HWRM 311 IRRIGATION II (THEORY) (02 Credit hrs)

PRE-REQUISITE: HWRM-201 Irrigation (I)

LEARNING OUTCOMES:

- This course will provide an introduction to the Pressurized irrigation systems to the students.
- The students will learn about the Drip Irrigation system.
- They will have the knowledge about Hydraulics of Flow Regime
- The Fertilization process used with drip system will be introduced to them.
- The students will get used to Drip Design Procedure.
- The students will be equipped with the Design of Pipe Network system.
- They will become conversant with Sprinkler Irrigation & its importance in local environment.

CONTENTS

Unit-1 Drip Introduction

1.1. Introduction
1.2. Histories and Development
1.3. Components of Drip Irrigation System
1.4. Types of Drip System
1.5. Advantages and Disadvantages
1.6. Evaluation and Futuristic Approach of Drip Irrigation in Pakistan

Unit-II Hydraulics of Flow Regime

2.1. Reynolds Number
2.2. Darcy-Weisbach Equation
2.3. Hazen-William Formula
2.4. Hydraulic Characteristics of Distributors
2.5. Manufacturing Variation of Distributors
2.6. Irrigation Uniformity and Efficiency

Unit-III: Drip Design Procedure

3.1. Crop Water Requirements
3.2. Water Distribution in Soils and Wetting Pattern
3.3. Selection of Number of Distributors per Plant
3.4. System Capacity
3.5. Questions & Problems

Unit-IV: Design of Pipe Network

4.1. Hydraulic Formulae/Head Losses in Pipes
4.2. Lateral Design
4.3. Sub-main Design
4.4. Design Charts
4.5. Main Line Design
4.6. Farm Drip System Design Examples

Unit-V: Fertilization

5.1. Introduction
5.2. Fertilizers in Drip Fertigation
5.3. Drip Fertigation Systems
5.4. Rate of Fertilizer Application

Unit-VI Sprinkler Irrigation

6.1. History of Sprinkler Irrigation
6.2. Advantage and Limitations of Sprinkler Irrigation
6.3. Scope of Sprinkler Irrigation in Pakistan
6.4. Type of Sprinkler System and Components
6.5. Design of Sprinkler Irrigation System

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
2.	Formative Assessment	25%	It is continuous assessment. It includes: classroom participation, attendance, assignments and presentation, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Ali, M. H. (2011). *Practices of Irrigation & On-Farm Water Management*: Volume 2. Springer, USA.
2. Choudhary, M. R. (2009). *A Text Book of Irrigation and Drainage Practices for Agriculture*. University of Agriculture, Faisalabad.
3. Kahlown, M. A. and Majeed. A. (2004). *Pakistan Water Resources Development and Management*. Pakistan Council of Research in Water Resources, Ministry of Science and Technology, Government of Pakistan.
4. Micheal, A. M. (2003). *Irrigation Theory and Practices*. Vikas Publishing House (Pvt), New Delhi.

5. Keller, J. (2001). *Sprinkle and Trickle Irrigation*. Blackburn Press, New Jersey, USA.
6. Phocaides, A. (2007). *Handbook on Pressurized Irrigation Techniques*. Food and Agriculture Organization of the United Nations, Rome.
7. Bliesner, R. D. and Keller, J. (2001). *Sprinkle and Trickle Irrigation*. Van Nostrand Reinhold.

HYD-311 IRRIGATION II (LAB) (01 Credit hr)

PRE-REQUISITE: HWRM-201 Irrigation (I)

LEARNING OUTCOMES:

- This course will provide an introduction to the Computation of reference crop evapotranspiration (ETo).
- The students will learn about the Determination of Crop water requirement.
- They will have the knowledge about the Use of computer models for the determination of crop water requirement and irrigation scheduling,
- The Determination of Irrigation requirements, leaching requirements and irrigation scheduling will be performed by the students.
- The students will perform hands on training on Design of sprinkle irrigation system.
- The students will be equipped with the Design of trickle irrigation system.

CONTENTS

Unit-1

1.1. Computation of reference crop evapotranspiration (ETo)

Unit-II

2.1. Determination of Crop water requirement (etc).

Unit-III:

3.1. Determination of Irrigation requirements, leaching requirements and irrigation scheduling

Unit-IV:

4.1. Use of computer model (Crop water) for determination of crop water requirement and irrigation scheduling

Unit-V:

5.1. Design of sprinkle irrigation system, selection of sprinklers, and evaluation of sprinkler system

Unit-VI

6.1. Design of trickle irrigation system, selection of proper emitter and evaluation of drip irrigation system; design of low head pipeline

Unit-VII:

7.1. Visit to a sprinkler and trickle irrigation project site, Layout and design of sprinkler and drip irrigation systems, evaluation of the systems

Unit-VIII

8.1. Field demonstration of sprinkler and drip irrigation systems,
8.2. Use of software Wetup, IRRICAD etc.

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
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4. Micheal, A. M. (2003). *Irrigation Theory and Practices*. Vikas Publishing House (Pvt), New Delhi.
5. Keller, J. (2001). *Sprinkle and Trickle Irrigation*. Blackburn Press, New Jersey, USA.
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Bliesner, R. D. and Keller, J. (2001). *Sprinkle and Trickle Irrigation*. Van Nostrand Reinhold.