# Jordan University of Science and Technology

## Faculty of Agriculture

## Natural Resources & Environment Department

NR306 Soil-Water-Plant Relations - JNQF Level: 7

Second Semester 2024-2025

| Course Catalog |
|---|
| 3 Credit Hours. The main objective of this course is to introduce the students to the basic concepts of soil-water, plant-soil, and plant-water relations. Soil and water properties and functions. Water retention and transport in soil. Soil-plant-atmosphere continuum. Physical, biochemical, and environmental processes in soil-plant-water relations. Plant roots and water flux in the soil-root continuum, Evapotranspiration, Water use efficiency. Response of plants to environmental stresses. |
| **Teaching Method:** Blended |

| Text Book | |
|---|---|
| **Title** | Water Relations of Plants and Soils |
| **Author(s)** | Kramer, P. J. and J. Boyer |
| **Edition** | 2nd Edition |
| **Short Name** | REF#1 |
| **Other Information** | |

**Course References**

| Short name | Book name | Author(s) | Edition | Other Information |
|---|---|---|---|---|
| REF#2 | Plant Physiological Ecology. | Lambers, H., Chapin III, F.S, and Pons, T.L. | 2nd Edition | |
| REF#3 | Plant physiology and Development. | Taiz, L, Zeiger E, Moller, I.M and Murphy A. | 6th Edition | |

| Class Schedule & Room |
|---|
| Section 1:<br>Lecture Time: U : -<br>Room: |

| Tentative List of Topics Covered | | |
|---|---|---|
| **Weeks** | **Topic** | **References** |
| Week 1 | Course Introduction | From **REF#1**,<br>From **REF#2**,<br>From **REF#3** |
| Week 1 | Soil Functions and Properties | From **REF#1**,<br>From **REF#3** |

| | | |
|---|---|---|
| Week 2 | Water functions and Properties | From **REF#1** |
| Week 2 | Plants : Root and Root System | From **REF#1**, From **REF#2** |
| Week 3 | Cell Water Relations | From **REF#1**, From **REF#2**, From **REF#3** |
| Week 4 | The absorption of water, root & Stem pressures | From **REF#1**, From **REF#3** |
| Week 5 | Transpiration and the Ascent of Sap | From **REF#1**, From **REF#3** |
| Week 6 | Stomata and Gas Exchange | From **REF#1**, From **REF#3** |
| Week 7 | Water Use Efficiency and its application in crop water management | From **REF#1**, From **REF#2**, From **REF#3** |
| Week 8 | Response of plants to environmental stresses | From **REF#1**, From **REF#2**, From **REF#3** |

| Mapping of Course Outcomes to Program Outcomes and NQF Outcomes | Course Outcome Weight (Out of 100%) | Assessment method |
|---|---|---|
| The students will learn about the factors affecting water movement in the soil. [5PLO1, 5PLO2, 10PLO6] [5L7K1, 3L7S3, 2L7C1] | 20% | |
| The students will be able to understand the mechanisms of water movement from the soil to the plant through the root system. [5PLO1, 5PLO2, 10PLO7] [10L7K1, 5L7S3, 3L7C3, 2L7C4] | 20% | |
| The course will provide student with the knowledge on the mechanisms of water movement through the shoot up the stem throughout the leaves. [3PLO1, 4PLO2, 3PLO6, 5PLO7] [4L7K1, 3L7S3, 3L7C1, 5L7C3, 2L7C4] | 15% | |
| Students are taught the physiological processes such as transpiration through the plant. [5PLO1, 5PLO2, 5PLO6, 5PLO7] [5L7K1, 5L7S3, 5L7C1, 5L7C4] | 20% | |
| In addition, students will be introduced to the concept of water use efficiency and the environmental stresses (water, nutrient, radiation, temperature stresses, and plant competition) affecting plant soil water relationship. 15 [3PLO1, 4PLO2, 3PLO6, 5PLO7] [5L7K1, 5L7S3, 5L7C1] | 15% | |
| The students will be able to fully understand how soil solution (water and solutes) moves through the soil. [5PLO1, 3PLO2, 2PLO4] [5L7K1, 3L7S3, 2L7C1] | 10% | |

| Relationship to Program Student Outcomes (Out of 100%) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 | PLO7 | PLO8 | PLO9 | MPLO1-K | MPLO2-K | MPLO3-S | MPLO4-S | MPLO5-C | MPLO6-C |
| 26 | 26 | | 2 | | 21 | 25 | | | | | | | | |

| Relationship to NQF Outcomes (Out of 100%) | | | | |
|---|---|---|---|---|
| L7K1 | L7S3 | L7C1 | L7C3 | L7C4 |
| 38.53 | 26.65 | 18.65 | 7.41 | 8.76 |

| Evaluation |
|---|

| Assessment Tool | Weight |
|---|---|
| Midterm | 40% |
| Short Exams | 10% |
| Final Exam | 50% |

| Policy | |
|---|---|
| Exams | All exams are closed book and notes. The final exam is comprehensive (covering all teaching materials). Incomplete exams need approval from the department chair and the faculty dean. |
| Cheating | Prohibited; and in case of cheating the student will be subject to punishment in according with the university regulations |
| Attendance | Students are expected to attend all class meetings regularly. If the student is absent for more than 20% of the course, the student will be prevented from taking all subsequent exams and assigned an F (Failure) grade in the course (deprived by absence). This maximum includes both excused and unexcused absences. |
| Participation | Participation is highly encouraged |
| Withdraw | The student can withdraw from the course in accordance with the timeline defined by the university regulations |

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