

Irrigation and Drainage Engineering Module					
Course Title		Drainage Engineering I			
Course Code		WRIE3143			
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: III Semester : II 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		3 ECTS			
Students' work load in hrs		Lecture	Tutorial	Lab	Home study
		1	2	0	2
Course objectives		The objective of the course is to aware students about the importance of drainage for Irrigated agriculture, to enable students to understand irrigation water quality, soil salinity, drainage for salinity control and land reclamation.			
Course Description		Introduction: Forms and nature of occurrence of water in soils, soil moisture characteristics, Flow of water in soils, Darcy's law and Richard's equation, soil water movement above water Table. Drainage and Crop production: The need for drainage, Drainage to control ponding, Drainage to control water logging Drainage to control salinization, Benefits of drainage. Drainage Systems: Components of a drainage system, Field Drainage systems: Surface drainage systems, subsurface drainage systems and compound drainage systems. Factors Related to Drainage: Drainage coefficient, Water Table, Depth to the water table, Dissolved Salts in the ground water, measuring ground water salinity, Hydraulic conductivity, Topography, impermeable layer irrigation water quality, Soil Salinity: Saline, alkaline and saline-alkali soils, salinization due to irrigation, Drainage for salinity control. Land Reclamation techniques for salt affected soils.			
Pre-requisite		Soil Physics			
Course status		Compulsory			
Schedule/syllabus					
Week	Topics			Required Text	

1	1. Introduction(Lec=2hrs, Tut=5hrs) 1.1 Forms and nature of occurrence of water in soils 1.2 Soil moisture characteristics 1.3 Flow of water in soils 1.4 Darcy's law and Richard's equation 1.5 Soil water movement above water table	Luthin , J.N., (1978). Drainage Engineering, John Wiley & Sons, 148 Literature York, USA.
	2. Drainage and crop production(Lec=5hrs, Tut=5hrs) 2.1 The need for drainage 2.2 Drainage to control pounding 2.3 Drainage to control water logging 2.4 Drainage to control salinization 2.5 Benefits of drainage	
	3. Drainage systems(Lec=3hrs, Tut=5hrs) 3.1 Surface drainage systems 3.2 Sub-surface drainage systems 3.3 Compound drainage systems	
2	4. Factors related to drainage (Lec=5hrs, Tut=10hrs) 4.1 Drainage coefficient 4.2 Water coefficient 4.3 Depth to the water table 4.4 Dissolved salt I n the ground water 4.5 Measuring ground water salinity 4.6 Hydraulic conductivity 4.7 Topography 4.8 Impermeable layer	Luthin , J.N., (1978). Drainage Engineering, John Wiley & Sons, 148 Literature York, USA.
	5. Irrigation water quality and Soil salinity(Lec=5hrs, Tut=5hrs) 5.1 Irrigation water quality 5.2 Saline, alkaline and saline-alkaline soils 5.3 Salinization due to irrigation 5.4 Drainage for salinity control 5.5 Land reclamation techniques for salt affected soils.	Luthin , J.N., (1978). Drainage Engineering, John Wiley & Sons, 148 Literature York, USA.
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
		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

Course Expectation	<p>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.</p> <p>Material availability: reference materials are expected to be available in the library nearest to respective faculties.</p>
Policy	<p>Attendance: students should attend at least 85%</p> <p>Assignments: all students must do all the assignments given Tests/quizzes: all students must site/take all tests/quizzes given Cheating/plagiarism: cheating/plagiarism is strictly forbidden. It will result in disqualification of the course.</p>
Reference	<ul style="list-style-type: none"> ➤ 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.