



# MOI UNIVERSITY

## SCHOOL OF SCIENCES AND AEROSPACE STUDIES

### MAIN CAMPUS

### DEPARTMENT OF BIOLOGICAL SCIENCES

#### **39 HOURS COURSE OUTLINE FOR PAT 814 (PLANT MYCOLOGY) ACADEMIC YEAR 2022/2023; SEMESTER I 4<sup>TH</sup> JULY 2022 TO 30<sup>TH</sup> SEPT 2022**

#### **a) Course Purpose**

To acquaint learners with knowledge and skills on the identification, monitoring and management of fungal plant diseases

#### **b) Course Objectives**

This course seeks to facilitate learning about;

1. Classical and modern techniques of identification of different groups of phytopathogenic fungi.
2. Epidemiology of fungal plant diseases.
3. Detection of mycotoxins in plants using chromatographic (HPLC, LC-MS) and immunoanalytical techniques (ELISA, LFD).
4. Mycorrhiza fungi and their applications

#### **c) Learning Outcomes**

By the end of the course, the learner should be able to:

1. Apply classical and modern techniques to identify different groups of phytopathogenic fungi.
2. Apply different monitoring strategies to assess disease epidemics.
3. Formulate management strategies to control the occurrence of mycotoxins in plants
4. Design biocontrol assays using mycorrhizal fungi.



#### d) Course Content

Overview of fungal plant pathogens: disease survey; disease vectors; systematics; reproduction; life cycles. Infection process: adhesion, penetration and colonization mechanisms, fungal effector proteins, cAMP signalling and MAP kinases, toxins, cell wall degrading enzymes, hormones. Diversity of fungal pathogens: diversity indices; loss of diversity; species indicators; habitat diversity; physiology; survival and adaptations; exploitation of fungal diversity. Plant diseases caused by pathogens: rust; wilt; leaf blight; botrytis; anthracnose; damping off; black rot; mildews; blast; Diagnosis of fungal diseases: symptomatology; culture-based; morphological observations; pathogenicity; biochemical and immunological properties; nucleic sequences of genomic DNA; isoenzymes; vegetative compatibility group (VCG) analysis and electrophoretic mobility of cell wall proteins. Epidemiology of fungal diseases: infection cycle; disease triangle; intraspecific diversity; evolutionary epidemiology; landscape epidemiology. Mycotoxins: groups of fungal genera producing mycotoxins; types of mycotoxins; chemical structure and phytotoxicity; mechanisms of action; detection of mycotoxins - chromatographic techniques (HPLC, LC-MS), immunoanalytical techniques (ELISA, LFD); pre-and post-harvest management strategies of mycotoxins. Mycorrhiza: types of mycorrhizal fungi; evolution of mycorrhizal symbiosis; diversification of mycorrhizal symbiosis; physiology and ecology of mycorrhizal fungi; specificity; colonization; role of helper bacteria and mycorrhizosphere; importance of plant mycorrhiza association; application – development, quality assessment, characterisation and evaluation of inocula.

#### e) Class Schedule

Session/week	CONTENTS /TOPICS
1	Overview of Bacterial plant pathogenic groups
2	Bacterial infection process
3	Bacterial diversity
4	Plant diseases caused by bacterial pathogens: streak, spots and blights, bacterial soft rots
5	Vascular wilts, bacterial cankers, bacterial galls, bacterial scabs
6	<b>CAT I (26/07/2021)</b>
7	Diagnosis of bacterial diseases: Symptomatology, culture-based; morphological observations,
8	Pathogenicity, biochemical & immunological properties, nucleic acid sequences of genomic DNA, isozymes.
9	<b>CAT II (16/08/2021)</b>
10	Epidemiology of bacterial diseases; Synergistic interactions between bacteria and other pathogens.
11	Antibiotic resistance by bacterial pathogens
12-13	<b>University Examinations</b>

## f) Student Evaluation Criteria

	Aspects	
1	Class attendance, participation, assignments, Lab session	20%
2	Continuous Assessment Test(s)	20%
3	University Exam	60%
	<b>TOTAL</b>	<b>100%</b>

## g) References:

- 1) **Agrios, G. N. (2005).** *Plant Pathology*, (5<sup>th</sup> ed). Elsevier Academic Press, Inc.: New York. 922 pp.  
<https://www.elsevier.com/books/plant-pathology/agrios/978-0-08-047378-9>
- 2) **Bolton, M. D. & Thomma, P. H. J. (2012).** *Plant Fungal Pathogens: Methods and Protocols in Molecular Biology*. Vol. 835. Springer Protocols. Humana Press
- 3) **Byrde R. J. W. & C. V. Cutting (1973).** *Fungal Pathogenicity and the Plants' Response*. Academic Press. <https://doi.org/10.1016/B978-0-121-48850-5.X5001-9>. ISBN: 978-0-12-148850-5.
- 4) **Hornby, D. (1998).** *Diseases caused by soilborne pathogens*. In: Jones D. G. *The Epidemiology of Plant Diseases*. Springer, Dordrecht. [https://doi.org/10.1007/978-94-017-3302-1\\_15](https://doi.org/10.1007/978-94-017-3302-1_15)
- 5) **John, W. & Roland, W. (2007).** *Introduction to Fungi*. (3<sup>rd</sup> ed). ISB 9780521807395. Cambridge. <https://www.amazon.com/Introduction-Fungi-John-Webster-ebook/dp/B00CF0JPWC>
- 6) **Rolf, A. P. & Bohnert, H. J. (2003).** *Genomics of Plants and Fungi*. (1<sup>st</sup> ed). ISBN-13: 978-0824741259. CRC Press, pp440. <https://www.routledge.com/Genomics-of-Plants-and-Fungi/Prade-Bohnert/p/book/9780367446741>
- 7) Any other relevant book.
- 8) The Internet

## h) Key Journals

- i) Fungal Diversity
- ii) Fungal Ecology
- iii) Journal of Fungi
- iv) Yeast and Fungal Research

**COURSE LECTURER:**

**Dr. MAKUMBA BILLY**

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**SIGNATURE**

4<sup>th</sup> July 2022

**DATE**



**CHAIR OF DEPARTMENT:**

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**SIGNATURE**

\_\_\_\_\_  
**DATE**

