Name of the Programme: M. Sc (Botany)
Course Code: BOT-509
Title of the Course: Lab in Microbiology and Plant Pathology
Number of Credits: 1 (30 hours)
Effective from AY: 2022-23

Prerequisites for the course:	Basic knowledge of microbial habitats in a tropical setup and general idea of diseases affecting crops.	
Objective(s):	To impart requisite field and lab skills in plant microbiology and pathology with emphasis on tropical strains and local needs in agriculture and economy dealing with economically important microbes.	
Content:	**Microbiology** 1. Microbial ecology in relation to the plants-Introduction to field techniques to study plant-microbe interactions. 2. Isolation of Phylloplane microflora on microbiological media and visualization of colony characteristics. 3. Isolation of Rhizosphere microflora on microbiological media and visualization of colony characteristics. 4. Isolation of endophytes and visualization of colony characteristics. 5. Maintenance of pure cultures of phylloplane, Rhizosphere and endophytic microflora using common microbiological media. 6. Use of Microscopy in studying microbes in detail - preparation of unstained and stained specimens of eubacteria, actinobacteria. Photomicrography and digital image analysis of representative pure cultures and interpretation of results. 7. Preparation of unstained and stained specimens of yeasts, fungi. Examination of gram character of bacteria. 8. SEM study of bacteria, fungi, plant viruses using electron dense stains. 9. Studying Phylogeny of plant viruses using bioinformatics tools. 10. Study of root nodulation, symbiosome, *Rhizobium*, leghemoglobin and Quorum Sensing in bacterial population. 11. Methods of isolation and culturing of fungi: colony characters; microscopic observations; morphology of hyphae and spores. 12. Study of reproductive structures of different genera of fungi. 13. Study of fungal physiology in pure colonies – characterization of fungal colonies. 14. Microfluidics in mycology- fabrication and application of microfluidics devices to fungal cultures for real time visualization of fungal metabolic activities. 15. Introduction to mycological databases and myco-systematics on Internet. 16. Introduction to Mycobioinformatics- tools and techniques (exercise to construct fungal phylogenetic tree to be given).	**2 hours** **4 hours** **4 hours** **4 hours** **2 hours** **2 hours** **2 hours** **2 hours** **2 hours** **2 hours** **2 hours** **2 hours** **2 hours** **2 hours**

	17. Observation of different fungal substrates using sterile moist chamber incubation (e.g. herbivore dung; decomposing leaf-litter). 18. Observations on ecological succession of fungi; Terrestrial, marine and freshwater fungi. 19. Particle-plating technique for isolation of litter fungi. 20. Technique for isolation of fungal endophytes. 21. Isolation and serial dilution techniques (e.g. soil, dung and leaf litter). **Plant pathology** 22. Collection of infected specimens in the field and observation of symptoms. 23. Hand sections and tease mounts from infected plant specimens. 24. Study of viral, bacterial and fungal diseases of crop plants (cereal, vegetable, fruit, and plantations) from surrounding habitats in Goa. 25. Submission of 10 dried herbarium specimens of infected plant materials [fungal (4) +bacterial (3) + viral (3)] collected from nearby habitats. 26. A mini field project to study crop diseases from field and market specimens. ***All plant pathology practicals will be conducted and any 16 hours from microbiology component will be conducted depending on availability of material, chemicals, equipments, etc.***	**2 hours** **2 hours** **2 hours** **2 hours** **2 hours** **2 hours** **2 hours** **4 hours** **2 hours** **4 hours**
Pedagogy:	Field visits and lab exercises/sample collections/use of electronic, digital and visual keys, herbarium production/videos/moodle guided exercises/mini projects/demonstration.	
References/ Readings:	**Agrios, G.N.** (1997). Plant Pathology. Academic Press, New Delhi. **Bilgrami, K.S. and Dube, H. C.** (1990). A text book of Modern Plant Pathology. Vikas Publishing House, New Delhi. **Butler, E.J. and Jones, S. G.** (1949). Plant Pathology. Mc Millan, London. **Chatterjee, P.B.** (1997). Plant Protection Techniques. Bharati Bhavan, Patna. **Chattopadhayay, S.B.** (1991). Principles and Procedures of Plant Protection. Oxford & IBH, New Delhi. **Sharma, P.D.** (2004). The Fungi for University students. Rastogi Publications, Meerut. **Srivastava, J.P.** (1998). Introduction to Fungi. Central Book Depot, Allahabad. **Sumbali, G.** (2005). The Fungi. Narosa Publishing House, New Delhi.	

Learning Outcomes:	1. Ability to work as a field microbiologist to sample various habitats and asplant pathologist being able to identify disease symptoms. 2. Being able to identify common micro and macrofungi from diverse natural habitats. 3. Being able to prepare herbarium of diseased plants. 4. Being able to isolate and manage microbial cultures. 5. Being able to perform image analysis of cultures. 6. Being able to apply techniques learnt in appropriate projects involving economically important microbes.	

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