prokaryotic and eukaryotic cells. Specialized cell types. Cell wall: structure and functions, cell wall architecture, biogenesis and growth. Plasma membrane: structure, models and functions. |
| **2.** | structure and function of Chloroplast and Mitochondria .structure and function– endoplasmic reticulum, Golgi apparatus, lysosomes, ribosome’s, micro bodies, paroxysms. Plasmodesmata: structure and function, plasmodesmata in comparison to gap junctions of animal cells. Vacuole structure and function, |
|  | **Assignment (not included in paper setting)**: **Cytoskeleton: microtubules and microfilaments, their role in cell division and motility; intermediate filaments– role in providing strength. Labeled antibody technique for visualizing cytoskeleton.** |
| **SECTION B** | |
| **3.** | Nucleus: structure of nuclear membrane and nuclear pore complex, nucleolus, Ribosome biosynthesis. Chromatin: Eu and heterochromatin, arrangement of chromatin. Chromosome structure: centromeres and telomeres. Types of chromosomes: lamp brush, polytene. |
| **4.** | Chromosomal numerical aberrations: classification of numerical aberrations. Aneuploids– trisomics (primary, secondary, tertiary), monsosomics and nullisomics – meiotic behavior. Eupolyploids – origin and production of auto -and allopolyploids, meiosis in autotetraploid. Genome of tobacco and wheat as examples of allopolyploids. The different stages of mitosis and meiosis: description of the stages. Experimental control of cell division. Apoptosis: mechanism and significance. |
|  | **Assignment (not included in paper setting):** **Cell cycle and its regulation: the G1, S, G2 and M phases. Synchronous and asynchronous cell divisions.** |

**Practical**

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| **S. No** | **Exhibit/Experiment** |
| **1.** | Electron microscopic picture of prokaryotic and eukaryotic cells. |
| **2.** | Images of cytoskeleton. |
| **3.** | Electron microscope pictures of chloroplast and mitochondria. |
| **4.** | Electron microscope pictures of endoplasmic reticulum, Golgi apparatus. |
| **5.** | Study of mitosis using acetocarmine. |
| **6** | Pictures of lampbrush and polytene chromosomes. |
| **7** | Photographs showing meiosis in structural and numerical aberrations |
| **8** | Preparation of slides from *Allium* floral buds for observation and identification of stages of meiosis. |

**Reference Books**

|  |  |
| --- | --- |
| **1.** | Alberts B, Breyer D, Hopkin K, Johnson AD, Lewis J, Raff M, Roberts K and Watter P 2014. **Essential Cell Biology.** 4thEdition. Garland publishers, New York. |
| **2.** | Sharp D, Ploppe G and Sikorski E 2014. **Elwin's Cells.** 3rd Edition. Viva Books, New Delhi. |
| **3.** | Cooper GM, Hausman RE 2013. **The Cell – A Molecular Approach**. 6th Edition. Sinauer Associates, Incorporated, USA. |
| **4.** | Karp G 2013. **Cell and Molecular Biology – Concepts and Experiments.** 7th Edition. Wiley Global Education, USA |
| **6.** | Cowling G, Allen T 2011. **The Cell. A very Short Introduction**. Oxford University Press, USA. |
| **8.** | Schaffer SW 2007. **Mitochondria: The Dynamic Organelle.** 1st Edition. Springer Verlag. |
| **10.** | Celis JE (ed) 2006. **Cell Biology–A Laboratory Hand Book.** 3rd Edition. Elsevier, USA. |
| **11.** | Lodish H, Berk A, Kaiser CA, Kreiger M, Scott P M, Bretcher A, Ploegh H, Matsudaira P. 2004. **Molecular Cell Biology.** 5th edition. W. H. Freemanand Company, New York. |
| **12.** | De DN 2000. **Plant Cell Vacuoles. An Introduction**. CSIRO Publication. Collingwood, Australia. |
| **13.** | Krishna Murthy KV 2000. **Methods in Cell Wall Cytochemistry.** CPC Press,  Boca Raton, Florida. |
| **16.** | Kleinsmith LJ and Kish VM 1995. **Principles of Cell and Molecular Biology.**  2nd Edition. Harper Collins College Publishes, New York, USA. |

**M.Sc. Botany – Semester I**

(For the Academic students of 2020-2021 Only)

**Core paper 104: Ethnobotany, Medicinal and Aromatic Plants**

**Theory**

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| **SECTION A** | |
| **1.** | Ethnobotany definition, history, scope, interdisciplinary approaches, World centers of Ethnobotany, Ethnobotany in India.  Ethnic communities of India, conservation practices of biodiversity, taboos and totems |
| **2** | Different categories of Ethno botanical plants: Food, Medicine, Shelter, Fodder, Timber, Fuel wood, NTFPs etc.  Role of research institutes on medicinal and aromatic plants (CDRI, CIMAP, NBRI, NBPGR & IUCN) |
|  | **Assignment (not included in paper setting): Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure, skin diseases etc,.** |
| **Section B** | |
| **3** | History, scope, significance, recent trends of medicinal and aromatic plants in the World and India. History and principles of Ayurveda, Homeopathy, Allopathy, Unani and Siddha system of medicines. |
| **4** | Conservation of endangered and endemic medicinal plants. In situ conservation: Biosphere reserves, sacred groves, National Parks; Ex situ conservation: Botanic Gardens & In-vitro conservation. |
|  | **Assignment (not included in paper setting): History, origin, distribution, significance, Taxonomy, Ecology, Alkaloids, Chemical constituents, Patenting and IPR and Cultivation methods of medicinal and aromatic plants (Medicinal plants: *Catharanthus, Rauwolfia, Withania.* Aromatic plants: Lemon grass, Mint and Clocimum.** |

**Practical**

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| **Exhibit/Experiment** | |
| **1** | Identification of major Ethnic groups of Andhra Pradesh |
| **2** | Identification of the different categories of Ethno botanical plants |
| **3** | Identification of locally available Medicinal and aromatic plants |
| **4** | Herbarium preparation of Ethonobotanical, medicinal and aromatic plants |
| **5** | Conservation practices (*in-vivo* & *in-vitro*) of medicinal and aromatic plants |
| **6** | Visit to Botanical/medicinal garden, forest, Wildlife Sanctuary etc |

**Reference Books**

|  |  |
| --- | --- |
| **1** | Advances in Horticulture : Volume 11: Medicinal & Aromatic Plants : Edited by K.L. Chadha, Malhotra Publishing House, 2006, Reprint, xl, 935 p, ISBN : 8185048290 |
| **2** | An Introduction to Ethnobotany : Definitions Methods New Concepts and Approaches : edited by S.K. Jain and Ashok K. Jain, Deep Publications, 2013, viii, 250 p, ISBN : 9789380702056 |
| **3** | Chadha, K.L. 2001. Hand Book of Horticulture. ICAR Publication, Krishi AnusandhanBhavan, Pusa, New Delhi |
| **4** | Cotton C.M. 1997. Ethnobotany – Principles and applications. John Wiley and sons – Chichester |
| **5** | Ethnic Tribes and Medicinal Plants: Edited by Pravin Chandra Trivedi, Pointer Pub, 2010, xii, 264 p, ISBN :9788171326235 |
| **6** | Ethno-Medicine in India Vol. II: A Selective Bibliography : Kamal Kant Misra, Mohammad Rehan and Ravindra K. Gupta, Gyan Publishing House, 2013, 359 p, ISBN : 9788121211895 |
| **7** | Farooqi, A.A. and B.S. Sreeramu. 2001. Cultivation of Medicinal and Aromatic Crops. Universities Press (India) Ltd.3-5-819, Hyderguda, Hyderabad – 29 |
| **8** | Faulks, P.J. 1958. An introduction to Ethnobotany, Moredale Pub. Ltd., London |
| **9** | Jain S.K., (ed.) 1981 Glimpses of Indian Ethnobotany, Oxford and I B.H., New Delhi |
| **10** | Jain S.K., 1995 Manual of Ethnobotany, Scientific Publishers, Jodhpur |
| **11** | Kumar, N., J.B. Md. Abdul Khadar, P. Rangaswamy and I. Irulappan. 1982. Introduction to spices, plantation crops, medicinal and aromatic plants. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi |
| **12** | Martin, G.J.. 1996, Ethnobotany, A methods manual, Chapman & Hall, London |
| **13** | Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach, 2nd edn. Agrobios, India |
| **14** | Rama Rao, N and A.N. Henry (1996). The Ethnobotany of Eastern Ghats in Andhra Pradesh, India. Botanical Survey of India, Howrah |
| **15** | Ramachandran, S.P. 1991, Recent Advances in Medicinal aromatic and spice crops |
| **16** | Schultes, R.E. 1995, Ethnobotany, Chapman and Hall |
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