

Irrigation and Drainage Engineering Module				
Course Title	Drainage Engineering II			
Course Code	WRIE4144			
Program	B.Sc. in Water Resources and Irrigation Engineering			
Module Name	Irrigation and Drainage Engineering			
Module Coordinator	Name: Office location Mobile:; e-mail: Consultation Hours: _____			
Instructor Name	Name: Office location Mobile:; e-mail: Consultation Hours: _____			
Course Information	Academic Year Year: IV Semester : I Meeting Day: To be arranged at the beginning of the semester Meeting Time: To be arranged at the beginning of the semester Meeting Location: To be arranged at the beginning of the semester			
ECTS	5 ECTS			
Students' work load in hrs	Lecture	Tutorial	Lab	Home study
	2	2	0	4
Course objectives	At the end of the course students are able to know the different components of surface and sub-surface drainage systems, design surface and subsurface drainage systems for irrigated agriculture and water logged areas, special types of drains and urban drainage.			
Course Description	Surface Drainage Systems: Land forming; land grading and land shaping, Design criteria, drainage design equations, Hydraulic Design of surface drains and its related structure construction and maintenance of surface drains. Subsurface Drainage Systems: Types of subsurface drainage systems, Design of Depth of subsurface drainage systems, Design criteria, drainage design equations, Design of spacing of sub-surface drainage systems for steady state and unsteady state conditions; Diameter of pipe drains, slope of pipe drains, Design of envelopes, Construction and maintenance of subsurface drains, Economics of subsurface drains. special type of drains, urban drainage.			
Pre-requisite	Drainage Engineering I			
Course status	Compulsory			
Schedule/syllabus				
Week	Topics			Required Text

1	1. Surface drainage systems(Lec=5hrs, Tut=10hrs) 1.1 Land forming ,land grading and land shaping 1.2 Drainage design of surface drainage system 1.2.1 Design criteria 1.2.2 Drainage design equations 1.2.3 Hydraulic design of surface drains and its related structure construction 1.3 Maintenance of surface drains	Luthin , J.N., (1978). Drainage Engineering, John Wiley & Sons, 148 Literature York, USA.	
	2. Sub-surface drainage systems (Lec=5hrs, Tut=5hrs) 2.1 Types of sub surface drainage systems 2.2 Design of sub-surface drainage systems 2.2.1 Design criteria 2.2.2 Drainage design equations 2.2.3 Design of spacing sub-surface drainage systems for steady state and unsteady state conditions. 2.2.3.1 Diameters of pipe drains 2.2.3.2 Slope of pipe drains 2.2.3.3 Design of envelope 2.3 Construction and maintenance of sub surface drains 2.4 Economics of sub-surface drains		
	3. special type of drain 3.1 Mole drains 3.2 Bio drains 3.3 Relied wells 3.4 Pumped wells 3.5 Inverted/recharge wells		
	4. Urban Drainage		
Summary of Teaching and Learning Method		Lecture, tutorials, discussion, individual work, problem solving, project work	
Assignments		At the end of each session assignment will be given.	
Assessment		10% Quiz	All chapters
		20% Test	All chapters
		10% project work	Instructor selection
		50% Final-exam	All chapters
Course Expectation		Preparedness and participation: both students and the teacher should be prepared since education is an interactive process. Students should be active participants in the teaching-learning process. They should be interested to the course and come to class with the necessary materials such as exercise books and pen. In addition, they should to take responsibility in their education. Teachers are also expected be prepared and interested to the course, which they are offering. They have to consult the essential materials ahead of time and try share their knowledge in an efficient and effective manner. Material availability: reference materials are expected to be available in the library nearest to respective faculties.	

Policy	Attendance: students should attend at least 85% Assignments: all students must do all the assignments given Tests/quizzes: all students must sit/take all tests/quizzes given Cheating/plagiarism: cheating/plagiarism is strictly forbidden. It will result in disqualification of the course.
Reference	➤ Luthin , J.N., (1978). Drainage Engineering, John Wiley & Sons, 148 Literature York, USA. ➤ ILRI, (1994). Drainage Principles and Application, Wageningen the Netherlands, Publication no 16. ➤ USBR, (1978). Drainage Manual – US Dept. of the Interior, Bu of Reclamation, 1st Edition, Oxford and Publishing Co. Pvt. Lt New Delhi. ➤ U.S. D.A, (1954). ‘Diagnosis and Improvement of Saline and Al soils,’ Agriculture Hand Book no 60. ➤ WAPCOS/LBII, Handbook of Drainage of Irrigated Areas in Indi Technical Report no 5, New Delhi.