**The University of Jordan**

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

**Program: Master Semester: 2017/2018**

**Course title: Crop Physiology** (0601705)

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| --- | --- | --- | --- | --- | --- | --- |
| Credit hours | 3 | Level | Master | Pre-requisite | Crop Physiology  0601705 | E-mail |
| Lecturers | Dr. Safwan Shiyab | Office number | 259 | Office phone | 22522 | safwan@ju.edu.jo |
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|  |  |  |  |  |  |
| Course website | <http://blackboard.ju.edu.jo/webapps/login/> |  |  |  |  |  |

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| --- | --- | --- | --- | --- | --- |
| Office hours | | | | | |
| Day/Time | Sunday | Monday | Tuesday | Wednesday | Thursday |
| Day | \* | \* | \* |  | \* |
| Time | 9-11 | 11-1 | 11-12 |  | 9-11 |

**Course Description**

Crop physiology is an advanced course on the physiological processes involved in the growth and development of crop plants and the interaction of these processes with the environment to influence productivity. Topics covered in this course include: plant water relations with special emphasis on osmo regulation and water stress in higher plants. Plant light interaction including the role of light in photosynthesis, photoperiodism and photomorphogenesis. Plant hormones with special reference to their metabolism, transport, and mode of action. Nitrogen metabolism and biological nitrogen ficxation. Secondary plant metabolism, and defense compounds. Developmental physiology with emphasis on juvenility, senescence and abscission.

**Learning Objectives**

1. To develop an understanding of basic plant/crop physiological and biochemical processes and to interrelate crop production and management practices with basic physiological mechanisms.
2. To develop an understanding of characterization and quantification of environmental factors affecting plants and how plants sense and respond to environmental factors and the ways that environmental factors impact yield and productivity
3. Understand the effects of the stress of environmental factors on crop growth and development.

**Intended Learning Outcomes (ILOs):**

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

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

A-1 knowing structure of plants (cell, tissue, and organs) and their functions.

A-2 knowing basic concepts of crop physiology

A-3 Understanding water potential and its effect on plant cells.

A-4 Understand the physiological mechanisms of water uptake and transport, transpiration, and food translocation by plants.

A-5 knowing the metabolism , metabolites and complementary metabolic pathways such as photosynthesis and respiration.

A-7 Understand the major effects and physiological mechanisms of growth regulators (hormones) in plants.

A-8 Understand the influence of abiotic stress factors such as (Temperature, light, salinity, heavy metals,…etc) on plant growth.

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

B-1 Understanding the relation between plant physiological and biochemical processes.

B-2 Develop critical thinking skills through the understanding of the role of plant physiology.

B-3 Understand the impacts of various environmental factors on plant growth.

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

C-1 Identify the basic techniques and methodologies used in crop physiology studies.

C-2 Develop critical thinking skills.

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

D-1 Improve oral and written communication skills, and an in depth appreciation of specific topics in crop physiology.

D-2 Communicate in both oral and written forms about key scientific concepts related to plant.

# ILOs: Learning and Evaluation Methods

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| **ILO/s** | **Learning Methods** | **Evaluation Methods** |
| **A**. Knowledge and Understanding (**A1-A4**) | Lectures and Discussions | Exam, Quiz, |
| **B**. Intellectual Analytical and Cognitive Skills (**B1-B2**) | Lectures and Discussions | Exam, Quiz, |
| **C**. Subject Specific Skills (**C1-C2**) | Lectures and Discussions | Exam, Quiz, |
| **D**.Transferable Key Skills (**D1-D2**) | Lectures and Discussions | Exam, Quiz, |

**Course Contents**

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| **No. of lecture (s) /Week** | **Subject** | **Sources** | **ILOs** |
| 1, 2, 3, 4  (1st , 2nd wk) | General Introduction:  -Plant physiology concepts  -Structure and Organization of Plants  -Plant cells and tissues  -Plant parts, structure, and function | Ch 1, | A-1 & A-2 |
| 5, 6, 7, 8  (3rd, 4rd wk) | Plant water relations:  -Physical and chemical properties of water,  -Translocation of water: diffusion, bulk flow, osmosis  -Concept of water potential  -Water movement in cells | Ch 3, Ch 4 | *A1, A3, A4, B1, B2, D1, D2* |
| 9, 10, 11, 12  (5th, 6th wk) | Metabolic process, primary and secondary metabolites, and plant defense. | Ch 7, Ch 8 | *A1, A3, A4, B1, B2, D1, D2* |
| 13, 14, 15, 16  (7th, 8th wk) | Photosynthesis   * Light and pigments:   + Physical nature of light   + Measuring light   + Absorption and action spectra   + Photoreceptors   + The chloroplast * Light dependent reaction   + Light absorption by leaves   + Photosystems and light harvesting complexes   + Photosynthetic electron transport (Z-Scheme)   + Photophosphorylation   + Electron transport and weed control * Carbon metabolism   + Photosynthetic carbon reduction (PCR) cycle   + Activation and regulation of PCR cycle   + Photorespiration   + C4 and CAM plants   + Factors affecting photosynthesis | Ch 7  Ch 7  Ch 8  Ch 9 | *A7, A8, B1, B2, B3, D1, D2* |
| 17, 18  (9th wk) | Respiration | Ch 10 | A-2 & A4 & B1 |
| 19, 20, 21, 22  (10th , 11th wk) | Plant hormones   * Mode of action of hormones * Role of major plant hormones in crop development and there uses in agriculture | Ch 19, 20, 21, 22, 23, 24 | *A11, B1, B2, B3, D1, D2* |
| 22, 24, 24, 25  (10th , 11th wk) | Physiological stresses   * Biotic and abiotic stresses * Plant responses to stresses, adaptation and tolerance | Ch 26 | *A12, B1, B2, B3, D1, D2* |
| 26, 27, 28, 29  (12th , 13th , 14th wk) | Scientific physiological topics selected and paper presentation | . | A-2 & A-4 & B-1 & D-1 |

**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 | 25% | 7th week |
| presentation | 10% |  |
| Quizzes | 10% |  |
| Final Exam | 50% | Will be announced through the registry |

# References and supporting materials:

* + Taiz L & Zeiger E (2006) [Plant Physiology](http://www.plantphys.net/). 4th Edition. Sinauer. (<http://www.plantphys.net/>)
  + *Hopkins, W. and Norman P.A. Huner. 2003. Introduction to plant physiology. 3rd edition. John Wiley and Sons, Inc. New York. U.S.A.*
  + Pessarakli, Mohammad. 2001. Handbook of Plant and Crop Stress: Second Edition, Revised and Expanded. Marcel Dekker Incorporated, New York, NY, USA.
  + Larcher, W. 1995. Physiological plant ecology. 3rd edition. Springer New York. U.S.A.
  + Smallwood, M.F. (Editor). 1999. *Plant Responses to Environmental Stress.* GBR: BIOS Scientific Publishers Ltd, Oxford.

<http://site.ebrary.com/lib/uoj/Doc?id=5000291&ppg=3>

* + Gardner, F.P., R.B. Pearce and R.L. Mitchell. Physiology of Crop Plants. Iowa State University Press. 1985.

**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 90 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>