**The University of Jordan**

**Faculty of Agriculture Department of Horticulture and Crop Science**

**Program: *2015-2016/Fall semester***

**Course title:** Plant Breeding **(**601440**)**

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| Credit hours | 3 | Level | BSc Course | Pre-requisite | 601240 |
| Coordinator/ Lecturer | Prof. Mahmoud Kasrawi | Office number | 215 | Office phone | 22335 |
| Course website | [Faculty](http://blackboard.ju.edu.jo/webapps/login/) Member Website | E-mail | kasrawi@ju.edu.jo | Place |  |

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| **Office hours** | | | | | |
| **Day/Time** | **Sunday** | **Monday** | **Tuesday** | **Wednesday** | **Thursday** |
| **Time** | 10: -11:00 |  | 10: -11:00 |  | 10: -11:00 |

**Course Description:**

Principles of plant breeding, application of genetic principles in plant breeding. Methods of selection for self-and-cross-pollinated and asexually propagated crops. Most important problems facing plant breeders and methods to overcome them.

**Course Objectives:**

1- Foster students understanding of genetic principles underlying plant improvement.

2- Understand plant improvement methodology including self-pollinated and cross-

pollinated crops.

3- Encourage critical thinking in relation to improvement strategy and methodology.

4- Present examples on problems facing plant breeders and approaches and methods to overcome them.

**Learning Outcomes:**

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

**A) Knowledge and Understanding: the students should:**

A1- Understand the importance of genetic principles in plant breeding and realize

the close linkage between genetics and plant breeding.

A2- Know how genetic variation could be identified, created and used in plant

breeding.

A3- Understand the major methods used for the improvement of the major crops.

A4- Know the problems facing the major crops and how to utilize plant breeding

in solving these problems.

## B) Subject Specific Skills: subject specifics skills, with ability to assist plant breeders in doing the following:

B1- Select germplasm with specific traits that will be used in crop improvement.

B2- Grow a crossing blocks for the major crops and conducted crossing (including

emasculation and pollination) following proper procedures for the major crops.

B3- Handle segregating populations and advance generations and select individuals with combined desirable traits.

## C) Transferable Skills

C1- Train technicians in how to make crosses and to measure specific traits for the major crops.

1. **Transferable Key Skills:** Student is expected to

D1- Understanding the techniques of Hybridization.

D2- Improving use of genetic resources for diseases tolerability.

D3- Identify the way to involve the genes characters in adaptation to microclimate.

D4- Development of new Hybrids that can tolerate soil stress.

# ILOs: Learning and Evaluation Methods

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| **ILO/s** | **Learning Methods** | **Evaluation Methods** |
| **A**. Knowledge and Understanding (**A1-A5**) | Lectures and Discussions  Assignment readings | Exam, Quiz, |
| **B**. Intellectual Analytical and Cognitive Skills (**B1-B3**) | Lectures and Discussions  Assignment readings | Exam, Quiz, |
| **C**. Subject Specific Skills (**C1-C3**) | Lectures and Discussions  Assignment readings | Exam, Quiz, |
| **D**.Transferable Key Skills (**D1-D4**) | Lectures and Discussions  Assignment readings | Exam, Quiz, |

**Course Contents**

|  |  |  |  |
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| **No. of lecture (s) /Week** | **Subject** | **Sources** | **ILOs** |
| 1, 2  (1st wk) | 1. What is plant breeding?  - Plant breeders and their work. | Chapter 1, pp. 3-15. in Poehlman, J. M. and D. A. Sleper. 1995 | *A1& A2& B1 & B2& C1 & D1* |
| 3,4,5  (2nd &3rd wks) | 2. The genetic basis of plant breeding  - Reproduction in crop plants  - Genetic recombination and plant breeding.  - Quantitative inheritance and plant breeding. | Chapter 2, 3, 4 pp. 19-84. in Poehlman, J. M. and D. A. Sleper. 1995 | *A1 & A2 & A4 & B2 & B3 & C1 & D1 & D2 & D3 & D4* |
| 6,7,8,9  (3rd & 4th & 5th wks) | 3. Tools of the plant breeder  - Variation in chromosome number.  - Mutation.  - Molecular biology: application in plant breeding. | Chapter 5, 6, 7, 8 pp. 85-158. In Poehlman, J. M. and D. A. Sleper. 1995 | *A1 & A2 & A3 & A4 & B1& B2 & B3 & C1 & D1 & D2 & D3 & D4* |
| 10,11,12,13,14,15,16,17  (5th & 6th & 7th & 8th & 9th wks) | 4. Method of plant breeding  - Breeding self pollinated crops.  - Breeding cross pollinated crops.  - Breeding asexually propagated crops. | Chapter 9, 10, 11, pp. 159-180, -215. in Poehlman, J. M. and D. A. Sleper. 1995 | *A1 & A2 & A3 & A4 & B1& B2 & B3 & C1 & D1 & D2 & D3 & D4* |
| 18 ( 9th wk) | **One hour exam.** |  |  |
| 19,20  (10thwk) | 5. Breeding objectives and techniques. | Chapter 12, pp. 216-242. in Poehlman, J. M. and D. A. Sleper. 1995 | *A1 & A2 & A3 & A4 & B1& B2 & B3 & C1& D1 & D2 & D3 & D4* |
| 21, 22  (11th wks) | 6. Germplasm resources for breeding crop plants. | Chapter 13, pp. 243-258. in Poehlman, J. M. and D. A. Sleper. 1995 | *A1 & A2 & B1& B3 & C1 & D1* |
| 23, 24, 25, 26  (12th & 13th wks) | 7. Application: breeding field crops that are self-pollinated.  Wheat and Soybean. | Chapter 14, 16 pp. 259-277, 300-320. in Poehlman, J. M. and D. A. Sleper. 1995 | *A1 & A2 & A3 & A4 & B1& C1 & D2 & D3 & D4* |
| 27, 28, 29, 30  (14th& 15th wks) | 8. Application: Breeding field crops utilizing hybrid breeding  procedures. Corn. | Chapter 17, pp. 321-344. in Poehlman, J. M. and D. A. Sleper. 1995 | *A1 & A2 & A3 & A4 & B1& B2&B3 & C1 & D1 & D2 & D3 & D4* |

**Learning Methodology:**

The course will be structured in lectures, discussions, labs, assignments and reports. The course comprises overviews, from general understanding to expert knowledge on key topics, and learning is based mainly on lectures, labs and reports as well as independent learning through assignments.

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| **Evaluation** | **Point %** | **Date** |
| Midterm Exam | 20% |  |
| Quizzes, term-paper and homework | 10% |  |
| Lab. exercises and homework | 20% |  |
| Final Lab  Final Exam | 10%  40% |  |

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| No. of hours | Laboratory Topics |
| 3 Hrs | 1. Introduction to the lab., objectives, activities and student  distribution. |
| 3 Hrs | 2. Planting major crops in the field and greenhouse to be used in  future lab. sessions: soil preparation and planting the  following crops: wheat, barley, faba bean, chickpea, peas,  corn, tomato and cucumber. |
| 3 Hrs | 3. Reproduction in crop plants. |
| 6 Hrs | 4. Techniques for artificial hybridization (lectures and slide  show). |
| 3 Hrs | 5. Mendelian’s genetics, problems and solutions |
| 3 Hrs | 6. Chromosome mapping. |
| 3 Hrs | 7. Chi-Square for studying linkage and independent assortment. |
| 6 Hrs | 8. Analysis of variance and heritability estimates. |
| 5 Hrs | 9. Hybridization practice for major crops in the greenhouse. |
| 3 Hrs | 10. Chromosome preparation |
| 6 Hrs | 11. DNA gel electrophoresis. |
| 3 Hrs | 12. Tissue culture techniques and plant breeding. |
| 1 Hr | Exam. |
| 48 Hrs | Total |

**References and Supporting Material:**

1- Poehlman, J. M. and D. A. Sleper (1995). Breeding Field Crops. 4th edition. Iowa State University Press. USA. (**Recommended text**).

2- Fehr, W. R. (1987) Principle of Cultivar Development. Vol. 1: Theory and Technique. MeGraw Hill Inc. New York.

3- Mayo, O. (1987). The theory of Plant Breeding. 2nd edition. Claredon Press. Oxford.

4- Simmonds, N. W. (1979). Principle of Crop Improvement. Longman Group

Limited. London.

**Intended Grading Scale (Optional)**

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| **From (%)** | **To (%)** | **Scale** | **Mark** | **Result** |
| 0 | 44 | 0 | H | Fail |
| 45 | 47 | 0.75 | D- | Fail |
| 48 | 54 | 1 | D | Accepted |
| 55 | 60 | 1.5 | D+ | Accepted |
| 61 | 63 | 1.75 | C- | Good |
| 64 | 66 | 2 | C | Good |
| 67 | 72 | 2.5 | C+ | Good |
| 73 | 75 | 2.75 | B- | Very Good |
| 76 | 78 | 3 | B | Very Good |
| 79 | 84 | 3.5 | B+ | Very Good |
| 85 | 87 | 3.75 | A¯ | Excellent |
| 88 | 100 | 4 | A | Excellent |

**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.

**Important Regulations:**

* 1. Attendance and departure of students on time to have full 50 minute lecture.
  2. check the frequency of students regularly and at the beginning of the lecture, if number of absent lectures for any student comes close to max. then the is reminded.
  3. Not allowed for students to speak together during the running of lecture but to ask the instructor.
  4. Close of the Mobile
  5. The instructor is ready to answer any question out of office hours if presented in the office.
  6. Reminding of Exams dates one week before.
* For more details on University regulations please visit:

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