



Course Weekly Outline

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Course name	Drainage Engineering		
General course objective	<ol style="list-style-type: none"> 1. Clarify the basic concepts of drainage engineering systems and their applications in agricultural fields. 2. Gain the ability to address the problems of high groundwater levels. 3. Gain basic skills in managing drainage systems and gain experience in designing these systems under different surrounding conditions. 4. Gain experience in the difference between the old and modern drainage system and managing the drainage system optimally. 		
Course description /special objectives	<ol style="list-style-type: none"> 1. Ability to design drainage systems in different ways. 2. Ability to think about problems of rising groundwater levels. 3. Writing scientific reports and reading charts and tables. 		
References	كتاب هندسة البزل تأليف الدكتور عبد الستار يونس الدباغ		
External sources	Irrigation and Drainage Engineering by Peter Waller and Muluneh Yitayew		
Course assessment	Assignments, and quizzes	Mid-term exam	Final exam
	10	30	60
General notes			



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Week No.	Theoretical	Unit-Chapter	Aims
1	Definition of drainage, causes and benefits of drainage	Introduction to the Drainage Engineering	This course covers a wide range of different drainage methods, their optimal conditions and design methods with the aim of enriching the knowledge base of the civil engineer in the field of agricultural engineering in a way that enables him to solve potential engineering problems in this field effectively.
2	Drainage Project Investigations	Introduction to the Drainage Engineering	
3	Soil permeability, calculating the soil permeability coefficient	Introduction to the Drainage Engineering	
4	Type of drainage systems	Drainage systems	
5	The advantages and disadvantages of open drains	Drainage systems	
6	The advantages and disadvantages of covered drains	Drainage systems	
7	Continuity equation and Manning equation	Design of drain cross sections	
8	Problems in the open drains designing	Design of drain cross sections	
9	Designing covered drains, drains depth, and solving some problems	Design of drain cross sections	
10	Hooghoudt equation	Distance between the drains	
11	Hooghoudt equation for a layered	Distance between the drains	
12	Equivalent depth and the equation of non-steady state drainage	Distance between the drains	
13	The relationship between level, discharge, and the coefficient of hydraulic conductivity in the case of steady flow for confined and unconfined aquifer	Vertical drainage	
14	The relationship between the level, discharge of the well, and the coefficient of hydraulic conductivity in the case of unsteady flow	Vertical drainage	
15	Special case for pumping wells	Vertical drainage	