**The University of Jordan**

**Faculty of Agriculture Department: Plant Protection**

**Program: Ph.D**

**Phytopathogenic Bacteria Ecology and Genetics (0606963)**

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| **Credit hours** | **3** | **Level** | **Ph.D** | **Pre-requisite** |  |
| **Coordinator/ Lecturer** | **Prof. Hamed Khlaif** | **Office number** | 227 | **Office phone** | **22524** |
| **Course website** |  | **E-mail** | : H-khlaif@ju.edu.jo | **Place** | **181** |

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| --- | --- | --- | --- | --- | --- |
| **Office hours** | | | | | |
| **Day/Time** | **Sunday** | **Monday** | **Tuesday** | **Wednesday** | **Thursday** |
|  | (10-11) | (10-11) | (10-11) | (10-11) | (10-11) |
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**Course Description**

The purpose of this course is to give the Ph.D students an idea about the concepts of bacterial genetics. Transfer genetic material between bacterial cells, developing new bacterial strains through mutagenic agents. Diversity among bacterial strains. The role of virulence factors ( extrapolysaccharides, enzymes, CWDE, pectolytic enzymes, toxins, growth regulators. Ice nucleation and plasmids) in bacterial disease induction .

**Learning Objectives**

The main objective of this course are:

1. Give the student an idea about the bacterial genetics, diversity,…etc.
2. Give an idea about the bacterial strain development.
3. Give an idea about the virulence factors and their role in bacterial diseases.
4. Principles of bacterial strains resistance to antibiotic and chemicals

**Intended Learning Outcomes (ILOs):**

Successful completion of the course should lead to the following outcomes:

**A. Knowledge and Understanding:** Student is expected to

**A1- Have an idea about different phytopathogenic bacterial genera**

**A2- Basic concept and elements in bacterial genetics diversity**

**A3- Developing of new bacterial strains and genetic diversity**

**A4- Role of plasmids, chromosome and virulence factors in disease induction**

**A5- Resistant of bacterial cells to antibiotic and chemicals**

**.….**

**B. Intellectual Analytical and Cognitive Skills:** Student is expected to have

B1- an idea about developing of bacterial strains through mutation, mutagenesis, ultra violet light , chemicals

B2- genetic diversity within the same species

B3- The role of Virulence factors ( extrapolysaccharides, enzymes, CWDE, pectolytic enzymes, toxins, growth regulators. Ice nucleation and plasmids) in bacterial diseases

**C. Subject- Specific Skills:** Students is expected to have an idea

C1-know the genetic basis of the structure of DNA in bacterial cell and their models .

C2-transfere of genetic material cell between the different bacterial cells  
C3-convert bacterial cells from F- to F+ cell.

C4- transformation, transduction and conjugation processes

**D. Transferable Key Skills:** Students is expected to have an idea

D1- bacterial genetic concept and elements

D2- DNA structure, models and replication

D3- difficulties in bacterial disease control as a result of developing new strains to bacterioside and genetic diversity

**ILOs: Learning and Evaluation Methods**

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| **ILO/s** | **Learning Methods** | **Evaluation Methods** |
| A. Knowledge and Understanding  (A1-A5) | Lectures and Discussions | **Exam** |
| B. Intellectual Analytical and Cognitive Skills  (B1-B3) | : Lectures and Discussions | **Exam** |
| C. Subject- Specific Skills  (C1-C3) | Lectures and Discussions | **Exam** |
| D. Transferable Key Skills (D1-D3) | Assignment and presentation | **Exam, presentation** |

**Course Contents**

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| --- | --- | --- | --- |
| **Content** | **Reference** | **Week** | **ILO/s** |
| Introduction and an overview bacteria, structure of bacterial cells, bacterial growth, genera of Plant Pathogenic Bacteria. | 7.9.12 | 1+2 | A1-A5 |
| Concepts and terminology, gene, genetics, plasmid, chromosome, gene expression, mutation, genotype, phenotype, variation, adaptation, life cycle, selection. | 1,4.6 | **3+4** | **A1-A3** |
| Cytological basis of bacterial genetics. | 1,4.6,12,13 | 5+6 | B1-B3 |
| Molecular aspects of bacterial genetics, DNA and RNA structure, DNA replication, recombination in bacteria.  exchange genetic material bacteria, transformation, conjugation and transduction. | 4,9,10,12,13 | 7+8 | C1-C3 |
| Mutation: molecular basis of mutation, mutagenic agent, induced and spontaneous mutation. | 10,11,13 | 8+9 | D1-D4 |
| Molecular genetic of pathogenicity to phytopathogenic bacteria.  Virulence factors in Plant Pathogenic Bacteria :  Plasmids their role in phytopathogenic bacteria,  Toxins, functions, classification, mode of action with examples.  Polysaccharides ( homo and hetero polysaccharides )  Enzymes: CWDE, pectolytic enzymes,  Growth regulators, IAA, cytokinen.  Ice nucleation | 1,2,5,6,10,12 | 10+11 | A1-A5 |
| Antibiotic resistance in phytopathogenic bacteria, types, mode of action to heavy metals | 3,7,11 | **12+13** | **A1-A5** |
| Plant regulated bacterial genes: Agrobacterium , Rhizobium gene control host specificity. | 2,3,6,8 | 14+15+16 | **C1-C3** |

**Learning Methodology**

Power point theoretical Lectures, discussion and presentation

**Evaluation**

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| **Evaluation** | **Point %** | **Date** |
| **Midterm Exam** | 30 |  |
| **Presentation and term papers** | 30 |  |
| **Final exam** | 40 |  |

**References:**

1. Birge, A.E. 1981. Bacterial and Bacteriophage Genetics. Springer vetaly, NewYork pp 359.

2. Chatterjee, A.K. 1986 Genetics of pathgenicity factors: application to phytopathogenic bacteria: Advances in Plant Pathology Vol. 4: Academic Press, London.

3. Crute, I. R. 1986. Investigation of gene for gene relationship for genetic analysis of both host and parasite. Plant pathology, 35: 15-17.

4. Day, P.R. 1980. Genetics as a tool in microbiology. Cambridge University pp. 361-75.

5. Donala, R. H 1985. Plasmids in Bacteria Ptenum press, NewYork pp. 995.

6. Dorman CJ: The genetics of bacterial virulence. Blackwell Scientific Press, Oxford, England, 1994 .

7.. Gnanamanickam S. Sam et al. 2006. Plant Associated Bacteria, Springer. Netherland

8. Gracen, V.E. 1982. Role of Genetics in Etiological Phytopatholgy. Ann. Rev. of phytopathology, 20: 219-33.

9. Janes, J.D.2005. Phytobacteriology Principles and Practices. Plant Protection service. Wageningen. The Netherlands.

10.Miller VL, Kaper JB, Portnoy DA et al. (eds): Molecular genetics of bacterial pathogenesis. American Society for Microbiology, Washington DC, 1994 .

11. Miushushi, S. 1985. Drug Resistance in Bacteria. Genetic Biochemistry and Molecular Biology.

12.Saylers AA, Whitt DD: Bacterial pathogenesis: a molecular approach. American Society for Microbiology, Washington DC, 1994 .

13. Weising, K. N. 1995. DNA fingerprinting in plant and fungi CRC press. London pp 318.

**Intended Grading Scale (Optional)**

**According to the university graduate scales**

**Notes:**

* Concerns or complaints should be expressed in the first instance to the module lecturer; if no resolution is forthcoming, then the issue should be brought to the attention of the module coordinator (for multiple sections) who will take the concerns to the module representative meeting. Thereafter, problems are dealt with by the Department Chair and if still unresolved the Dean and then ultimately the Vice President. For final complaints, there will be a committee to review grading the final exam.
* For more details on University regulations please visit:

<http://www.ju.edu.jo/rules/index.htm>