**The University of Jordan**

**Faculty of Agriculture Dept. Horticulture & Crop Science**

**Program: Ph.D. in Hort. & Crop Science Academic year: \_\_\_\_\_\_\_**

**Plant Molecular Genetics** (**0601937**)

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| --- | --- | --- | --- | --- | --- |
| **Credit hours** | **3** | **Level** | **1st year** | **Pre-requisite** | **0631240** |
| **Lecturer** | **Dr. Muhanad Akash** | **Office number** | **290** | **Office phone** | **22340** |
| **Course website** | **http://elearning.ju.edu.jo/** | **E-mail** | **makash@ju.edu.jo** | **Place** |  |

|  |
| --- |
| **Office hours** |
| **Day/Time** | **Sunday** | **Monday** | **Tuesday** | **Wednesday** | **Thursday** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

**Course Description**

This course covers DNA replication, transcription, translation and repair mechanism, DNA sequencing, protein biosynthesis post transcriptional and post translational modifications and mutations

**Learning Objectives**

The course is designed to expose the graduate students to the following fields in plant molecular genetics: Introduction and review for plant genetics, cytogenetics, chromosome structure and behavior, plant DNA isolation and characterization, genetic and physical mapping, computer application

**Intended Learning Outcomes (ILOs):**

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

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

**A1-** Examine a brief introduction and review for basic principles of plant genetics.

**A2-** Understand genome structure and function.

**A3**- Understand mapping plant genome

**A4**- Understand analysis techniques of plant DNA

**A5**- Discuss the concept behind DNA markers in plants

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

**B1**- Reading and interpretation of molecular genetic related papers

**B2**- Use the scientific method to define and solve problems independently and collaboratively

**B3**- Accurately interpret scientific information

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

**C1**- Reading genetic and physical maps

**C2**- Utilizing mapping software

**C3**- Seek out and interpret research literature related to quantitative genetics in plant breeding

**D. Transferable Key Skills:** Students is expected to

**D1**- Ability to emphasis on laboratory-oriented sciences research problems

**D2**- Using scientific software

**D3**- Presentation and discussion

# 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, assignments |
| B. Intellectual Analytical and Cognitive Skills (B1-B3) | Lectures, Homework and Assignments | Exam, assignments |
| C. Subject Specific Skills (C1-C3) | Lectures, Homework | Exam , assignments |
| D.Transferable Key Skills (D1-D3) | Lectures, Assignments | Projects, presentation |

**Course Contents**

|  |  |  |  |
| --- | --- | --- | --- |
| **Content** | **Reference**  | **Week** | **ILO/s** |
| 1. DNA – basic of structure and analysis & introduction to cytogenetics and cell cycle
 | Lewin (2014) | 1 | A1 |
| 1. Chromosomal behavior & structure
 | Lewin (2014) | 2 | A1, A3 |
| 1. Gene regulation
 | Lewin (2014) | 3 | A2,C2 |
| 1. Mutations & transposable elements
 | Lewin (2014) | 4 | A2,C2 |
| 1. Plant DNA isolation & quantification
 | Lewin (2014) | 5 | A4,C2 |
| 1. Additive genetic correlations
 | Lewin (2014) | 6 | A3 |
| 1. Polymerase chain reaction
 | Lewin (2014) | 7 | A3,A4,C2 |
| 1. Restriction digestion
 | Lewin (2014) | 8 | A3, A4 |
| 1. Gel electrophoresis
 | Lewin (2014) | 9 | A4 |
| 1. Southern blotting
 | Lewin (2014) | 10 | A4, A5 |
| 1. DNA sequencing
 | Lewin (2014) | 11 | A2-A5 |
| 1. Mapping plant genome
 | Lewin (2014) | 12 | A2-A5 |
| 1. Analysis of plant genome with molecular markers
 | Lewin (2014) | 13 | A2-A5 |
| 1. Cloning and cloning vectors
 | Lewin (2014) | 14 | A2-A5 |
| 1. Student presentations
 | Selected articles | 15-16 | B1-B3,C2,C3,D1-D3 |

**Learning Methodology**

1. **Lectures**: 2 per week (including one 2-hour exam)
2. **Duration:** 16 weeks, 48 hours in total
3. **Assignments:** to be notified

# Evaluation

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| --- | --- | --- |
| **Evaluation** | **Point %** | **Date** |
| **Midterm Exam**  | 30 |  |
| **Project** | 10 |  |
| **Assignments** | 10 |  |
| **Homework**  | 10 |  |
| **Final Exam**  | 40 |  |

**Main Reference/s:**

* Lewin, B. (2014) Genes XI. Oxford University Press, UK.

# References:

* Caetano-Anollés, G., and Gresshoff, P.M. (1997) DNA Markers: Protocols, Applications, and Overviews. Wiley-Liss.
* Phillips, R.L. and Vasil, I.K. (1994) DNA-based markers in plants. Kluwer Academic Publishers, London.
* Miesfeld, R.L. (1999) Applied Molecular Genetics. John Wiley and Sons, Ltd., New York, USA.
* Griffiths, A.J.F et al (2002) Modern Genetic Analysis: Integrating Genes and Genomes. 2nd Edition.
* [Genebank] <<http://www.ncbi.nlm.nih.gov>>.
* [The Arabidopsis Information Resources] <<http://www.arabidopsis.org>>.
* Selected papers.

**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>