**UNIVERSITY OF SARGODHA**

**DEPARTMENT OF PLANT PATHOLOGY, UNIVERSITY COLLEGE OF AGRICULTURE**

COURSE OUTLINE FALL 2020

Course Title: Plant Bacteriology

Course Code: PLPT-7106

Credit Hours: 3(2-1)

Instructor: Dr. Muhammad Usman Ghazanfar

Email: usmanghazanfar1972@gmail.com

|  |
| --- |
| **DESCRIPTION & OBJECTIVES** |

*Write here a brief description of the course and its key objectives/outcomes (150 words)*

To study the economic importance of bacterial diseases; plant pathogenic bacteria; ecology and spread of bacterial diseases; host range; measurement of bacterial growth; diseases caused by plant pathogenic bacteria; entry of bacteria into plants; pathogenicity and virulence factors in bacterial diseases; plant response to bacterial infection; diagnosis of bacterial diseases: symptoms, microscopic examination, isolation, gram stain test, biochemical tests, serological tests, fatty acid-based tests, Polymerase Chain Reaction (PCR)-based analysis, pathogenicity, Bacterial mechanisms underlying pathogenesis and virulence in interactions causing plant disease, and symbiotic compatibility in mutualisms. After successful accomplishment of this course the students will be able to

1. To become familiar with current taxonomy of plant pathogenic prokaryotes and important bacterial diseases.
2. To become familiar with techniques for manipulating bacteria such as isolation, identification and inoculation of pathogens.
3. To gain the knowledge of different pathogenic mechanisms used by different groups of major bacterial pathogens.
4. To understand the ecology of various plant pathogenic bacteria and current disease management strategies for bacterial diseases.
5. To develop the academic ability to critically review research articles about biological/agricultural sciences

|  |
| --- |
| **READINGS** |

*Write here the list of books, articles and chapters (with full publication details) in serial numbers*

1. 1. Agrios, G. N. 2005. Plant Pathology (5th Edition). Academic Press.
2. De Boer, S.H. 2001. Plant Pathogenic Bacteria. Kluwer Academic Publishers.
3. Fahy, P.C. and G.J. Persley. (eds.). 1983. Plant Bacterial Diseases: A Diagnostic Guide. Academic Press, New York, USA.
4. Goto, M. 1992. Fundamentals of Bacterial Plant Pathology. Academic Press Inc., USA. 53
5. Hampton, R., E. Ball and S. DeBoer. 1990. Serological Methods for Detection and Identification of Viral and Bacterial Plant Pathogens. A Laboratory Manual. American Phytopathological Society Press, Saint Paul, Minnesota, USA.
6. Kado, C. I. 2010. Plant Bacteriology. APS Press.
7. Janse, J.D. 2008. Phytobacteriology: Principles and Practice. CABI Publishing.
8. Jayarman, J. and J.P. Verma. 2002. Fundamentals of Plant Bacteriology. Kalyani Publishers, Ludhiana, India.
9. Srivastava, M. 2006. Introductory Phytobacteriology. Advance Publishing Concept, New Delhi India

|  |
| --- |
| **CONTENTS** |

*Write here the complete list of your course contents in serial numbers*

**Theory**:

History of phytobacteriology; economic importance and characteristics of plant pathogen i.e bacteria; taxonomy and nomenclature, morphology, nutrition, growth and reproduction; survival mechanism in bacteria; bacterial pathogenesis and symptomology; hypersensitive reaction and host-specificity; ecology and spread of plant pathogenic bacteria; bacteriophages and bacteriocins; study of important bacterial diseases in Pakistan and their management; nitrogen fixing and nitrifying bacteria; plant growth promoting rhizobacteria (PGPR); effective microorganisms (EM).

**Practical**:

Isolation, purification and identification of plant pathogenic bacteria on the basis of morphological, biochemical and molecular techniques; inoculation techniques and pathogenicity tests; demonstration of plant disease symptoms exhibited by bacteria/fastidious bacteria and mollicutes; sensitivity tests; characterization of bacteria using phages

|  |  |  |
| --- | --- | --- |
| **COURSE SCHEDULE** | | |
| **Week** | **Topics and Readings**: *Give Reading No from your list of readings above and its Page Nos. relevant to the topic(s) covered each week* | **Dates** |
| 1 | Economic importance and characteristics of phytopathogenic bacteria | 06.11.20  To  23.11.20 |
| 2 | Evolution, classification and nomenclature | 23.11.20  To  30.11.20 |
| 3 | Growth and reproduction | 30.11.20  To  07.12.20 |
| 4 | Nutrition mineral cycles | 07.12.20  To  14.12.20 |
| 5 | Bacterial pathogenesis and symptomology | 14.12.20  To  21.12.20 |
| 6 | hypersensitive reaction and host-specificity | 21.12.20  To  04.01.21 |
| 7 | Ecology and spread of plant pathogenic bacteria | 04.01.21  To  11.01.21 |
| 8 | Study of important bacterial diseases in Pakistan and their management | 11.01.21  To  18.01.21 |
| 9 | Mid Exam | 18.01.21  To  25.01.21 |
| 10 | Survival and dissemination of phytopathogenic bacteria | 25.01.21  To  01.02.21 |
| 11 | Nitrogen fixing and nitrifying bacteria | 01.02.21  To  08.02.21 |
| 12 | General biology of bacteriophages | 08.02.21  To  15.02.21 |
| 13 | Prokaryotic inhibitors and their mode of action against phytopathogenic bacteria | 15.02.21  To  22.02.21 |
| 14 | Plant growth promoting rhizobacteria (PGPR), Bacteria as biological control agent | 01.03.21  To  08.03.21 |
| 15 | Bacterial pathogenesis of plants: future challenges from a  microbial perspective  Bacterial pathogenesis of plants: future challenges from a  microbial perspective Bacterial pathogenesis of plants: future challenges from a microbial perspective | 08.03.21  To  15.03.21 |
| 16 | Bacterial disease management: challenges, experience, innovation and future prospects | 15.03.21  To  22.03.21 |

***Note****: You can reserve one week for sessional or mid-term exam, and if you wish, one week for student presentations of the assigned research project*

###### PRACTICAL SCHEDULE FOR PP-505

|  |  |  |  |
| --- | --- | --- | --- |
| S. # | Contents to be covered | Books/Journals | **Chapter/Pages** |
| 1 | Isolation, purification, identification and calibration of plant pathogenic bacteria on the basis of morphological | Bacterial plant pathology: cell and molecular aspects | Pg. 1-4 |
| 2 | biochemical and molecular techniques | Bacterial plant pathology: cell and molecular aspects | Pg. 5-7 |
| 3 | Inoculation techniques and pathogenicity tests | Bacterial plant pathology: cell and molecular aspects | Pg. 8-10 |
| 4 | Demonstration of plant disease symptoms exhibited by bacteria/fastidious bacteria and mollicutes | Bacterial plant pathology: cell and molecular aspects | Pg. 10-14 |
| 5 | Sensitivity tests | Bacterial plant pathology: cell and molecular aspects | Pg. 18 |
| 6 | Use of antibacterial chemicals / antibiotics | Bacterial plant pathology: cell and molecular aspects | Pg. 20 |
| 7 | biochemical and molecular techniques | Bacterial plant pathology: cell and molecular aspects | Pg. 22 |
| 8 | biochemical and molecular techniques | Bacterial plant pathology: cell and molecular aspects | Pg. 34 |
| 9 | Isolation, purification, identification and calibration of plant pathogenic bacteria on the basis of morphological | Bacterial plant pathology: cell and molecular aspects | Pg. 40 |
| 10 | biochemical and molecular techniques | Bacterial plant pathology: cell and molecular aspects | Pg. 44 |
| 11 | Inoculation techniques and pathogenicity tests | Bacterial plant pathology: cell and molecular aspects | Pg. 50 |
| 12 | Demonstration of plant disease symptoms exhibited by bacteria/fastidious bacteria and mollicutes | Bacterial plant pathology: cell and molecular aspects | Pg. 55 |
| 13 | Sensitivity tests | Bacterial plant pathology: cell and molecular aspects | Pg. 56 |
| 14 | Use of antibacterial chemicals / antibiotics | Bacterial plant pathology: cell and molecular aspects | Pg. 57 |
| 15 | Some basic techniques for gene manipulation and genetic analysis of bacterial plant pathogens. | Bacterial plant pathology: cell and molecular aspects | Pg. 58 |
| 16 | Use of serological methods in bacterial plant pathology | Bacterial plant pathology: cell and molecular aspects | Pg. 59 |

|  |
| --- |
| **RESEARCH PROJECT** |

*State here the prerequisites of the assigned research project including term paper or lab assignment etc.*

**Assignment No.1** Draw a labeled sketch of typical bacterial cell

**Assignment No.2** Important Bacterial diseases and their losses in the world

**Assignment No.3** Impact of bacterial diseases on Agriculture in Pakistan

**Assignment No.4** Mechanism of Antagonistic Bacteria

|  |
| --- |
| **ASSIGNMENT CRITERIA** |

*Write here the distribution of marks. You can chose any or all from the below for the purpose*

Sessional: 04

Project: 02

Presentation: 01

Participation: 01

Mid: 12

Final Exam: 20

Practical: 20

|  |
| --- |
| **RULES AND REGULATIONS** |

*Write here the rules and regulations that students have to abide in your class. Some of these rules, for example, 80% class attendance are standards for the university.*

***FINAL NOTE****: The instructions above mentioned in italics and red colors are for your guidance only. Remove them while completing this course outline template. Your final course outline document should be in black color.*

* Attendance 75% mandatory to sit in exam
* The practical note book should be prepared and signed