**The University of Jordan**

**Faculty of Agriculture Department of Land, Water and Environment**

**Program: 2013-2014/First Semester**

**Course title: Landscape Irrigation and drainage Systems (634314)**

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| **Credit hours** | **3** | **Level** | **Fourth year** | **Pre-requisite** | **Principles of Irrigation (604103)** |
| **Coordinator/ Lecturer** | **Dr. Ahmad M. Abu-Awwad** | **Office number** | **114** | **Office phone** | **22464** |
| **Course website** | **On UJ E Learning portal** | **E-mail** | **abuawwad@ju.edu.jo** | **Place** | **132, Almagdade Hall** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Office hours** | | | | | |
| **Day/Time** | **Sunday** | **Monday** | **Tuesday** | **Wednesday** | **Thursday** |
| **Day** | **\*** | **\*** | **\*** | **\*** | **\*** |
| **Time** | **9-11** | **10-12** | **9-11** | **10-12** | **9-11** |

**Course Description**

Common vocabulary, fluid properties, and fundamental equations govern flow in pipes, Irrigation and drainage systems. Design of pressurized (sprinkler and trickle) irrigation systems, and irrigation pumps.

**Learning Objectives**

Students will:

* Have an understating of hydraulics principles and how they apply to irrigation systems.
* Have an understanding of the pressurized types of irrigation systems and how they function.
* Demonstrate the ability to apply knowledge of irrigation systems to evaluate irrigation systems.
* Be able to correctly identify common tools, equipment, and materials used in the irrigation.
* Demonstrate the ability to design landscape sprinkler and/or trickle irrigation systems.
* Develop design specifications for sprinkler and trickle irrigation application systems and their operation.
* Develop design specifications for irrigation pumps.

**Intended Learning Outcomes (ILOs):**

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

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

**A1-** Understanding of the common types of irrigation drainage systems and how they function.

**A2-** Understating some common hydraulics vocabulary, dimensions and units.

A3- Understanding of fundamental equation of fluid static, energy and hydraulic grade lines.

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

B1- Demonstrate the ability to apply knowledge of irrigation systems to evaluate irrigation systems.

B2- Be able to correctly identify common tools, equipment, and materials used in the irrigation

B3- Demonstrate the ability to design a field-scale sprinkler irrigation and trickle irrigation systems.

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

C1- Develop design specifications for sprinkler and trickle irrigation application systems and their operation

C2- Develop design specifications for irrigation pumps.

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

D1- Be able to design efficient pressurized irrigation systems that minimize cost and attain design uniformity.

D2- Be able to evaluate irrigation system performance.

# ILOs: Learning and Evaluation Methods

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| **ILO/s** | **Learning Methods** | **Evaluation Methods** |
| **A. Knowledge and Understanding** | **Lectures and Discussions** | **Exam** |
| **B. Intellectual Analytical and Cognitive Skills** | **Lectures and Discussions** | **Exam** |
| **C. Subject- Specific Skills** | **Lectures and Discussions** | **Exam** |
| **D. Transferable Key Skills** | **Homework and Assignments** | **Evaluation** |

**Course Contents**

|  |  |  |  |
| --- | --- | --- | --- |
| **Content** | **Reference** | **Week** | **ILO/s** |
| Introduction: syllabus, some common hydraulics vocabulary. | Chapter 3: Fundamental Principles and Applications of Fluid Mechanics. | 1st week | A1 |
| Forces acting on fluids and their related fluid properties | Chapter 11: Fundamental Principles and Applications of Fluid Mechanics. | 2nd week | A1-A2 |
| Gage and absolute pressure. Manometer applications, Barometer, and piezometer. | = | 3rd week | A1-A2 |
| Energy line and hydraulic grade line. Bernoulli equation. | Chapter 17: Fundamental Principles and Applications of Fluid Mechanics. | 4th week | A1-A2 |
| Measurement of Energy Line, Hydraulic Grade Line and velocity head. Piezometer and stagnation tube. | = | 5th week | A1-B2 |
| Introduction to Sprinkler system design. Types. Advantages and disadvantages, .. | Chapter 7.  Internet review | 6th week | A1 |
| Uniformity of application. Adequacy of application concept | = | 7th week | A1, B1 |
| Component of system design: application rate, sprinkler and lateral spacing. Nozzle selection criteria | = | 8th week | B1-C3 |
| System Capacity. Distribution system design and layout concept of lateral design. Lateral layout | = | 9th week | B1-C3 |
| Pressure required at mainline entrance to lateral. Critical pressure requirement on mainline. Pressure required at the pump. | = | 10th week | B1-C3 |
| Sprinkler system design review and pump selection. | Chapter 7 and 9 | 11th week | B1-D2 |
| Trickle system design: concept of trickle system. System components. | Chapter 8  Internet review | 12th week | A1, A2 |
| Type of emitters. Emitter uniformity | = | 13th week | A1-B2 |
| Lateral hydraulics governing relationships | = | 14th week | B1-C3 |
| Filtration and water treatment systems. Fertilizer injector systems. | Chapter 8 and 9 | 15th week | A1, A2 |
| Trickle system design review and pump selection. Final Exam | = | 16th week | B1-D2 |

**Learning Methodology**

## The course will be structures mainly in Lectures; and discussions, exercise, demonstration, and applications.

# Evaluation

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| **Evaluation** | **Point %** | **Date** |
| **Midterm Exam** | 30 | 5 / 11 / 2013 |
| **2nd Exam** | 20 | 5 / 12 /2013 |
| **Homework an Quizzes** | 10 | Bonus |
| **Final Exam** | 50 | 12 / 1 / 2014 |

**Main Reference/s:**

* Irrigation System Design. Richard H. Cuenca. Prentice Hall, Inc. 1989.
* Fundamental Principles and Applications of Fluid Mechanics. Gorden H. Flammer, Roland W. Jeppson. Hugh F. Keedy. 1986.

# References

* Sprinkle and Trickle Irrigation*by J. Keller and R. Bliesner (1990)*
* Hydraulic Engineering. John A.Roberson, John J. Cassidy, M. Hanif Chaudhry. John Wiley & Sons, Inc. New York. 1997 (ISBN 0-471-12466-4)**.**
* Internet

**Intended Grading Scale (Optional)**

0-35 **F**

36-39 **D**-

40-47 **D**

48-51 **D+**

52-55 **C**-

56-63 **C**

64-67 **C+**

68-71 **B**-

72-79 **B**

80-83 **B+**

84-87 **A**-

88-100 **A**

**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>