**The University of Jordan**

**Faculty of Agriculture Department: Plant Protection**

**Program: Ph.D in Plant Protection Academic Year 2015/2016 - First Semester**

 Seed Pathology (0606931)

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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 seed- borne diseases, their causal agents, including fungi, bacteria, viruses, and nematodes, economic importance, epidemiology, control and different detection techniques.

**Learning Objectives**

1. To give the students an idea about seed borne diseases
2. The economic importance of these diseases
3. Mode of transmission and location of seed borne diseases causal agents in seeds
4. Seed anatomy in relation to pathogen infection and transmission
5. Seed health testing methods for detection of diseases causal agents

**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 seed borne diseases causal agents and their symptoms**

**A2- economic importance of these diseases**

**A3- developing, epidemiology and control methods of these diseases**

**.….**

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

B1- an idea about different diseases causal agents ( biotic and abiotic)

B2- location of the causal agents inside or outside seeds

B3- detection of the causal agents from the seeds

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

C1-effect of seed viability .

C2-different techniques for detection of these causal agents
C3- biochemical changes in seeds due to infection

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

D1- examples of the different seed borne diseases

D2- epidemiology in relation to environmental conditions

D3- Integrated control methods of seed borne diseases

# ILOs: Learning and Evaluation Methods

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| **ILO/s** | **Learning Methods** | **Evaluation Methods** |
| A. Knowledge and Understanding(A1-A3) | Lectures and Discussions | **Exam, Quiz and presentation** |
| B. Intellectual Analytical and Cognitive Skills(B1-B3) | : Lectures and Discussions | **Exam, Quiz,**  |
| C. Subject- Specific Skills(C1-C3) | Lectures and Discussions | **Exam, Quiz,**  |
| D. Transferable Key Skills (D1-D3) | Assignment and presentation | **Exam, Quiz,**  |

**Course Contents**

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| **Content** | **Reference**  | **Week** | **ILO/s** |
| Introduction: Historical development. Development of seed health testing, Significance   | 1,3,8,17 | 1 | A1,A2,B1,B2 |
| Seed borne pathogensFungi, Bacteria, Mycoplasma like organisms. Fastidious Vascular bacteria, Spiroplasma, Viruses, viroids, Nematodes | 1,2,9,10,13,15,17 | **2** | **B1, B2** |
| Location of seedborne inoculum : IHistopathology of some seedborne pathogens, Seed infection (embryo, endosperm and perisperm. seed coat and pericarp. glume infection), Seed infestation or contamination | 4,12,14,15,17,18 | 3,4 | B2, C1, C2 |
| Mechanism of seed infection ( seed infection, seed infestation or contamination) | 1,2,4,10,16 | 5 | B2, C1, D2 |
| Factors affecting seed infection:Host genotype, environment, crop management, type of inoculum, seed quality, plant growth stage, mother plant infection, insect infestation and pathogen interaction. | 9,10,17 | 6,7 | A3, C1, D2 |
| Longevity of seedborne pathogens:Longevity, factors influencing longevity | 9,10,14,15,17 | 8 | C1-C2 |
| Seed transmission and inoculation: Seed transmission ( systemic and nonsystemic), seed inoculation | 11, 15,17 | **9** | **C2-D2** |
| Factors affecting seed transimission:Crop species. Environment, inoculum, survival of inoculum. cultural practices. seed abnormalities, seed germination. seed ,leachates, and presence of other microflora | 7,13,15,17 | 9-10 | **A3-D2** |
| Epidemiology and inoculum thresholds of seedborne pathogens: epidemiology ( classification of seedborne diseasesbased on epidemiology), inoculum thresholds, development of inoculum thresholds. | 7,8,10 | 11,12 | **A3,B2,C2D2** |
| Nonparasitic seed disorders: Genetic effects. mechanical injuries, environmental effects.mineral deficiencies, and insect damage | 9,10,13,15,17 | 13 | A1,D1 |
| Deterioration of seeds by storage fungi:Field and storage fungi, invasion by storage fungi. losses.conditions favoring storage fungi development, detection of damage. and control. | 1,2,10,13,17 | 14 | B1-D1 |
| Mycotoxins and mycotoxicoses:\* Mycotoxins, fungi known to produce mycotoxins, factors affecting mycotoxins production, effects of mycotoxins. and detection. | 1,10,16,17 | 15 | C1,C2 |
| Control of seedboine pathogens:Introduction, selection of seed production area, crop, management, seed treatment. certification. plant quarantine, disease resistance | 2,6,8,10,17 | 16 | A3,C1,C2,D2 |

**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. Agrios, G. N. 2005. Plant Pathology. 5-th edition. University of Florida. Academic press
2. Barry J. Jacobsen, Montana State University (2014). Seed-borne fungal pathoge of vegetable crops . International Workshop on Seedborne Diseases of Vegetable Crops . Hyderabad, India June 2-5, 2014, presentation , 30 slid
3. Beales Paul (2012)Detection of Fungal Plant Pathogens from Plants,Soil, Water and Air. Detection of Fungal Plant Pathogens from Plants, Soil, Water and Air , Chapter 3: 22-56
4. Du Toit, L.J. ( 2005) Infection of Seed & Transmission of Seed Borne Pathogens. WSU Mount Vernon NWREC link location:
5. Du Toit, L.J. 2013,Scientific method and *habeus corpus*: Assessing the significance and management of seedborne pathogens. Invited seminar presentation, Pl Sci 501, University of Idaho, 11 Apr. 2013, Moscow, ID.
6. Du Toit, L.J.2009. Efficacy of seed treatments for management of seedborne pathogens and seedling blights of onion. 2009 Short Course of the Columbia Basin Crop Consultants’ Association, 22 Jan. 2009, Moses Lake, WA.
7. Ebrahim O., Babak Pakdaman S., Majed B., Nima A., O., Shabnam K., and Saideh H. 2014. First Report of Curtobacterium flaccumfaciens pv. flaccumfaciens Causing Cowpea Bacterial Wilt in Iran. Journal of Phytopathology.1-4
8. Fry. E. William, 1982: Principles of plant disease management, Academic press, INC Orlenda, Florida, PP- 378.
9. Harveson, R. M., Markell, S. G., Goswami, R., Urrea, C. A., Burrows, M. E. 2015. Bacterial wilt of dry-edible beans in the central high plains of the U.S. ; past, present, and future.The American Psychopathological Society.1-13
10. Michelle M. Cram and Stephen W. Fraedrich.Seed Diseases and Seedborne Pathogens of North America. Tree Planters’ Notes, *Volume 53, No. 2*
11. Nazmul Hasan, Kohinoor Begum, Ahbubul Islam and Rafiqul Islam .2015. Transmission Behavior of Colletotrichum corchori from Seed to Plant to Seed in CVL-1 Jute under Different Field Condition World Journal of Agricultural Sciences 11 (4): 215-221,
12. Ritchie, D.F. 2000. Bacterial spot of pepper and tomato. The Plant Health Instructor. DOI: 10.1094/PHI-I-2000-1027-01 Updated 2007.
13. - S. B. Mathur, Johs Jrargensen, Technical Centre for Agriculture and Rural Co-operation (Ede, Netherlands), 1993, seed pathology
14. Sue Tolin (2014) Seed-Borne Virus and Virus-Like Diseases of Vegetable Crops:Description, Detection, and Diagnosis.IPM Innovation Lab Plant Virus Disease Global Theme. Workshop on Seed-borne Viruses of Vegetable Crops. NIPHM: Hyderabad, India: 2-5 June, 2014
15. Subramanya Sastry K (2013). Seed-borne Plant Virus Diseases. Springer India 2013, 327pp
16. Tegli S., Sereni, A., and Surico, G. 2002. PCR-based assay for the detection of *Curtobacterium flaccumfaciens* pv. *flaccumfaciens* in bean seeds. Applied Microbiology, 35, 331–337
17. Vijendra K. Agarwal. Sinclair, J.B 1987 Principles of Seed Pathology. vol. 1. and 2. CRC Press, Inc Boca Raton, Florida.
18. Walcott Ron R. (2013) Detection of Seedborne Pathogens. HortTechnology\_ 47 January–March 2003 13(1), 40-47

**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>