Academic Program Description Form for Colleges and Institutes

Academic Year: 2022-2023

University: University of Mosul

College/Institute: Engineering

Scientific Department: Dams and Water Resources Engineering

Academic Program Description

This academic program description provides a concise summary of the key features of the program and the expected learning outcomes that the student should achieve, demonstrating whether they have fully benefited from the available opportunities. It is accompanied by a description of each course within the program.

Educational Institution	University of Mosul
Scientific Department / Center	College of Engineering / Dams and Water Resources Engineering
Name of the Academic or Professional Program	Dams and Water Resources Engineering
Final Degree Awarded	Bachelor of Science
Study System	Courses / Semester-based
Accreditation Program	None
Other External Influences	Higher Authority Decisions
Date of Description Preparation	

Academic Program Objectives

- Enhance the student's ability and skills in technical communication such as presentation skills, report writing, and explanation as a team member or individually.
- Guide students through their studies to effectively collaborate with colleagues, ensuring a spirit of cooperation and teamwork.
- Develop an engineering personality in graduates capable of understanding and addressing engineering problems wisely and scientifically, preparing them for leadership roles in scientific and administrative fields while contributing to community development.
- Maintain communication channels with graduates through conferences, scientific seminars, periodic social events, and continuous education courses.
- Serve the community through faculty members with advanced degrees and the services of the college's consulting office.
- Develop faculty members through scholarships, study programs, academic leaves, and linking the department with equivalent departments in advanced international universities.
- Prepare graduates to serve the community effectively and efficiently.
- Continuously review curricula to improve them and reach a scientific level that aligns with scientific advancements and societal needs.
- Strengthen contemporary skills and sciences related to dams, water resources engineering, and modern engineering applications to ensure students' ability to develop and engage in lifelong learning.
- Develop engineering research education to achieve a distinguished level that meets quality requirements.
- Enhance scientific laboratories to support the educational and research process and provide professional experience in engineering applications.
- Establish a knowledge base grounded in dam and water resources engineering.
- Ensure students build knowledge on solid foundations of basic sciences such as mathematics, physics, and other engineering sciences related to dams and water resources engineering.

College of Engineering / Dams & Water Resources Dept. / First Year

Units	Prac	Appl.	Theo.	Subject	Course No.	Units	Prac	Appl.	Theo.	Subject	Course No.
				Second term						First term	
3	1	-	3	Mathematics II	DWR 109	3	1	-	3	Mathematics	DWR 101
3	-	2	2	Drawing by computer (Autocad)	DWR 110	3	-	2	2	Principles of Computers and programming	DWR 102
3	1	-	3	Engineering Mechanics II	DWR 111	3	1	-	3	Engineering Mechanics I	DWR 103
3	-	6	-	Engineering Drawing & Descriptive Geometry	DWR 112	3	-	6	-	Engineering Drawing	DWR 104
2	1	-	2	Engineering Statistics II	DWR 113	2	1	-	2	Engineering Statistics I	DWR 105
2	-	-	2	Human rights and general freedom	DWR 114	2	-	-	2	Engineering Geology	DWR 106
2	-	-	2	Water Resources Projects in Iraq	DWR 115	2	-	-	2	Introduction to water Resources Engineering	DWR 107
2	-	-	2	Arabic Language	DWR 116	2	-	2	1	Water quality and pollution	DWR 108
20	3	8	16	Total		20	3	10	15	Total	
	27			Total weakly hours			28			Total weakly hours	

College of Engineering / Dams & Water Resources Dept.   / Second Year

<table>
<tr><td colspan="11" align="center">المستوى الدراسي الثاني / الفصل الاول</td></tr>
<tr>
<td rowspan="2">الملاحظات</td>
<td rowspan="2">رمز المقرر</td>
<td rowspan="2">الممهد ان وجد</td>
<td rowspan="2">عدد الوحدات</td>
<td rowspan="2">عدد الساعات العملية</td>
<td rowspan="2">عدد الساعات النظرية</td>
<td colspan="2" align="center">اسم المقـــرر</td>
<td rowspan="2">نوع المتطلب (اجباري – اختياري)</td>
<td rowspan="2">اسم المتطلب</td>
</tr>
<tr>
<td>باللغة الإنكليزية</td>
<td>باللغة العربية</td>
</tr>
<tr>
<td></td><td>ENGC 227</td><td></td><td>2</td><td>---</td><td>2</td><td>Statistics</td><td>الإحصاء</td><td>اجباري</td><td>متطلبات الكلية</td>
</tr>
<tr>
<td></td><td>DWR 240</td><td>الرياضيات I</td><td>2</td><td>3</td><td>1</td><td>Calculus III</td><td>الرياضيات III</td><td>اجباري</td><td rowspan="9">متطلبات القسم</td>
</tr>
<tr>
<td></td><td>DWR 241</td><td></td><td>2</td><td>---</td><td>2</td><td>Fluid Mechanics I</td><td>ميكانيك الموائع I</td><td>اجباري</td>
</tr>
<tr>
<td></td><td>DWR 242</td><td></td><td>2</td><td>3</td><td>1</td><td>Engineering Surveying I</td><td>المساحة I</td><td>اجباري</td>
</tr>
<tr>
<td></td><td>DWR 243</td><td></td><td>2</td><td>2</td><td>1</td><td>Building Construction</td><td>انشاء المباني</td><td>اجباري</td>
</tr>
<tr>
<td></td><td>DWR 244</td><td>الميكانيك الهندسي (ساكن)</td><td>2</td><td>---</td><td>2</td><td>Strength of Materials I</td><td>مقاومة المواد I</td><td>اجباري</td>
</tr>
<tr>
<td></td><td>DWR 245</td><td></td><td>2</td><td>2</td><td>1</td><td>Soil Physics</td><td>فيزياء التربة</td><td>اجباري</td>
</tr>
<tr>
<td></td><td>DWR 246</td><td></td><td>2</td><td>2</td><td>1</td><td>Computer Programming (Matlab)</td><td>برمجة الحاسوب (ماتلاب)</td><td>اجباري</td>
</tr>
<tr>
<td rowspan="2">يختار الطالب مقرر واحد ، عدد الوحدات المطلوبة = 2 وحدة</td><td>DWR 290</td><td></td><td>2</td><td>---</td><td>2</td><td>Water Resource Projects in Iraq</td><td>مشاريع الموارد المائية في العراق</td><td>اختياري</td>
</tr>
<tr>
<td>DWR 291</td><td></td><td>2</td><td>2</td><td>1</td><td>Remote Sensing and GIS applications</td><td>تطبيقات الاستشعار عن بعد ونظم المعلومات الجغرافية</td><td>اختياري</td>
</tr>
<tr>
<td></td><td></td><td></td><td>18</td><td>14</td><td>14</td><td colspan="4" align="center">مجموع ساعات ووحدات الفصل الدراسي الأول</td>
</tr>
</table>

<table>
<tr><td colspan="11" align="center">المستوى الدراسي الثاني / الفصل الثاني</td></tr>
<tr>
<td rowspan="2">الملاحظات</td>
<td rowspan="2">رمز المقرر</td>
<td rowspan="2">الممهد ان وجد</td>
<td rowspan="2">عدد الوحدات</td>
<td rowspan="2">عدد الساعات العملية</td>
<td rowspan="2">عدد الساعات النظرية</td>
<td colspan="2" align="center">اسم المقـــرر</td>
<td rowspan="2">نوع المتطلب (اجباري – اختياري)</td>
<td rowspan="2">اسم المتطلب</td>
</tr>
<tr>
<td>باللغة الإنكليزية</td>
<td>باللغة العربية</td>
</tr>
<tr>
<td>وحدتين لكل مستوى دراسي وقد تم استيفاء ثلاثة وحدات في المستوى الاول لذلك ستكون وحدة واحدة لهذه السنة فقط</td><td></td><td></td><td>1</td><td>---</td><td>1</td><td>English Language - Pre Intermediate</td><td>اللغة الانكليزية - ما قبل المتوسط</td><td>اجباري</td><td rowspan="2">متطلبات الجامعة</td>
</tr>
<tr>
<td></td><td>UOMC 104</td><td></td><td>2</td><td>---</td><td>2</td><td>Professional Ethics</td><td>اخلاقيات المهنة</td><td>اجباري</td>
</tr>
<tr>
<td>اجبارية لطلبة القسم</td><td>ENGE 229</td><td></td><td>2</td><td>---</td><td>2</td><td>Public Safety</td><td>السلامة العامة</td><td>اختياري</td><td>متطلبات الكلية</td>
</tr>
<tr>
<td></td><td>DWR 247</td><td>الرياضيات III</td><td>2</td><td>3</td><td>1</td><td>Calculus IV</td><td>الرياضيات IV</td><td>اجباري</td><td rowspan="7">متطلبات القسم</td>
</tr>
<tr>
<td></td><td>DWR 248</td><td>ميكانيك الموائع I</td><td>3</td><td>3</td><td>2</td><td>Fluid Mechanics II</td><td>ميكانيك الموائع II</td><td>اجباري</td>
</tr>
<tr>
<td></td><td>DWR 249</td><td>المساحة I</td><td>2</td><td>3</td><td>1</td><td>Engineering Surveying II</td><td>المساحة II</td><td>اجباري</td>
</tr>
<tr>
<td></td><td>DWR 250</td><td>انشاء المباني</td><td>2</td><td>3</td><td>1</td><td>Construction Material Technology</td><td>تقنيات مواد الانشاء</td><td>اجباري</td>
</tr>
<tr>
<td></td><td>DWR 251</td><td>فيزياء التربة</td><td>2</td><td>2</td><td>1</td><td>Water Management and Land Reclamation</td><td>ادارة المياه واستصلاح الاراضي</td><td>اجباري</td>
</tr>
<tr>
<td></td><td>DWR 252</td><td>الجيولوجيا الهندسية</td><td>1</td><td>---</td><td>1</td><td>Hydrogeology</td><td>هيدروجيولوجي</td><td>اجباري</td>
</tr>
<tr>
<td></td><td>DWR 253</td><td>مقاومة المواد I</td><td>2</td><td>---</td><td>2</td><td>Strength of Materials II</td><td>مقاومة المواد II</td><td>اجباري</td>
</tr>
<tr>
<td></td><td></td><td></td><td>19</td><td>14</td><td>14</td><td colspan="4" align="center">مجموع ساعات ووحدات الفصل الدراسي الثاني</td>
</tr>
</table>

College of Engineering / Dams & Water Resources Dept. / Third Year

المستوى الدراسي الثالث (الفصل الاول)

الملاحظات	رمز المقرر	المتمهد ان وجد	عدد الوحدات	عدد الساعات العملية	عدد الساعات النظرية	اسم المقـرر باللغة الإنكليزية	اسم المقـرر باللغة العربية	نوع المتطلب (اجباري – اختياري)	اسم المتطلب
	DWR 340	Calculus IV	2	1	2	Engineering Analysis	تحليلات هندسة	اجباري	متطلبات القسم
	DWR 341	Fluid Mechanics II	2	-	2	Hydraulics	هيدروليك	اجباري	
	DWR 342	-	2	-	2	Surface Hydrology	هيدرولوجيا المياه السطحية	اجباري	
	DWR 343	Water Management and Land Reclamation	2	-	2	Irrigation Principles and Practices	اسس الري وعملياته	اجباري	
	DWR 344	Strength of Materials II	2	1	2	Theory of Structures I	نظرية المنشآت I	اجباري	
	DWR 345	Strength of Materials II and Construction Material Technology	2	-	2	Concrete Design	تصاميم الخرسانة	اجباري	
	DWR 346	Water Management and Land Reclamation	2	2	1	Soil Mechanics I	ميكانيك التربة I	اجباري	
	DWR 347	-	2	2	1	Computer Applications in Water Resources I	تطبيقات الحاسوب في الموارد المائية I	اجباري	
يختار الطالب مقرر واحد عند الوحدات المطلوبة = 2 وحدة	DWR 391	-	2		2	River Mechanics	ميكانيك الانهر	اختياري	
	DWR 394	-	2	-	2	Statistical Methods in Hydrology	الطرق الإحصائية في الهيدرولوجيا	اختياري	
			18	6	16	مجموع ساعات ووحدات الفصل الدراسي الأول			

المستوى الدراسي الثالث (الفصل الثاني)

الملاحظات	رمز المقرر	المتمهد ان وجد	عدد الوحدات	عدد الساعات العملية	عدد الساعات النظرية	اسم المقـرر باللغة الإنكليزية	اسم المقـرر باللغة العربية	نوع المتطلب (اجباري – اختياري)	اسم المتطلب
	-	-	2	---	2	English Language - Intermediate	اللغة الإنكليزية - المتوسط	اجباري	متطلبات الجامعة
اجباري لطلبة القسم	ENGE320	Calculus I and Calculus II	2	---	2	Numerical Analysis	التحليلات العددية	اختياري	متطلبات الكلية
	DWR 348	Hydraulics	2	---	2	Open Channels and Hydraulic Machines	القنوات المفتوحة والآلات الهيدروليكية	اجباري	متطلبات القسم
	DWR 349	Surface Hydrology	2	---	2	Groundwater Hydrology	هيدرولوجيا المياه الجوفية	اجباري	
	DWR 350	-	2	---	2	Drainage Engineering	هندسة البزل	اجباري	
	DWR 351	Soil Mechanics I	2	2	1	Soil Mechanics II	ميكانيك التربة II	اجباري	
	DWR 352	Irrigation Principles and Practices	2	---	2	Consumptive Use and Water Duty	الاستهلاك والمقننات المائية	اجباري	
يختار الطالب مقرر واحد عند الوحدات المطلوبة = 2 وحدة	DWR 392	-	2	---	2	Theory of Structures II	نظرية المنشآت II	اختياري	
	DWR 393	Concrete Design	2	---	2	Reinforced Concrete Design	تصميم الخرسانة المسلحة	اختياري	
يختار الطالب مقرر واحد عند الوحدات المطلوبة = 2 وحدة	DWR 395	-	2	---	2	Field Flow Measurements and Analysis	قياسات الجريان الحقلي وتحليلاته	اختياري	
	DWR 396	-	2	---	2	Computer Applications in Water Resources II	تطبيقات الحاسوب في الموارد المائية II	اختياري	
			18	2	17	مجموع ساعات ووحدات الفصل الدراسي الثاني			

ملاحظة: التدريب الصيفي (Summer Training) من متطلبات التخرج المطلوبة بعد اكمال الطالب المستوى الثالث للفترة من 1 تموز إلى 31 تموز أو من 1 آب إلى 31 آب.

College of Engineering / Dams & Water Resources Dept.   / Fourth Year

الملاحظات	رمز المقرر	الممهد ان وجد	عدد الوحدات	عدد الساعات العملية	عدد الساعات النظرية	اسم المقـــرر باللغة الانكليزية	اسم المقـــرر باللغة العربية	نوع المتطلب (اجباري – اختياري)	اسم المتطلب
							المستوى الدراسي الرابع (الفصل الاول)		
	-	-	2	---	2	English language – Upper Intermediate	اللغة الانكليزية – ما بعد المتوسط	اجباري	متطلبات الجامعة
	ENGC 425	-	2	---	2	Engineering Management	إدارة هندسة	اجباري	متطلبات الكلية
	DWR 440	Open Channel and Hydraulic Machines	3	2	2	Design of Hydraulic Structures I	تصميم المنشآت الهيدروليكية I	اجباري	
	DWR 441	Irrigation Principles and Practices	3	2	2	Design and Gravity Irrigation Systems	تصميم منظومات الري السيحي	اجباري	
	DWR 442	Irrigation Principles and Practices and Drainage Engineering	2	---	2	Design of Irrigation and Drainage Networks	تصميم شبكات الري والبزل	اجباري	
	DWR 443	Surface Hydrology	2	---	2	Design of Gravity and Arch Dams	تصميم السدود الجاذبية والقوسية	اجباري	متطلبات القسم
	DWR 444	Soil Mechanics II	2	---	2	Foundation Engineering	هندسة الاسس	اجباري	
	DWR 445	جميع متطلبات القسم الاجبارية للمستوى الثالث	2	---	2	Graduation Project I	مشروع التخرج I	اجباري	
يختار الطالب مقرر واحد. عدد الوحدات المطلوبة = 2 وحدة	DWR 490	-	2	---	2	Linear Algebra	الجبر الخطي	اختياري	
	DWR 491	-	2	---	2	Operation Research	بحوث العمليات	اختياري	
			20	4	18		مجموع ساعات ووحدات الفصل الدراسي الأول		

الملاحظات	رمز المقرر	الممهد ان وجد	عدد الوحدات	عدد الساعات العملية	عدد الساعات النظرية	اسم المقـــرر باللغة الإنكليزية	اسم المقـــرر باللغة العربية	نوع المتطلب (اجباري – اختياري)	اسم المتطلب
							المستوى الدراسي الرابع (الفصل الثاني)		
	ENGC426		2	---	2	Engineering Economic	الاقتصاد الهندسي	اجباري	متطلبات الكلية
	DWR 446	Design of Hydraulic Structures I	3	2	2	Design of Hydraulic Structures II	تصميم المنشآت الهيدروليكية II	اجباري	
	DWR 447	Design and Gravity Irrigation Systems	3	2	2	Design of Sprinkler and Drip Irrigation System	تصميم منظومات الري بالرش والتنقيط	اجباري	
	DWR 448		2	2	1	Estimations and Specifications	التخمين والمواصفات	اجباري	
	DWR 449	Design of Gravity and Arch Dams	2	---	2	Earth and Earth Rock Fill Dams	السدود الترابية والإملائية	اجباري	
	DWR 450	Foundation Engineering	2	---	2	Foundation Engineering of Hydraulic Structures	هندسة الاسس للمنشآت الهيدروليكية	اجباري	متطلبات القسم
	DWR 451		2	---	2	Sediment Transport	انتقال الرسوبيات	اجباري	
	DWR 452	مشروع التخرج I	2	---	2	Graduation Project II	مشروع التخرج II	اجباري	
يختار الطالب مقرر واحد. عدد الوحدات المطلوبة = 2 وحدة	DWR 492		2	---	2	Finite Elements	العناصر المحددة	اختياري	
	DWR 493		2	---	2	Water Supply Engineering	هندسة تجهيز المياه	اختياري	
			20	6	17		مجموع ساعات ووحدات الفصل الدراسي الثاني		

Program Skills Outline										
First Semester				Required program Learning outcomes						
Year/Level	Course Code	Course Name	Basic or optional	Knowledge			Skills			Ethics	
				i	ii	vi	iii	iv	vii	v	vii
2	ENGC 227	Statistics	Basic	*							
	DWR 240	Calculus III	Basic	*	*						
	DWR 241	Fluid Mechanics I	Basic	*	*						
	DWR 242	Engineering Surveying I	Basic	*	*				*		
	DWR 243	Building Construction	Basic	*	*						
	DWR 244	Strength of Materials I	Basic	*	*			*			
	DWR 245	Soil Physics	Basic	*			*			*	
	DWR 246	Computer Programming (Matlab)	Basic	*	*			*			
	DWR 290	Water Resource Projects in Iraq	Basic	*	*						
	DWR 291	Remote Sensing and GIS applications	Basic		*				*		

Program Skills Outline											
Second Semester				Required program Learning outcomes							
Year/Level	Course Code	Course Name	Basic or optional	Knowledge			Skills			Ethics	
				i	ii	vi	iii	iv	vii	v	vii
2		English Language - Pre Intermediate	Basic					*		*	
	UOMC 104	Professional Ethics	Basic			*				*	
	ENGE 229	Public Safety	Basic			*				*	
	DWR 247	Calculus IV	Basic	*	*						
	DWR 248	Fluid Mechanics II	Basic	*	*						
	DWR 249	Engineering Surveying II	Basic	*			*				
	DWR 250	Construction Material Technology	Basic	*	*						
	DWR 251	Water Management and Land Reclamation	Basic	*			*			*	
	DWR 252	Hydrogeology	Basic	*			*		*	*	*
	DWR 253	Strength of Materials II	Basic	*	*						

Program Skills Outline										
				Required program Learning outcomes						
Year/Level	Course Code	Course Name	Basic or optional	Knowledge			Skills			Ethics	
				i	ii	vi	iii	iv	vii	v	vii
3	DWR 340	Engineering Analysis	Basic	*	*						
	DWR 341	Hydraulics	Basic	*	*			*			
	DWR 342	Surface Hydrology	Basic	*	*					*	
	DWR 343	Irrigation Principles and Practices	Basic	*	*				*		
	DWR 344	Theory of Structures I	Basic	*			*				
	DWR 345	Concrete Design	Basic	*	*						
	DWR 346	Soil Mechanics I	Basic	*	*						
	DWR 347	Computer Applications in Water Resources I	Basic	*	*						
	DWR 391	River Mechanics	optional	*	*						*
	DWR 394	Statistical Methods in Hydrology	optional	*	*						

Program Skills Outline										
				Required program Learning outcomes						
Year/ Level	Course Code	Course Name	Basic or optional	Knowledge			Skills			Ethics	
				i	ii	vi	iii	iv	vii	v	vii
3	-	English Language - Intermediate	Basic					*			
	ENGE320	Numerical Analysis	Basic	*	*		*				
	DWR 348	Open Channels and Hydraulic Machines	Basic	*	*	*	*				
	DWR 349	Groundwater Hydrology	Basic	*	*						
	DWR 350	Drainage Engineering	Basic	*	*			*	*		*
	DWR 351	Soil Mechanics II	Basic	*	*				*		*
	DWR 352	Consumptive Use and Water Duty	Basic	*			*				
	DWR 392	Theory of Structures II	optional	*			*				
	DWR 393	Reinforced Concrete Design	optional	*	*						
	DWR 395	Field Flow Measurements and Analysis	optional	*	*						
	DWR 396	Computer Applications in Water Resources II	optional	*	*						

Program Skills Outline										
				Required program Learning outcomes						
Year/ Level	Course Code	Course Name	Basic or optional	Knowledge			Skills			Ethics	
				i	ii	vi	iii	iv	vii	v	vii
4	-	English language – Upper Intermediate	Basic						*		
	ENGC 425	Engineering Management	Basic	*	*					*	
	DWR 440	Design of Hydraulic Structures I	Basic	*	*		*				
	DWR 441	Design and Gravity Irrigation Systems	Basic	*	*			*			
	DWR 442	Design of Irrigation and Drainage Networks	Basic	*	*						
	DWR 443	Design of Gravity and Arch Dams	Basic	*	*			*			
	DWR 444	Foundation Engineering	Basic	*	*						
	DWR 445	Graduation Project I	Basic	*	*		*	*		*	*
	DWR 490	Linear Algebra	optional	*	*				*		
	DWR 491	Operation Research	optional	*	*				*		

Program Skills Outline											
				Required program Learning outcomes							
Year/ Level	Course Code	Course Name	Basic or optional	Knowledge			Skills			Ethics	
				i	ii	vi	iii	iv	vii	v	vii
4	ENGC426	Engineering Economic	Basic	*	*		*				
	DWR 446	Design of Hydraulic Structures II	Basic	*	*		*		*		*
	DWR 447	Design of Sprinkler and Drip Irrigation System	Basic	*	*	*					
	DWR 448	Estimations and Specifications	Basic	*	*						
	DWR 449	Earth and Earth Rock Fill Dams	Basic	*	*		*				
	DWR 450	Foundation Engineering of Hydraulic Structures	Basic	*	*						
	DWR 451	Sediment Transport	Basic	*	*						
	DWR 452	Graduation Project II	Basic	*	*		*	*	*	*	*
	DWR 492	Finite Elements	optional	*	*						
	DWR 493	Water Supply Engineering	optional	*	*						

DWE 101 : Mathematics (3,-,1)

An Overview of the derivatives

- Integration
- The indefinite integral
- Integration by substitution
- The definite integral
- Evaluating definite integrals by substitution

Applications of the definite integral

- Area between two curves
- Volumes by slicing ; disks and washers
- Volumes by cylindrical shells
- Length of a plane curve
- Area of a surface of revolution

Transdental Functions

- Inverse Functions
- Exponential and logarithmic functions
- Derivatives and integrals involving logarithmic and exponential functions
- Graphs and applications involving logarithmic and exponential functions
- Derivatives and integral of inverse trigonometric functions
- Hyperbolic functions
- Hopital's Rule.

An overview of integration methods

- Integration by parts
- Trigonometric integral
- Trigonometric substitutions
- Integrating rational functions by partial fractions
- Numerical integration ; Simpson's rule
- Improper integrals

DWE 102 : Fundamentals for Computer and programming (2,2,-)

- General introduction about computers and their types
- Window system
- Microsoft office (word, power point)
- Internet and E-mail
- AUTOCAD

DWE 103 : Human rights and general Freedom (1,-,1)

Human rights; its evolution, different schools of thoughts about it, personal and public freedoms, national and international organizations to assure its implementation. Human rights between theories and practice.

DWE 104 : Engineering Mechanics (3,-,1)

This course is designed for first year dam and water resource engineering students. It aims to give students a comprehensive idea of the appreciation of developing thinking in the search for the best and easiest way to solve problems. Gaining a skill in knowing the form of the forces affecting structures in practice, the shapes and types of engineering structures and how to analyze them, and then learning in the next stages of their results. Analysis in the design of these engineering structures.

DWE 105 : Engineering Drawing (-,6,-)

Engineering Drawing, Graphic Instruments and their use, Graphic Geometry, Lettering, orthographic Drawing, Pictorial Drawing , Sectional Views. Descriptive Geometry, Theory of Projection,

Projection of a point & Straight Line, The Plane surface, Projection of Bodies, Sections of Bodies.

DWE 106 : Engineering Statistics (2,-,1)

- Introduction: the importance of statistics in water resources Engineering.
- Viewing the data: the table method, the drawing method.
- Measures of central tendency, the arithmetic mean, median, and mode.
- Measures of the mean, dispersion, and range.
- The average deviation, variance, coefficient of variation.
- Principles of probability theory, conditional probability, the probability of the independent tree, probabilities , Baye,s theory .
- Statistical tests , Z- test , Chi square test , and F-test .
- Regression and correlation , the drawing method, the least squares method , all kinds of correlation , the linear correlation.
- The probability distribution: normal distribution, poisson distribution,
- Hypothesis testing approach,
- Time series approach.

DWE **107 : Engineering Geology (1,-,2 S1)**

Internal structure of the Earth, Minerals, Igneous Rocks, Metamorphic Rocks, Structural Geology, Weathering and soil, Denudation and deposition, Geology of Dams and Tunnels, Rock Mechanics, Topographic and Geological Maps, Surface water and Ground water Tunnels and dams Geology.

DWE **108 : Introduction to water Resources Engineering (2,-,-)**

Definition of Irrigation, the importance of water for the life and development of the humankind, Drainage and reclamation and the relation to water resource of irrigation water . Water resources, Resource of irrigation water in Iraq. Method of irrigation, Irrigation structures. Basic relation between soil-water, plant. Irrigation and civilization. Global water resources , the reality and future horizons. Irrigation, conservation, and water control projects in Iraq. Drainage. Hydraulics of water flow in pipes, Rainfall and surface runoff. Flow measurements.

DWE **109 : Water quality and pollution (1,2,- S2)**

Introduction to Environment and Environmental Pollution. Quantitative and Qualitative distribution of water in the world. Hydrological Cycle of water from quantity sides. Properties of water sources. How water sources polluted. Effect of engineering project on water quality and self purification, some of Units of sewage treatment plants in villages. Lab. Electrical Conductivity, Chlorides determination in water.

- Effect of rate constant (K) on bod.
- Effect in put rate on output rate in the take
  in put out = output + KVC

- The study of deficit of oxygen in the water.
- The study of reaecartion and deoxygention in the water.
- Effect of waste water on the river (mixed water) on (kd, QR,UR,TR,BOD,DO mix).
- Effect of quality of the phosphorous on the pollution of the water.
- Source of natrition of organism of the water.
- Study the type of pollution on the river.
- Chemical composition of the water.

هسـمم **110 :** Arabic Language

- همزة الوصل .
- همزة القطع .
- انواع الخبر .
- المبتدأ.
- العدد .

Professional ethics
UOMC104

Academic Year	:	2022-2023
Credit hours	:	4
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (**6ijhyf5**)
Instructor	:	assistant Lec. : Noor adrees khattab
		assistant Lec. : Omar kanan
Instructor E-mail	:	n.kattab@uomosul.edu.iq
		omar.alsultan@uomosul.edu.iq

Catalog Description:

The engineering profession is one of the professions that most needs to frame its practice in an ethical framework due to its direct impact Engineering events and activities in the life, safety and well-being of human society, as well as their impact on the environment and pillars of sustainable development, and this effect is exacerbated by the acceleration of technical developments and the large amount of innovations and explorations flowing every day; Which necessitates that engineers realize their responsibilities and the size and seriousness of this standards The noble values of dealing are entrenched among all parties to the engineering work.

Text Books:

Code of ethics for practicing the engineering profession, an Iraqi building code issued by the Ministry of Construction, Housing, Municipalities and Public Works and the Ministry of Planning, the Central Agency for Standardization and Quality Control (a basic methodological book for professional ethics).
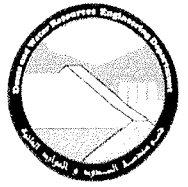
Graduate outcomes (GOs) addressed by the course:

i	ii	iii	iv	v	vi	Vii
		✓		✓	✓	

Course Outcomes (CLOs)

The course teaches students a lot of useful things about the concept of professional ethics and its role in the human development and life system

General, after completing this course, students are supposed to be familiar with the following points:

1- 1. Defining professional ethics. (iii).
2- The importance of engineering professional ethics . (Vi)
3- Obligations to the profession ,coworkers and the environment(v).
4- Knowledge individual property right between the engineer and co workers. (v).

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Introduction and the concept of professional ethics	8	2
Definition of ethical concepts	8	2
Professions and ethical principles	8	2
First Term Exam	4	1
Engineering profession	12	3
Global dimensions of the engineering profession and principles	8	2
The self obligation of the engineer towards employers society and co works	8	2
second Term Exam	4	1
Total	**60**	**15**

Grading Policy:

reports	5pts
Term Exam	35pts
Final Exam	60pts
Total	100pts

Public Safety
ENGE 229

Academic Year	:	2022-2023
Credit hours	:	4
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (zeqggw2)
Instructor	:	assistant Lec. : gada younis abdulla
		assistant Lec. : arwa abd alrazzaq jamal
Instructor E-mail	:	g.alobaidy@uomosul.edu.iq
		Arwa.abdalrazzaq@uomosul.edu.iq

Catalog Description:

Public safety in the implementation of construction projects aims to achieve safety for project executors, supervisors and those concerned with the implementation of those projects by introducing them to the procedures that must be taken to prevent accidents that may be exposed to people or property. As Public safety aims to teach the engineer its concept and role in the system of human development, public life, public safety and its relationship Public health and occupational safety, the objectives of public safety, laws and legislation, as well as learning about the results of work in public safety.

Text Books:

Code of public safety in the implementation of construction projects (an Iraqi building code) issued by the Ministry of Construction, Housing and Municipalities And public works with the Ministry of Planning / first edition 1025 (a basic methodological book for public safety).

Graduate outcomes (GOs) addressed by the course:

i	ii	iii	iv	v	vi	Vii
				✓	✓	

Course Outcomes (CLOs)

The public safety course teaches students a lot of useful things about the concept of public safety and its role in the human development and life system
General, after completing this course, students are supposed to be familiar with the following points:
1. The importance of public safety.(v)
2. The goal of public safety.(v)

3. Learn about work environment protection procedures and their surrouvdings.(vi)
4. Defining public administration and its five functions.(iii)
5. the ability to realize ethical and professional responsibilities in engineering issues and to issue sound judgments that take into account the consequences in the environment , economic , social and how to find and evaluate it . (vii)

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
General Requirements and Technical Code Notations	8	2
Measures to protect the work environment and its vicinity	8	2
Measures to protect the materials involved in the work	8	2
First Term Exam	4	1
Protection measures related to the types of construction works	12	3
Protection measures related to several work requirements	8	2
Personal protection measures during work	8	2
second Term Exam	4	1
Total	**60**	**15**

Grading Policy:

reports	5pts
Term Exam	35pts
Final Exam	60pts
Total	100pts

Mosul University
College of Engineering
Dams and water resources Eng.

Calculus IV
DWR 247

Academic Year	:	2022-2023
Credit Hour	:	4
Course Type	:	Required (R)
E-Class (Code)	:	Google Classroom (rikccu3)
Instructor	:	Dr. Muhanad Talal Yousif
Instructor E-mail	:	mohanad_alsheer@uomosul.edu.iq
Pre-requisites	:	Calculus III (DWR 240)

Catalog Description:

The course objects demonstrate sequence in mathematics IV primarily for students intending to major in a field of dams and water resources engineering.

Topics included in this course divided into:

- ❖ Partial Differentiation
- ❖ Second – Order Partial Differentiation
- ❖ The chain rule for partial derivatives
- ❖ Tangent plane and normal line
- ❖ Maxima and Minima of function of two independed variables
- ❖ The methods of least squares
- ❖ Methods of Lagrange multipliers
- ❖ Double Integrals
- ❖ Complex numbers and Functions
- ❖ Infinite Sequences and Series

References:

1. "Calculus". Ross L Finney and George B. Thomas. Copyright by Addison Wesley Publishing Company, 1990.
2. "THOMAS CALCULUS" George B. Thomas. Printed in the United States of America., 2014.

Graduate outcomes (GOs) addressed by the course:

i	ii	iii	iv	v	vi	vii
✓	✓					

Course Outcomes (CLOs):

Students who study principles of mathematics IV will be able to

1- Understanding of the fundamental concepts of Partial Differentiation (i)

2- Used Tangent plane and normal line to find the equation of a plane (i) (ii).

3- Understanding the maxima and minima of functions of several independent variables (i)

4- Apply the principle of double integrals to find the area under the curves (i) (ii).

5- Understanding of the fundamental concepts Infinite Sequences and Series approach (i)

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Partial Differentiation	4	1
Second – Order Partial Differentiation	4	2
The chain rule for partial derivatives	4	3
The directional derivative	4	4
The gradient of the surface	4	5
Tangent plane and normal line	4	6
Maxima and Minima of function of two independed variables	4	7
The methods of least squares	4	8
Methods of Lagrange multipliers	4	9
Double Integrals	4	10
Physical Application of double integrals	4	11
Complex numbers and Functions	4	12
Infinite Sequences	4	13
Infinite Series	4	14
Test for convergence of series with non-negative terms	4	15

Grading Policy:

No. of Quizzes 3 (each quiz 2 mark)	6 pt	Attendance is compulsory and absenteeism
No. of Home works 4 (each H.W 1 mark)	4 pt	of more than 30% of classes will cause
Semi-final Exam	30 pt	grade "NA".

Final Exam	60 pt
Total	100 pt

Last updated : March 2023

Fluid Mechanics 1
DWR 241

Academic Year	:	2022-2023 Semester
Credit Hour	:	(2-0)2
Course type	:	Required (R)
Course web page	:	https://classroom.google.com
		Class code: rt54ewtyt
Instructor	:	Ahmed Y. Mohammed
Instructor E-mail	:	a.altaee@uomosul.edu.iq
Pre-requisites	:	Non

Catalog Description:

The fluid mechanics is the basic subject for second-stage students in the dams and water resources engineering department that from this subject student will learn and practice to fluid properties (units and dimensions, Density, Specific weight. Viscosity, Surface tension, Capillarity. Fluid static (pressure–density–height relationships). Absolute pressure and gage pressure, types of pressure gages. Force on submerged plane surfaces. Force on submerged curved surfaces. Applied problem about gates, dams ………etc. Stability of submerged and floating bodies. This achieved by theoretical lecturers.

Text Books:
o   Elementary fluid mechanics
By: Vinnard 6th ed. 1981

Graduate outcomes (GOs) addressed by the course:

i	ii	iii	iv	v	vi	vii
✓	✓					

Course Outcomes (CLOs)

On successful completion of this course students will be able to:
- learn and practice to fluid properties. i
- learn the fundamental of pressure, (atmosphere, absolute and gauge) pressure. i
- Determine pressure in static fluid on vertical inclined and curved gates. ii
- Determine stability of floating bodies and center of pressure. ii

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Introduction	2	1
Fluid properties – Units and Dimensions, Density, Specific weight,	2	1
Compressibility, Elasticity. Viscosity, Surface tension, Capillarity	2	1
Fluid static (pressure–density–height relationships).	2	1
first quiz	2	1
Absolute pressure and gage pressure,. types of pressure gages	2	1
Second Quiz	2	1
Force on submerged plane surfaces.	2	1
Force on submerged Inclined surfaces.	2	1
Force on submerged Curved surfaces.	2	1
Applied problem about gates, dams ....etc.	2	1
Applied problem about gates, dams ....etc.	2	1
Stability of submerged and floating bodies.	2	1
1st Term Examination	2	1
Total	**30**	**15**

Grading Policy:

1 quiz	5 pts
1 homework	5 pts
First monthly Exam	15 pts
Second monthly Exam	15pts
Final Exam	60pts
Total	100pts

Mosul University
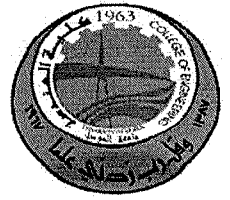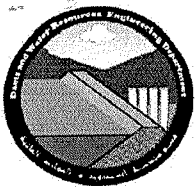
Dams and Water Resources Engineering Department

Surveying II
DWR 249

Academic Year	:	2022-2023
Credit hours	:	4
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (u7suise)
Instructor	:	Dr. Omar M. A. Mahmood Agha
Co-Instructor	:	Alaa I. Naser
Instructor E-mail	:	O. agha@uomosul.edu.iq
Pre-requisites	:	Surveying I (DWR 242)

Catalog Description:

Surveying II : it includes a set of topics: Earthworks and Calculation of reservoir volumes from contour maps, bearing of lines, Designation of Bearing, Theodolite, construction and adjustment of the theodolite, measurement of angles, Traverse surveys and their adjustment, and Tachometer, Total Station.

Text Books:

Surveying (A.Bannister & S.Raymond)
Surveying by (S.K.Hussin and M.SNagaraj)
المساحة الهندسية - تأليف الدكتور ناجي توفيق

Graduate outcomes (GOs) addressed by the course:

i	ii	iii	iv	v	vi	vii
✓		✓				

Course Outcomes (CLOs)

On successful completion of this course students will be able to:

- 1- To understand different types of survey (i).
- 2-To calculate areas using different methods(i)
- 3-To calculate volumes using different methods(i)
- 4- To determine and choose the appropriate method for calculating earthwork volumes (iii)
- 5- To use plane surveying instruments such as: Theodolite, Tachometry and Total station (iii)

- 6- To choose appropriate equipment for specific survey measurements (iii).

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Introduction, Irregular figures, Give and take lines, Counting squares, Trapezoidal Rule, Simpson Rule (for odd number)	4	1
Volumes Earthwork calculation, Computation of volumes, mean areas, end areas, Prismoidal formula	12	3
Simpson's Rule for Volumes, Volumes from spot levels, Volume from contour lines	8	2
Bearing, Designation of Bearings, whole circle system, Quadrantal system, Deflection angle,	12	3
The theodolite and traverse surveying, Traverse computations, Closing error, Distribution of the angular error.	12	3
Tachometry, Optical principles	8	2
Total station	8	1
Total	**60**	**15**

Grading Policy:

2quizzes	7.5pts
2 homework	7.5pts
Term Exam	15pts
Workable test	20pts
Final Exam	50pts
Total	100pts
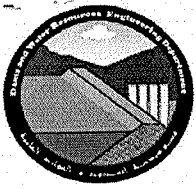
Mosul University

Dams and Water Resources Engineering Department

Instructor   : Dr. Omar Muqdad Abdugany   Co-Instructor : Alaa A. Naser

Email ID   :

Last updated   :26-2-2023

University
of Mosul

Dams and Water Resources Engineering Department

Construction Materials Technology
DWR 250

Academic Year	:	2022-2023
Credit hours	:	1
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (nsvygpp)
Instructor	:	Samer Sami Majeed
Instructor E-mail	:	s.gasgous@uomosul.edu.iq
Pre-requisites	:	Building construction

Catalog Description:

Brick and block works, Properties of fresh concrete, Stone works, Brick tests, Formwork and scaffolding, Test compressive strength of concrete, lintels, beams and columns, Block test, Floors and ceilings, Tiles tests, Steel reinforcement bars tests, Moisture blocker works.

Reference Book:

o   Construction of buildings, by Zuhair Saku and Artin Levon.
o   Test of materials, by Yousif Al Duaf.
o   Concrete mixtures, written by Dr. Ibrahim Ali Al Darwish, Dr. Abdul Wahab Awad.
o   Concrete Mix Design
o   Appendix issued by the Laboratory of testing of construction materials including details and vocabulary for the testing of construction materials.
o   ACI code.

Graduate outcomes (GOs) addressed by the course:

i)   An ability to distinguish, identify, define, formulate, and solve engineering problems by applying principles of engineering, science and mathematics.
ii)   An ability to produce engineering designs that meet desired needs within certain constraints by applying both analysis and synthesis in the design process.

i	ii	iii	iv	v	vi	vii
✓	✓					

University of Mosul

Dams and Water Resources Engineering Department

Course Outcomes (CLOs)

In DWRE 250, initially students will learn Standard specifications for construction materials and the importance of using good materials in construction of buildings and Methods of conducting laboratory tests on construction materials.

1- Brick and block works. (i)
2- Stone works. (i)
3- Formworks and scaffolding. (i)
4- Lintels, beams and columns. (ii)
5- Floors and ceilings. (ii)
6- Moisture blocker works. (ii)

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Introduction; syllabus; Brick and block works.	2	1 and 2
Brick and block works, Brick test.	2	3 and 4
Exam I		
Introduction, Stone works.	1	5
Stone works, Properties of fresh concrete.	2	6 and 7
Exam II		
Formworks and scaffolding.	2	8 and 9
Midterm Exam	1	10
Lintels, beams and columns, Block test, Tiles tests	3	11, 12 and 13
Floors and ceilings, Moisture blocker works, Steel reinforcement bars tests.	2	14 and 15
Total	**15**	**15**

Grading Policy:

Three Exams, (each 10pt)	30pt	Attendance is compulsory and absenteeism of more than 30% of classes will cause grade "NA".
Midterm Exam	20pt	
Final Exam	50pt	
Total	100pt	

Exam Policy

- o   All exams will be Closed-Book, Closed-Notes. Bring a calculator, pencil, and eraser for the exams.
- o   No phones or electronic devices are allowed to use during the exams. Phones and electronic devices must be switched off and put away during the final exam.

Last updated   : Feb 2023

Hydrogeology
DWR 252

Academic Year	:	2022-2023
Credit Hour	:	1
Course Type	:	Required (R)
E-Class (Code)	:	Google Classroom (5d2wgtk)
Instructor	:	Dr. Muhanad Talal Yousif
Instructor E-mail	:	mohanad_alsheer@uomosul.edu.iq
Pre-requisites	:	Fundamentals of engineering geology

Catalog Description:

The hydrogeology and the significance of groundwater in the terrestrial aquatic environment. Water is a precious natural resource, without which there would be no life on Earth.

Topics included in this course divided into:

* Introduction to hydrogeology
* Hydrologic budget
* Rock properties affecting groundwater
* Types of Aquifers
* Geologic formations as aquifers
* Porosity of rocks or soils in aquifers
* Groundwater Movement
* Permeability and Hydraulic Conductivity

References:

1- "Basic Ground-Water Hydrology". RALPH C. HEATH. Prepared in cooperation with the North Carolina Department of Natural Resources and Community Development. Tenth printing, 2004.

2- "Ground Water". R. Allan Freeze and John A. Cherry. Printed in the United States of America. 1979 by Prentice-Hall. Inc., Englewood Cliffs, N.J.

3- "Groundwater Hydrology". K.R. Rushton. 2003 John Wiley & Sons Ltd, the Atrium, Southern Gate, Chichester.

4- "The Handbook of Groundwater Engineering". John H. Cushman, Daniel M. Tartakovsky. Published online on: 07 Nov 2016.

5- "STUDY GUIDE FOR A BEGINNIN-G COURSE IN GROUND-WATER HYDROLOGY" PART 1. by O. Lehn Franke, Thomas E. Reilly, Ralph J. Haefner, and Dale L. Simmons. U.S. GEOLOGICAL SURVEY. Reston, Virginia 1990.
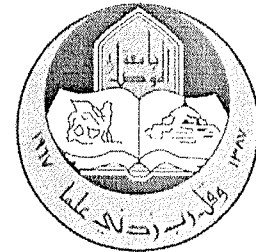
6- "STUDY GUIDE FOR A BEGINNIN-G COURSE IN GROUND-WATER HYDROLOGY" PART II. by O. Lehn Franke, Thomas E. Reilly, Ralph J. Haefner, and Dale L. Simmons. U.S. GEOLOGICAL SURVEY. Reston, Virginia 1993.

7- "Groundwater Hydrology". David Keith Todd and Larry W. Mays. John Wiley & Sons Ltd, 2005.

Graduate outcomes (GOs) addressed by the course:

i	ii	iii	iv	v	vi	vii
✓		✓				✓

Course Outcomes (CLOs):

Students who study principles of hydrogeology will be able to

1- Define hydrogeology and Hydrologic budget (i)

2- Study rock properties affecting groundwater (i)

3- Distinguish between Types of aquifers (vii)

4- State and apply Geologic formations as aquifers (iii)

5- Calculate Porosity of rocks or soils in aquifers, groundwater movement, Permeability and Hydraulic Conductivity (iii)

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Introduction to hydrogeology	1	1, 2
Hydrologic budget	1	3
Rock properties affecting groundwater	1	4, 5
Types of aquifers	1	6, 7
Geologic formations as aquifers	1	8, 9
Porosity of rocks or soils in aquifers	1	10, 11
groundwater movement	2	12 , 13
Permeability and Hydraulic Conductivity	1	14, 15

Grading Policy:
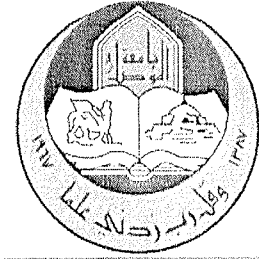
No. of Quizzes 3 (each quiz 2 mark)	6 pt	Attendance is compulsory and absenteeism of more than 30% of classes will cause grade "NA".
No. of Home works 2 (each H.W 1 mark)	4 pt	
Semi-final Exam	30 pt	
Final Exam	60 pt	
Total	100 pt	

Last updated : March 2023

University of Mosul

Dams and Water Resources Engineering Department

Strength of Material I
DWR 244

Academic Year	:	2022-2023
Credit hours	:	2
Course type	:	Optional (R)
E-Class (Code)	:	Google Classroom (bapfqls)
Instructor	:	Dr. Saddam M. AHMED
Instructor E-mail	:	Ahmed.saddam@uomosul.edu.iq
Pre-requisites	:	Engineering mechanics (statics), DWR 142

Catalog Description:

General Principles, Units of Measurement, Numerical Calculations,
Conditions for Rigid-Body Equilibrium, Structural Analysis, Simple Truss stresses,
Stress and Strain, Internal Resultant Loadings, Average Normal Stress in an Axially Loaded Bar,
Shear Stress, Allowable Stress, Design of Simple Connections, Deformation, Strain,
Hooke's Law, Strain Energy, Elastic Deformation of an Axially Loaded Member
Principle of Superposition, Statically Indeterminate Axially Loaded Member, The Force Method of
Analysis for Axially Loaded Members, Torsion, Torsional Deformation of a Circular Shaft, The
Torsion Formula, Power Transmission, Angle of Twist, Statically Indeterminate Torque-Loaded
Members.

Reference Book:

○ R C., HIBBELER (2011) "Mechanics of Materials", eight Edition, PEARSON, ISBN 13: 978-0-13-602230-5, USA. (can be downloaded from the Course web page).

Graduate outcomes (GOs) addressed by the course:

i) An ability to distinguish, identify, define, formulate, and solve engineering problems by applying principles of engineering, science and mathematics.

ii) An ability to produce engineering designs that meet desired needs within certain constraints by applying both analysis and synthesis in the design process.

i	ii	iii	iv	v	vi	vii
✓	✓					

University of Mosul

Dams and Water Resources Engineering Department

Course Outcomes (CLOs)

In DWR 244, initially students will learn how to analysis and assess the Internal strength and deformation for systems. Upon successful completion of this course the student shall be able to assess the:
1. Assess Mechanical properties of systems, (i)
2. Behavior of Axially Loaded Bars and trusses, (i)
3. Design Axially Loaded Bars and trusses, (ii)
4. Assess the shear stresses and design the connections and bolts, (ii)
5. Assess the deformation and strain for cables and analysis indeterminate system, (i)
6. Assess the shear stresses, deformation and design of system due to torsion, (ii)

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Introduction, syllabus, Conditions for Rigid-Body Equilibrium, Structural Analysis	2	1
Structural Analysis, Average Normal Stress in an Axially Loaded Bar, Simple Truss stresses.	6	2, 3 and 4
Exam I		
Shear Stress, Allowable Stress, Design of Simple Connections,	6	5,6 and 7
Exam II		
Assess the deformation and strain for cables and analysis indeterminate system.	6	8, 9 and 10
Midterm Exam	2	11
Torsional Deformation of a Circular Shaft, The Torsion Formula, Power Transmission, Angle of Twist	4	12 and 13
Exam III		
Shear stresses, deformation and design of system due to torsion	4	14 and 15
Exam IV		
Total	**60**	**15**

Students Behaviour in Class

In all classes, to ensure a respectful environment that allows all students to learn effectively, please adhere to the following expectations.

- Be on time in class hall (Plan for the transport delay possibilities). If you are late, be quiet and find a seat quickly (minimize disturbances to both the instructor and other students).

- Do not speak to your friends during the lectures. If you have a question about the material, please raise your hand to ask the instructor.

- Ensure that mobile devices are set to silent mode to avoid disrupting the class. Also, please do not use electronic devices to access games, Facebook, twitter or other non-related course material.

- If you feel that you affected by the behaviour of other students, please let the instructor know your concerns so he can solve the problem.
- Don't ask the instructor about the following:

    1. Exam question patterns
    2. Increase your grade or letter
    3. Postpone exam or extend the due dates (deadlines).
    4. Failure to meet behavioral expectations ma y result in a request to leave the lecture hall.

Grading Policy:

		Attendance is compulsory and absenteeism of more than 30% of classes will cause grade "NA".
Four Exams, (each 5pt)	20pt	
Midterm Exam	20pt	
Final Exam	60pt	
Total	100pt	

Exam Policy

- o All exams will be Closed-Book, Closed-Notes. Bring a calculator, pencil, and eraser for the exams.
- o No phones or electronic devices are allowed to use during the exams. Phones and electronic devices must be switched off and put away during the final exam.
- o The final exam must be completed in order to complete the course.
- o Four Quizzes 40-minute duration time, will be held at the end of the class period on the dates indicated on the weekly schedule.
- o Sharing of items during the exams is prohibited (e.g. calculators, rulers, erasers, etc.) under any circumstances.

Last updated   : Feb 2023

University

of Mosul

Dams and Water Resources Engineering Department

Strength of Materials II
DWR 253

Academic Year	:	2022-2023
Credit hours	:	2
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (hhlqkkd)
Instructor	:	Samer Sami Majeed
Instructor E-mail	:	s.gasgous@uomosul.edu.iq
Pre-requisites	:	Strength of Materials I

Catalog Description:

Shear and moment in beams.
Stresses in beams.
Deflection in beams.

Reference Book:

Strength of Materials, Andrew Pytel&Ferdinand L Singer, 1980.

Graduate outcomes (GOs) addressed by the course:

i) An ability to distinguish, identify, define, formulate, and solve engineering problems by applying principles of engineering, science and mathematics.

ii) An ability to produce engineering designs that meet desired needs within certain constraints by applying both analysis and synthesis in the design process.

i	ii	iii	iv	v	vi	vii
✓	✓					

Course Outcomes (CLOs)

In DWRE 253, initially students will learn how to draw shear and moment in beams and to find the distribution of shear and moment on beams and to calculate the stresses in beams and how to find the maximum stress in each beam and how to calculate the deflections in beams. The student shall be able to assess the:

1- Shear and moment in simple beams. (i), (ii)
2- Shear and moment in overhanging beams. (i), (ii)
3- Stresses in beams. (i), (ii)

4- Design of beam cross section according to stress. (i), (ii)
5- Deflection in simple beams. (i), (ii)
6- Deflection in overhanging beams. (i), (ii)

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Introduction; syllabus; Shear and moment in beams.	4	1 and 2
Solve questions for all types of beams and loading	4	3 and 4
Exam I		
Introduction, Stresses in beams.	2	5
Solve questions for all types of beams and loading	4	6 and 7
Exam II		
Deflection in beams.	4	8 and 9
Midterm Exam	2	10
Solve questions for all types of beams and loading	6	11, 12 and 13
Solve questions for all types of beams and loading	4	14 and 15
Total	**30**	**15**

Grading Policy:

Four Exams, (each 5pt)	20pt	Attendance is compulsory and absenteeism of more than 30% of classes will cause grade "NA".
Midterm Exam	20pt	
Final Exam	60pt	
Total	100pt	

Exam Policy

- All exams will be Closed-Book, Closed-Notes. Bring a calculator, pencil, and eraser for the exams.
- No phones or electronic devices are allowed to use during the exams. Phones and electronic devices must be switched off and put away during the final exam.

Hydraulic
DWR 341

Academic Year	:	2022-2023
Credit hours	:	4
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (m6az75z)
Instructor	:	Dr. Mena Ahmed Alsawaf
Instructor E-mail	:	m.alsawaf@uomosul.edu.iq
Pre-requisites	:	Fluid II (DWR 248)

Catalog Description:

The aim of this course is to introduce the students to the Hydraulic and water flow phenomenon in close conduit. The course will cover how to model a project and deal with all the parameters related to the type of flow, also the course deals with the flow in pipes in many cases such as laminar flow or turbulent. At the end of the course the students will have a knowledge of using right way to analyze flow in pipes and have the skills to perform a complete process of making a model for any hydraulic structure, with the ability to understand the physical phenomenon related to each type of flow. This will be achieved through descriptive lectures with design projects and supervised tutorials.

Text Books:
- Rajput, R.K., 2004. *A textbook of fluid mechanics and hydraulic machines.* S. Chand Publishing.
- Totten, G.E., 2011. *Handbook of hydraulic fluid technology.* CRC press.
- Vennard, J.K., 1963. Elementary fluid mechanics. 4th edition.

Graduate outcomes (GOs) addressed by the course:

i	ii	iii	iv	v	vi	vii
√	√	√			√	

Course Outcomes (CLOs)

On successful completion of this course students will be able to:
- Recognize the common types of flow in pipes (i)
- Apply the basic concepts of sciences and engineering to solve issues associated with the flow in pipes(i)
- Formulate the main parameter to design a model related to flow of water (ii)
- Develop and solve design problems and analyze the data to evaluate the pipes used in supply system (iii).
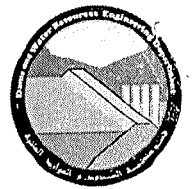
- Identify and analyze the solution of a problem occurs in flow over a hydraulic structure (iv)

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Dimensionless analysis	4	2
Modelling in pipes and open channel	4	2
Flow in pipes, general equations	2	1
Laminar and turbulent flow in pipes	2	1
Distribution of velocities and shear stress in pipes	4	2
Flow in smooth pipes, seventh root law	6	3
Flow in rough pipes	4	2
Flow in non-circular pipes	2	1
Friction and using Moody diagram	2	1
Total	60	15

Grading Policy:

5 class works	10pts
2 monthly Exam	15pts
Final Exam	60pts
Total	100pts

University
of Mosul

Dams and Water Resources Engineering Department

Theory of Structures I
DWR 344

Academic Year	:	2022-2023
Credit hours	:	2
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (gij7ujg)
Instructor	:	Dr. Mohammed M. Khalaf
Instructor E-mail	:	Mohammedmukhlifkhalaf@uomosul.edu.iq
Pre-requisites	:	Engineering Mechanics, Strength of Materials

Catalog Description:

Stability and determinacy of structures,
Analysis of the statically determinate beams,
Analysis of the statically determinate frames,
Analysis of the statically determinate trusses,
The elastic deformation of structures by virtual work (unit load) method,
The elastic deformation of beams by Castigliano's first theorem method.

Reference Book:

o Hibbeler R. C. (2012). Structural analysis (8th ed.). Pearson/Prentice Hall.

Graduate outcomes (GOs) addressed by the course:

i) An ability to distinguish, identify, define, formulate, and solve engineering problems by applying principles of engineering, science and mathematics. iii) An ability to create and carry out proper measurement and tests with quality assurance, analyze and interpret results, and utilize engineering judgment to make inferences.

i	ii	iii	iv	v	vi	vii
✓		✓				

Course Outcomes (CLOs)

On successful completion of this course students will be able to:
1. Find out stability and determinacy of structures, (i)
2. Analyze the statically determinate beams, (i)
3. Analyze the statically determinate frames, (i)
4. Analyze the statically determinate trusses, (i)
5. Evaluate the elastic deformation of structures by virtual work (unit load) method, (iii)
6. Evaluate the elastic deformation of structures by Castigliano's first theorem method, (iii)

University
of Mosul

Dams and Water Resources Engineering Department

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Stability and determinacy of structures	3	1
Analysis of the statically determinate beams	6	2 and 3
Analysis of the statically determinate frames	6	4 and 5
Exam I		
Analysis of the statically determinate trusses	6	6 and 7
The elastic deformation of beams by virtual work (unit load) method	3	8
The elastic deformation of frames by virtual work (unit load) method	3	9
The elastic deformation of trusses by virtual work (unit load) method	6	10 and 11
The elastic deformation of beams by Castigliano's first theorem method	3	12
The elastic deformation of frames by Castigliano's first theorem method	3	13
The elastic deformation of trusses by Castigliano's first theorem method	6	14 and 15
Exam II		
Total	**45**	**15**

Grading Policy:

One quiz	6pt
One homework	4pt
Two exams, (each 15pt)	30pt
Final Exam	60pt
Total	100pt

Exam Policy

o All exams will be Closed-Book, Closed-Notes. Bring a calculator, pencil, and eraser for the exams.

o No phones or electronic devices are allowed to use during the exams. Phones and electronic devices must be switched off and put away during the final exam.

Last updated : March 2023

University
of Mosul

Dams and Water Resources Engineering Department

Theory of Structures II
DWR 392

Academic Year	:	2022-2023
Credit hours	:	2
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (7jqi6a6)
Instructor	:	Dr. Mohammed M. Khalaf
Instructor E-mail	:	Mohammedmukhlifkhalaf@uomosul.edu.iq

Catalog Description:

Analysis of the statically indeterminate structures by consistent deformation method,
Analysis of the statically indeterminate structures by least work method,
Analysis of the statically indeterminate structures by slope-deflection method,
Analysis of the statically indeterminate structures by moment distribution method.

Reference Book:

o Hibbeler R. C. (2012). Structural analysis (8th ed.). Pearson/Prentice Hall.

Graduate outcomes (GOs) addressed by the course:

i) An ability to distinguish, identify, define, formulate, and solve engineering problems by applying principles of engineering, science and mathematics.
iii) An ability to create and carry out proper measurement and tests with quality assurance, analyze and interpret results, and utilize engineering judgment to make inferences.

i	ii	iii	iv	v	vi	vii
✓		✓				

Course Outcomes (CLOs)

On successful completion of this course students will be able to:
1. Analyze the statically indeterminate structures by consistent deformation method, (i)
2. Analyze the statically indeterminate beams and frames by least work method, (iii)
3. Analyze the statically indeterminate beams and frames by slope-deflection method, (iii)
4. Analyze the statically indeterminate beams and frames by moment distribution method, (iii)

University of Mosul

Dams and Water Resources Engineering Department

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Analysis the statically indeterminate beams by method of consistent deformation	2	1
Analysis the statically indeterminate frames by method of consistent deformation	2	2
Analysis the statically indeterminate trusses by method of consistent deformation	2	3
Analysis the statically indeterminate beams by least work method	4	4 and 5
Analysis the statically indeterminate frames by least work method	4	6 and 7
Exam I		
Analysis the statically indeterminate beams by slope-deflection method	4	8 and 9
Analysis the statically indeterminate frames by slope-deflection method	4	10 and 11
Analysis the statically indeterminate beams by moment distribution method	4	12 and 13
Analysis the statically indeterminate frames by moment distribution method	4	14 and 15
Exam II		
Total	**30**	**15**

Grading Policy:

One quiz	6pt
One homework	4pt
Two exams, (each 15pt)	30pt
Final Exam	60pt
Total	100pt

Exam Policy

- o   All exams will be Closed-Book, Closed-Notes. Bring a calculator, pencil, and eraser for the exams.
- o   No phones or electronic devices are allowed to use during the exams. Phones and electronic devices must be switched off and put away during the final exam.

Last updated   : March 2023

University
of Mosul

Dams and Water Resources Engineering Department

Concrete Design
DWR 345

Academic Year	:	2022-2023
Credit hours	:	2
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (7srx5ai)
Instructor	:	Dr. Saddam M. AHMED
Instructor E-mail	:	Ahmed.saddam@uomosul.edu.iq
Pre-requisites	:	Engineering Mechanics, Strength of Materials

Catalog Description:

An introduction to composite element (Reinforced concrete structure),
Characteristics of reinforced concrete elements,
Concrete Grades, Steel Grades,
Loading types.
Design of different structural elements subjected to flexural bending using Working Stress Method.
Design of different structural elements subjected to flexural bending using load and resistance factor Design method (LRFD method).
Shear design for beams and columns.

Reference Book:

o Jack M., Russell B. (2012) "DESIGN OF REINFORCED CONCRETE", nine Edition, Wiley, ISBN: 978-1-118-12984-5, USA. (can be downloaded from the Course web page).

o Gillesania, D.I.T. "FUNDAMENTALS OF CONCRETE DESIGN". Phils. DIT Gillesania, 2003. (can be downloaded from the Course web page).

Graduate outcomes (GOs) addressed by the course:

i) An ability to distinguish, identify, define, formulate, and solve engineering problems by applying principles of engineering, science and mathematics.

ii) An ability to produce engineering designs that meet desired needs within certain constraints by applying both analysis and synthesis in the design process.

i	ii	iii	iv	v	vi	vii
✓	✓					

Course Outcomes (CLOs)

In DWRE 345, initially students will learn how to analysis and design reinforced concrete elements. Upon successful completion of this course the student shall be able to assess the:

1. Mechanical properties of concrete, and reinforcements, (i)
2. Safety and serviceability provision, (i)
3. Behavior of reinforced concrete at working and ultimate loads, (i)
4. Analysis and Design of simple beams and slabs by working stress method, (ii)
5. Analysis and Design of simple beams and slabs by ultimate strength design method, (ii)
6. Analysis and design of T beam, Doubly reinforced beam and continuous beams by Ultimate strength design method (USD), (ii)
7. Shear strength in beams and design of shear reinforcement, (ii)

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Introduction; syllabus; Advantages and Disadvantages of Reinforced Concrete as a Structural Material; Mechanical properties of concrete; steel. Concrete and steel grading; design philosophy; Loading types.	4	1 and 2
Introduction, Flexural Analysis of Beams (working): Cracking Moment; Elastic Stresses—Concrete Cracked	4	3 and 4
Exam I		
Introduction, Flexural Analysis of Beams (Ultimate): Ultimate Moment; Yield Stresses	2	5
Strength Analysis of Beams According to ACI Code: Design Methods; Strains in Flexural Members; Balanced Sections, Tension-Controlled Sections, and Compression-Controlled.	4	6 and 7
Exam II		
Design of Rectangular Beams and One-Way Slabs: Load Factors; Design of Rectangular Beams; One-Way Slabs	4	8 and 9
Midterm Exam	2	10
Analysis and Design of T Beams and Doubly Reinforced Beams: T Beams; Design of Doubly Reinforced Beams (positive and Negative Moment design); L-Shaped Beams	6	11, 12 and 13
Shear and Diagonal Tension: Shear Stresses in Concrete Beams; Design for Shear.	4	14 and 15
Total	**60**	**15**

Students Behaviour in Class

In all classes, to ensure a respectful environment that allows all students to learn effectively, please adhere to the following expectations.

- Be on time in class hall (Plan for the transport delay possibilities). If you are late, be quiet and find a seat quickly (minimize disturbances to both the instructor and other students).

- Do not speak to your friends during the lectures. If you have a question about the material, please raise your hand to ask the instructor.

- Ensure that mobile devices are set to silent mode to avoid disrupting the class. Also, please do not use electronic devices to access games, Facebook, twitter or other non-related course material.

- If you feel that you affected by the behaviour of other students, please let the instructor know your concerns so he can solve the problem.

- Don't ask the instructor about the following:

    1. Exam question patterns
    2. Increase your grade or letter
    3. Postpone exam or extend the due dates (deadlines).
    4. Failure to meet behavioral expectations ma y result in a request to leave the lecture hall.

Grading Policy:

Two Exams, (each 10pt)	20pt	Attendance is compulsory and absenteeism of more than 30% of classes will cause grade "NA".
Midterm Exam	20pt	
Final Exam	60pt	
Total	100pt	

Exam Policy

- All exams will be Closed-Book, Closed-Notes. Bring a calculator, pencil, and eraser for the exams.
- No phones or electronic devices are allowed to use during the exams. Phones and electronic devices must be switched off and put away during the final exam.
- The final exam must be completed in order to complete the course.
- Two Quizzes 40-minute duration time, will be held at the end of the class period on the dates indicated on the weekly schedule.
- Sharing of items during the exams is prohibited (e.g. calculators, rulers, erasers, etc.) under any circumstances.

Last updated   : Feb 2023

Reinforced Concrete Design
DWR 393

Academic Year	:	2022-2023
Credit hours	:	2
Course type	:	Optional (O)
E-Class (Code)	:	Google Classroom (26b6lve)
Instructor	:	Dr. Saddam M. AHMED
Instructor E-mail	:	Ahmed.saddam@uomosul.edu.iq
Pre-requisites	:	Concrete Design, DWR 345

Catalog Description:

Characteristics of shear reinforcement concrete beams and continuous beam and columns.
Analysis and Design of Axially Loaded Columns,
Design of Short Columns Subject to Axial Load and Bending,
Design of flat slab, Design of drop panels and column capital.
Design of one way and two-way slabs,
Introduction to seismic design.

Reference Book:

o Jack M., Russell B. (**2012**) "DESIGN OF REINFORCED CONCRETE", nine Edition, Wiley, ISBN: 978-1-118-12984-5, USA. (can be downloaded from the Course web page).

o Gillesania, D.I.T. "FUNDAMENTALS OF CONCRETE DESIGN". Phils. DIT Gillesania, 2003. (can be downloaded from the Course web page).

Graduate outcomes (GOs) addressed by the course:

i) An ability to distinguish, identify, define, formulate, and solve engineering problems by applying principles of engineering, science and mathematics.

ii) An ability to produce engineering designs that meet desired needs within certain constraints by applying both analysis and synthesis in the design process.

i	ii	iii	iv	v	vi	vii
✓	✓					

University of Mosul

Dams and Water Resources Engineering Department

Course Outcomes (CLOs)

In DWR 393, initially students will learn how to analysis and design reinforced concrete elements. Upon successful completion of this course the student shall be able to assess the:
1. Mechanical properties of Shear strength in beams and design of shear reinforcement, (i)
2. Behavior of reinforced concrete columns, (i)
3. Analysis and Design of short columns, (ii)
4. Analysis and Design of flat slab, (ii)
5. Analysis and design of flat slab with drop panels, (ii)
6. Analysis and design of Two-way slab and beams, (ii)
7. Procuration for seismic resistance moment frames, (ii)

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Introduction; syllabus; Advantages main and secondary reinforcements; steel and concrete shear resistance.	4	1 and 2
Introduction to columns, Flexural Analysis of short columns (under axial loads), Load carrying capacity of short columns, ties design.	4	3 and 4
Exam I		
Short column under axial and bending actions, Interaction diagram (m-p curves).	2	5
Design of short columns subjected to bending and axial loads according to ACI Code: Design Methods.	4	6 and 7
Exam II		
Design of flat slab: Load Factors.	4	8 and 9
Midterm Exam	2	10
Design of flat slab with drop panels.	4	11 and 12
Design of Rectangular Beams and two-Way Slabs.	4	13 and 14
Total	60	15

Students Behaviour in Class

In all classes, to ensure a respectful environment that allows all students to learn effectively, please adhere to the following expectations.

- Be on time in class hall (Plan for the transport delay possibilities). If you are late, be quiet and find a seat quickly (minimize disturbances to both the instructor and other students).

- Do not speak to your friends during the lectures. If you have a question about the material, please

raise your hand to ask the instructor.

- Ensure that mobile devices are set to silent mode to avoid disrupting the class. Also, please do not use electronic devices to access games, Facebook, twitter or other non-related course material.

- If you feel that you affected by the behaviour of other students, please let the instructor know your concerns so he can solve the problem.

- Don't ask the instructor about the following:

    1. Exam question patterns
    2. Increase your grade or letter
    3. Postpone exam or extend the due dates (deadlines).
    4. Failure to meet behavioral expectations ma y result in a request to leave the lecture hall.

Grading Policy:

Two Exams, (each 10pt)	20pt	Attendance is compulsory and absenteeism of more than 30% of classes will cause grade "NA".
Midterm Exam	20pt	
Final Exam	60pt	
Total	100pt	

Exam Policy

- o All exams will be Closed-Book, Closed-Notes. Bring a calculator, pencil, and eraser for the exams.
- o No phones or electronic devices are allowed to use during the exams. Phones and electronic devices must be switched off and put away during the final exam.
- o The final exam must be completed in order to complete the course.
- o Four Quizzes 40-minute duration time, will be held at the end of the class period on the dates indicated on the weekly schedule.
- o Sharing of items during the exams is prohibited (e.g. calculators, rulers, erasers, etc.) under any circumstances.

Last updated   : Feb 2023

Dams and Water Resources Engineering Department

Numerical Analysis
ENGE320

Academic Year	:	2022-2023
Credit hours	:	2
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (qj4tonk)
Instructor	:	Ali Ahmed Abdulmawjood
Instructor E-mail	:	aliabdulmawjood@uomosul.edu.iq
Pre-requisites	:	Calculus IV (DWR247)
		Calculus II (DWR109)

Catalog Description:

Article includes many mathematical topics in the engineering analysis and numerical methods advanced that contain many engineering applications with direct contact with life in the process specialist civil engineering and engineering of dams and water resources.

Text Books:
- Numerical Analysis By Dass

Graduate outcomes (GOs) addressed by the course:

i	ii	iii	iv	v	vi	vii
✓	✓	✓				

Course Outcomes (CLOs)

On successful completion of this course students will be able to:
- The objectives of studying this module are to make the students familiarise with the ways of solving complicated mathematical problems numerically. (i)
- Obtaining numerical solutions to problems of mathematics. (ii)
- Describing and understanding of the several errors and approximation in numerical methods. (iii)
- The understanding of several available Solutions of Equations in One Variable. (ii)
- The explaining and understanding of the several available methods to Solve the simultaneous equations. (iii)

Dams and Water Resources Engineering Department

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Numerical Methods: Iteration and graphical method Newton-Raphson's method and False position method	2	1
Taylor's series and Euler's method	2	1
Runge's -Kutta method	2	1
Indeterminate weight method and Integration method	2	1
Interpolation:Greagory Newton forward interpolation method	2	1
Gauss-Guadpruter method	2	1
Defintion, Forming,Order and Degree of Difference equations	4	2
Solution of Difference equations	2	1
Gauss, Jacopi's and Gauss-seidel method	2	1
Central differences	4	2
Derivative of Newton forward and backward differences	6	3
Total	**30**	**15**

Grading Policy:

2 quizzes	8pts
2 homework	7pts
2 Term Exam	25pts
Final Exam	60pts
Total	100pts
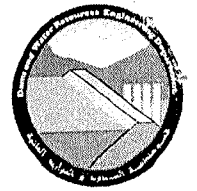
Open Channels and Hydraulic Machines
DWR 348

Academic Year	:	2022-2023
Credit hours	:	2
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (2ltcnyp)
Instructor	:	Dr. Mena Ahmed Alsawaf
Instructor E-mail	:	m.alsawaf@uomosul.edu.iq
Pre-requisites	:	Hydraulic (DWR 341)

Catalog Description:

The aim of this course is to introduce the students to the flow in open channel and the energy dissipated. The course will cover types of open channel and uses of each one, with the best hydraulic cross section the minimize the cost. Also, the energy transmitting and dissipating in one of the most common phenomena in open channels, the hydraulic jump. The student will have knowledge of prediction the water profile when there is an obstacle in the flow. Last, introduction will be introduced about pumps and how they connect each of them (if needed), and how to compute the pressure and power required. This will be achieved through descriptive lectures with design projects and supervised tutorials.

Text Books:
- Rajput, R.K., 2004. *A textbook of fluid mechanics and hydraulic machines.* S. Chand Publishing.
- French, R.H. and French, R.H., 1985. Open-channel hydraulics (p. 705). New York: McGraw-Hill.

Graduate outcomes (GOs) addressed by the course:

i	ii	iii	iv	v	vi	vii
√	√	√			√	

Course Outcomes (CLOs)

On successful completion of this course students will be able to:
- Recognize the common physical phenomenon of flow in open channel (i)
- Classify the type of flow and the properties for each type, with the common empirical equations (i).
- Define the specific energy of the flow in open channel and connect that with practical cases that happen in reality (iii).
- Route the curve of surface water profile when there is a structure in open channel (vi).

- Recognize the main typed of pumps used in water resources engineering and how the connect each other and define the main requirements to design the right one (ii).

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Open channel, types and classifications.	2	1
Uniform flow, Chezy and Manning equation.	4	2
Best hydraulic cross section.	4	2
Specific energy and critical depth.	4	2
Hydraulic jump.	4	2
Varied flow, water surface profile.	6	3
Pumps, types and performance.	4	2
Calculating pressure and power required.	2	1
Total	60	15

Grading Policy:

5 class works	10pts
2 monthly Exam	30pts
Final Exam	60pts
Total	100pts

Ground water Hydrology

DWR 349

Academic Year	:	2022-2023
Credit hours	:	2
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (7kkvh3o)
Instructor	:	Dr. Shatha H.Dawood
Instructor E-mail	:	s.alzakar@uomosul.edu.iq
Pre-requisites	:	Surface Hydrology

Catalog Description:

Introduction to ground water/ Aquifer Properties, Types of Aquifers, Confined aquifer and Unconfined aquifer/ Properties of Aquifers/ Analysis of Steady Groundwater Flow, Steady Flow in Confined and Unconfined Aquifers/ Equations of Motion/Hydraulics of Wells and function of wells. Multiple Well System.

Reference Book:

1- Groundwater hydrology (2005) by Todd, D. K., & Mays, L. W. Wiley, New Jersey.
2- Groundwater Science (2012) by Charles Fitts. Published by Elsevier.
3- Groundwater Hydrology - Conceptual and Computational Models (2003) by K.R. Rushton; published by Wiley.

Graduate outcomes (GOs) addressed by the course:

i) An ability to distinguish , identtify, define, formulatem and solve engineering problems by appling principles of engineering, scince and mathmatics.
ii) An ability to produce engineering designs that meet desired needs within certain constraints by appling both analysis and synthesis in the design process.
iii) Apply the basic concepts of sciences and engineering to solve issues associated with the treatment of wells.

i	ii	iii	iv	v	vi	vii
√	√	√				

Dams and Water Resources Engineering Department

Course Outcomes:

The aim of this course is to develop a student's understanding of the occurrence of groundwater and how it is interlinked with surface water. In addition, the student will understand the basic methods of groundwater investigations and development. At the conclusion of this course, students should be able to:

1. Have an ability to understand what groundwater is and where it occurs.(i)
2. Understant the flow of water in confined and unconfined aquifer,(i)
3. Understand the connectivity of surface water and groundwater resources, (i)
4. Understant thetypes of wells and the flow of water in multy wells,(iii)
5. Understand how to investigate and develop groundwater resources.,(ii)

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
What is Groundwater?, Groundwater and the Water Cycle Importance of Groundwater, Groundwater Scenario: Global Perspectives, Groundwater in Iraq	2	1
Aquifer Properties, Types of Aquifers, Confined aquifer Unconfined aquifer, Leaky aquifer, Perched Aquifers	2	1
Properties of Aquifers, Porosity, Specific yield, Coefficient of permability.	2	1
Exam I		
Darcy's Law, Hydraulic Conductivity, Transmissibility	2	1
Analysis of Steady Groundwater Flow, Steady Flow in Confined Aquifers.	2	1
Exam II		
Steady Flow in Unconfined Aquifers ,Steady Unconfined Flow without Recharge or Evapotranspiration	2	1
Equations of Motion, Confined Groundwater Flow Confined Groundwater Flow between Two water Bodies. Unconfined Flow by Dupit's Assumption	2	1
Hydraulics of Wells, Drawdown in Wells, Steady Flow into a Well Confined Flow	2	1
Unconfined Flow	2	1
Midterm Exam		
Functions of Wells, Classification of Water Wells, Open Wells, Tubewells	2	1
Unsteady flow in a confined aquifer	2	1
Application of Differential Equations to Well Hydraulics Well losses	2	1
Well flow near aquifer boundaries	2	1
Well flow near an Impermeable boundaries	2	1
Multiple Well System	2	1
Total	30	15

Mosul University

Dams and Water Resources Engineering Department

Grading Policy:

|		
Tow Exams, (each 10pt)	20pt	Attendance is compulsory and absenteeism of more than 30% of classes will cause grade "NA".
Midterm Exam	20pt	
Final Exam	60pt	
Total	100pt	

Exam Policy:

1. All exams will be Closed-Book, Closed-Notes. Bring a calculator, pencil, and eraser for the exams.
2. No phones or electronic devices are allowed to use during the exams. Phones and electronic devices must be switched off and put away during the final exam.
3. The final exam must be completed in order to complete the course.

Last updated : **2023**

University of Mosul

Dams and Water Resources Engineering Department
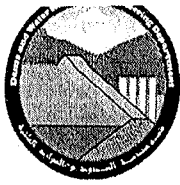
Drainage Engineering
DWR 350

Academic Year	:	2022-2023
Credit hours	:	2
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (2oujesl)
Instructor	:	Dr. Ahmed A. M. Al-Ogaidi
Instructor E-mail	:	a.alogaidi@uomosul.edu.iq
Pre-requisites	:	---------

Catalog Description:

The aim of this course is to introduce the students to the agricultural drainage required to enhance the field production, and to create a balance among water, air, and salts contents in the soil. The students will learn the purpose of drainage, benefits of drainage, history of drainage in Iraq. Then, general principles of groundwater hydraulics will also be given to the students such as Darcy's law, Dupuit-Forchheimer method, and groundwater flow in layered soils. Furthermore, the students will learn leaching requirements to for saline lands reclamations. Drainage projects' investigations, drainage systems (surface and subsurface), design of drainage sections, design of field drainage spacing, drainage wells (vertical drainage), drainage maintenance, and drainage and environmental pollution will be also given to the students in details. At the end of the course the students will have a working knowledge of the drainage networks and have the skills to design drainage projects. This will be achieved through descriptive lectures with design projects and supervised tutorials.

Text Books:

- Luthin, James N., and James N. Luthin. *Drainage engineering*. No. TC970 L8. New York: Wiley, 1973.
- Waller, Peter, and Muluneh Yitayew. *Irrigation and drainage engineering*. Springer, 2015.
- Al-Dabagh, Abdulsattar Younis, and Ali, Angham Ezz Al-Deen. *Drainage Engineering*. Dar Al-Kutob for Printing and Publishing, University of Mosul, Mosul, Iraq, 1992.
- Al-Lamy, Muhsin M. A., and L-Janaby, Alaa', S. A. Drainage, investigations, designs, execution and maintenance. Dar Al-Kutob for Printing and Publishing, University of Mosul, Mosul, Iraq, 1991.

Graduate outcomes (GOs) addressed by the course:

i	ii	iii	iv	v	vi	vii
✓	✓		✓			✓

Course Outcomes (CLOs)

The Drainage Engineering course teaches students a lot of useful things in designing and understanding drainage networks. After completing this course, students are supposed to be familiar with the following points:
- Definition of drainage, its purpose, evidence and benefits, as well as an overview of the history of drainage in Iraq. (i)
- Learn the basics of groundwater movement by studying Darcy's law, Laplace's equation, and Dupuis-Forchheimer's equation. (i)

- Learn about the reclamation of saline soils, salts removal, and the requirements for washing them. (i)
- Learn the exploratory and design investigations of drainage projects. (iv)
- Studying the various methods used to estimate the hydraulic conductivity of soils in the laboratory and field. (vii)
- Identifying the different drainage systems through their types, planning their locations and depths, and designing filters. (i)
- Learn the basics of designing surface (open) and subsurface (covered) drainage sections. (ii)
- Designing the distances between the drains in the case of stable and unstable flow. (ii)
- Identifying the vertical drainage (drainage wells). (vii) •
- Learn drainage maintenance. (iv)
- The relationship between drainage and environmental pollution. (i)

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
General introduction on drainage of agricultural lands, Definition of drainage, purpose of drainage, evidences of drainage problems, drainage benefits, drainage in Iraq, and sources of excess water in soil.	2	1
Principles of groundwater hydraulics, introduction, Law of energy conservation, groundwater potential, Darcy's law, Law of mass conservation, Laplace's equation, and Dupuit-Forchheimer equation.	4	2
Reclamation of saline soils, the origin and nature of saline soils, Factors helping to increase the concentration of salts in agricultural soils, distribution and movement of salts in soil, the critical depth of groundwater, classification of saline soils, reclamation methods of saline soils, and soil leaching and leaching requirements.	4	2
Drainage projects' investigations, exploratory investigations, design investigations, and groundwater investigations.	2	1
Estimation of soil hydraulic conductivity, introduction, laboratory methods of soil hydraulic conductivity estimation, and field methods of soil hydraulic conductivity estimation.	4	2
Drainage systems, introduction, types of drainage networks, planning drains' positions, patterns of drainage network distribution, drain depths, accompanying works to subsurface drainage network, and filters (envelopes).	2	1
Design of drains' sections, introduction, drainage coefficient, design of open drains' sections, and design of pipe drains diameters.	2	1
Spacing between drains, introduction, equations used in specifying drains' spacing, equations based on steady-state flow condition, and equations based on unsteady-state flow condition.	6	3
Vertical drainage (drainage wells), introduction, types of drainage wells, advantages of vertical drainage, disadvantages of vertical drainage, groundwater flow towards drainage walls, and overlapping among drainage wells.	2	1
Drains' maintenance, introduction, maintenance of open drains, maintenance of buried drains, and maintenance of drainage wells.		
Drainage and water pollution, introduction, effect of return water on domestic water uses, effect of return water on industrial water uses, effect of return water on fish water life, effect of return water on entertainment water uses, and methods of return water controlling.	2	1
Total	30	15

Grading Policy:

2 quizzes	12pts
2 homework	8pts
Term Exam	20pts
Final Exam	60pts
Total	100pts

University of Mosul

Dams and Water Resources Engineering Department

Soil Mechanics-II
DWR 351

Academic Year	:	2022-2023
Credit hours	:	(1+2) 3
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (7srx5ai)
Instructor	:	Dr. Zuheir Karabash + Prof. Ibrahim M. Alkiki
Instructor E-mail	:	karabash@uomosul.edu.iq, i.alkiki@uomosul.edu.iq
Pre-requisites	:	Soil mechanics I

Catalog Description:

The objective of the soil mechanics course is to introduce the subject of geotechnical engineering. In this course the student will understand and be familiar with important topics: soil improvements, compaction, the compressibility of the soil, shear stress in soils, lateral earth pressure, and slope stability problem, upon completion of the soil mechanics course, students should be able to apply principles of soil mechanics and in the analysis, design, and construction of civil engineering projects.

Reference Book:

- o Al-Asho, M. O "Soil Mechanics Principles", 1990 Student textbook, University of Mosul.
- o Das, B.M. and Sobhan, K. "Principle of Geotechnical Engineering", ninth Edition, Cengage Learning.
- o Coduto, D.P. "Geotechnical Engineering Principle and practices", 1999, Prentice-Hall, Inc.

Graduate outcomes (GOs) addressed by the course:

- i) An ability to distinguish, identify, define, formulate, and solve engineering problems by applying principles of engineering, science and mathematics.
- ii) An ability to produce engineering designs that meet desired needs within certain constraints by applying both analysis and synthesis in the design process.

vii) An ability to work adequately on teams and to set up objectives, plan activities, meet due dates, and manage risk and uncertainty

i	ii	iii	iv	v	vi	vii
✓	✓					✓

Course Outcomes (CLOs)

In DWRE 351, initially, students will learn about soil stabilization, consolidation, shear strength, and how to analyze the Geotechnical properties of the soil. Upon successful completion of this course, the student shall be able to assess the:

CLO:1 Understand soil stabilization and improvement techniques (i).

CLO:2 Analyze and understand consolidation characteristics of the soil (ii).

CLO:3 Analyze and understand the shear strength of the soil (ii).

CLO:4 Evaluation of the lateral earth pressure, Analyze, and design of the soil retaining structure (ii).

ClO:5 Ability to conduct soil mechanic tests related to soil improvements, consolidation, and soil shear strength. Analyze the test results and present them as a report (vii).

Weekly Teaching Plan:

Theoretical 1 hr/week		
Subject	**Credit hours**	**No. of Weeks**
Soil stabilization and improvements. Soil stabilization techniques, Compaction, Field compaction, and soil field density	2	1 and 2
Consolidation, mechanism of consolidation, consolidation test and data analysis, presentation of consolidation test results.	2	3 and 4
Rate of consolidation, and degree of consolidation.	1	5
Homework and Exam I		
Shear strength, introduction, and shear strength components, Mohr coulomb failure theory, methods of shear strength determination	4	6,7, 8, and 9
Lateral earth pressure, types and theories, at-rest condition, Rankine active and passive conditions, coulomb active and passive conditions.	3	10, 11, and 12
Slope stability analysis, introduction, methods of slope stability analysis.	2	13 and 14
Midterm Exam	1	15
Total	**15**	**15**

Laboratory 2 hr/week		
Subject	**Credit hours**	**No. of Weeks**
Introduction, and visiting the Lab.	2	1
Lecture and compaction test	4	2 and 3
Lecture and field density test	4	4 and 5
Lecture and consolidation test.	4	6 and 7
Lecture and direct shear test	4	8 and 9

Unconfined compression test.	2	10
Lecture and triaxial shear test.	6	11, 12 and 13
Collapse test.	2	14
Midterm Exam	2	15
Total	**30**	**15**

Grading Policy:

Assessment Instruments	Mark
1st term examination	15%
2nd term examination	15%
Quiz, homework, and report	5%
Laboratory, experimental part	15%
Final Examination:	50%
Total	100%

Exam Policy

o   All exams will be Closed-Book, Closed-Notes. Bring a calculator, pencil, and eraser for the exams.

o   No phones or electronic devices are allowed to use during the exams. Phones and electronic devices must be switched off and put away during the final exam.

Consumptive use and water duty
DWR 352

Academic Year	:	2022-2023
Credit hours	:	2
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (jlwlozr)
Instructor	:	Dr. Anmar Abdulaziz AL-Talib
Instructor E-mail	:	Anmar.altalib@uomosul.edu.iq
Pre-requisites	:	Irrigation principal and practices

Catalog Description:

Consumptive use of water
Penman monteth equation
Irrigation efficiencies
Irrigation frequency and amount of water
Irrigation methods
Principles of Irrigation networks

Reference Book:

- Irrigation principles and practices , by V.E. Hansen ,O.W.Israelsen and G.F. Stringham, fourth edition, john wiley and sons., 1980.
-Crop water requirements (FAO – 24) o
-Crop evapotranspiration –guide lines for computing crop water requirements (FAO – 56)

-Design manual for irrigation &drainage- ministry of irrigation-Iraq (pencol),1980.

Graduate outcomes (GOs) addressed by the course:

i)   An ability to distinguish, identify, define, formulate, and solve engineering problems by applying principles of engineering, science and mathematics.

iii) An ability to create and carry out proper measurement and tests with quality assurance, analyze and interpret results, and utilize engineering judgment to make inferences.

I	ii	iii	iv	v	Vi	vii
*		*				

Course Outcomes (CLOs)

In DWRE 352, initially students will learn how compute Consumptive use and water duty
. Upon successful completion of this course the student shall be able to assess the:
1. how to use mathematical relations in a calculation of the potential Consumptive use(Eto) of different crops , (i)
2. Identify the different stages of crop growth, (i)
3. Draw the crop coefficient curve for different crops, (iii)
4. Calculating the water consumption of the crop, (iii)
5. Identify the different irrigation efficiencies within the field, (iii)
6. Calculation of water duty for irrigation projects (iii)
7. Learn about different irrigation methods and their specifications, (iii)

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Absolute water consumption - transpiration - evaporation - conditions affecting water consumption - direct measurements of water consumption - Hargreves equation - water consumption of natural plants, Calculation of water consumption reference ETo for crops using the Benman Monteth equation	4	1 and 2
Find crop coefficient Kc for different plants and calculate water consumption of crop ETc, - Meteorology as a guide for water consumption - Plani - Creedli method - Jensen - Hayes method Climate and plant physiology (functions of plant members) and their relevance to water consumption	4	3 and 4
Exam I		
Plant growth season - Water consumption needs for crops during the growing season - Practical considerations	2	5
When to irrigate - and how much water to apply, the soil moisture endpoints, the external appearance of the crop, Use of various crops for water, available water resources, winter irrigation, Autumn irrigation	4	6 and 7
Exam II		
The effect of the sedimentary soil layer, the stage of plant growth and its effect on the irrigation method, irrigation during the vegetative growth stage, the method of flowering irrigation	4	8 and 9
Midterm Exam	2	10
The method of irrigation during the fruiting period, depth of the root area, irrigation frequency (irrigation rotation), irrigation efficiency, water transfer efficiency, water application efficiency , water use efficiency, water storage efficiency,	6	11, 12 and 13

sprinkler irrigation, other uses of sprinkler networks, basic conditions for sprinkler irrigation system design, sprinkler network design		
Drip irrigation, the benefits of drip irrigation, potential problems of drip irrigation, Surface irrigation and underground irrigation (under surface) Free flooding without control, submerged slides, submerged docks, internal irrigation, hydraulic surface irrigation,	4	14 and 15
Total	60	15

Grading Policy:

Four Exams, (each 5pt)	20pt	Attendance is compulsory and absenteeism of more than 10% of classes will cause grade "NA".
Midterm Exam	20pt	
Final Exam	60pt	
Total	100pt	

Exam Policy

- o All exams will be Closed-Book, Closed-Notes. Bring a calculator, pencil, and eraser for the exams.
- o No phones or electronic devices are allowed to use during the exams. Phones and electronic devices must be switched off and put away during the final exam.

Last updated   : Mar. 2023

Flow measurements methods and their analysis

DWR 395

Academic Year	:	2022-2023
Credit hours	:	2
Course type	:	Elective (E)
Instructor	:	Dr. Mena Ahmed Alsawaf
Instructor E-mail	:	m.alsawaf@uomosul.edu.iq
Pre-requisites	:	None

Catalog Description:

The aim of this course is to introduce the students two ways to measure the discharge in natural and man-made channels. The course will cover the main ways to measure their depth of flow and their instruments also the main practical ways the measure the discharge in two ways, direct and Indirect. The limitations and requirements for each way also coved. This will be achieved through descriptive lectures with supervised tutorials.

Text Books:
- Herschy, R.W., 2008. *Streamflow measurement.* CRC press.
- Liptak, B.G., 1993. *Flow measurement.* CRC Press.

Graduate outcomes (GOs) addressed by the course:

i	ii	iii	iv	v	vi	vii
√	√					

Course Outcomes (CLOs)

On successful completion of this course students will be able to:
- Recognize the common types of flow instruments to measure the flow in open channel (i)
- Apply the basic concepts of sciences and engineering to solve issues associated with measuring the normal flow in channels and flood flow(i)
- Formulate the main parameter to measure the flow and learn to choose the right way(ii)

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Direct methods for flow measurement: Measurements of flow depths	4	2
Area- velocity method	4	2
Practical ways to use Area- velocity method	2	1

Dilution method	4	2
Electromagnetic method and Ultrasonic method	4	2
Indirect Methods for flow measurements :Hydraulic structure (Weirs and Notches)	6	3
Slope- area Method	6	3
Total	**60**	**15**

Grading Policy:

5 class works	10pts
2 monthly Exam	30pts
Final Exam	60pts
Total	100pts

Design of Hydraulic Structures I
DWR 440

Academic Year	:	2022-2023
Credit hours	:	3
Course type	:	Required (R)
E-Class (Code)	:	https://classroom.google.com (icko3bb)
Meet address	:	https://meet.google.com/ybz-vsra-esa
Instructor	:	Dr. Nashwan K. Alomari
Instructor E-mail	:	nashwan.alomari@uomosul.edu.iq
Co-instructor	:	Dr. Rasha M.Sami
Co-instructor E-mail	:	rasha.fadhil@uomosul.edu.iq
Pre-requisites	:	Open channel and Hydraulic machines (DWR 348)

Course Description:

The course would cover the aspects related to the design the hydraulic structures as follows:

- Introduction of the hydraulic structures.
- Some theories for estimating the uplift pressure and piping phenomena in hydraulic structures (Bligh's theory, Lane's theory, Khosla's theory, and flow net analysis).
- Protection work of approaches for the horizontal floor.
- Introduction of hydraulic jump, their types, efficiency, length, position, and tailwater conditions.
- Introduction of stilling basins. Design of SAF stilling basin, and U.S.B.R II stilling basin.
- Introduction and design of cross regulator and Head regulator.

Reference Books:

1. Asawa, G. L. (2008) *"Irrigation and Water Resources Engineering"* New age International(P) Limited, Publishers.

2. Chanson, Hubert., (2004) *"The Hydraulics of Open Channel Flow: An Introduction"* Elsevier.

3. Chow, Ven te., (1959) *"Open Channels Hydraulics"* Mc Graw Hill.

4. Schall, J.D., Thompson, p. L., Zeryes, S. M., Kilgore, R. T., and Morris, J. L. (2012) *"Hydraulic design of Highway culverts "* (Report No . FHWA – HIF – 12 – 026 HD55).

5. Varshney, R.S., Gupta, S. C., Gupta, R. L., (1979) *"Theory & design of irrigation structures"*. Nem Chand & Bros; Roorkee, India.

Graduate outcomes (GOs) addressed by the course:

i	ii	iii	iv	v	vi	vii
✓	✓	✓				✓

Course Outcomes (CLOs)

Upon completing this course, the students will learn the steps of designing hydraulic structures. From a practical view, students can increase their design experience and skills.

In DWR 440, students will initially learn how to use some theories for estimating the uplift pressure and piping phenomena in hydraulic structures. Upon successful completion of this course, the student will be able to:

1. Classify the hydraulic structures and their uses, (i)

2. Recognize problems accompanying water seepage under the hydraulic structures, (i)

3. Apply the basic concepts of engineering to calculate seepage and uplift pressure under different hydraulic structures, (i)

4. Develop and solve design problems and analyze the data to evaluate the feasibility of components of some types of stilling basin and head and cross regulator, (ii).

5. Evaluate and analyze the safety of the head and cross regulator, (iii).

6. Demonstrate the ability to lead and productively participate in group situations via assigning multidisciplinary design projects for some of the hydraulic structures (vii).

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Subject topics- Introduction of types of hydraulic structures	3	1
Uplift pressure – Bligh theory – applied example	3	1
Lane theory– applied example – Flownet analysis	3	1
Khosla's theory – exit gradient-applied example	6	2
Protection work of approaches for horizontal floor	3	1

Hydraulic jump- types of tailwater condition and drawing of hydraulic jump	3	1
Stilling basins - SAF stilling basin - U.S.B.R II stilling basin - R.S.Varshney stilling basin - applied examples	9	3
Cross regulator and Head regulator	6	2
Design example of cross and head regulator	6	2
General Revision	3	1
Total	45	15

Teaching Techniques:

Powerpoint presentations and boards are used in the classroom. Examples and problems will be solved and illustrated on the classroom board. Tutorials are also organized to establish closer contact with students.

Grading Policy:

2 Quizzes	8 pts	
2 Assignments	8 pts	Attendance is compulsory
Monthly Exam	10 pts	and absenteeism in more
Term Exam	14pts	than 30 % of classes will
Final Exam	60pts	cause a grade "NA".
Total	100pts	

Exam Policy

o All exams will be Closed-Book, Closed-Notes. Bring a calculator, pencil, and eraser for the exams.

o No phones or electronic devices are allowed to use during the exams. Phones and electronic devices must be switched off and put away during the final exam.

o The final exam must be completed to complete the course.

o Sharing of items during the exams is prohibited (e.g. calculators, rulers, erasers, etc.) under any circumstances.

Last updated   : March 2023

University
of Mosul

Dams and Water Resources Engineering Department

Design of Gravity Irrigation Systems
DWR 441

Academic Year	:	2022-2023
Credit hours	:	3
Course type	:	Compulsory
E-Class (Code)	:	Google Classroom (code: ztwsguq)
Instructor	:	Dr. Haqqi Ismail Yasin and Dr. Zeyad Ayoob Sulaiman
Instructor E-mail	:	z.alsinjari@uomosul.edu.iq
Pre-requisites	:	Irrigation Principles and Practices

Course Description:

This course provides a comprehensive overview of various types of irrigation systems in term of description and design. This course is one of the essential courses for students of the Department of Dams and Water Resources Engineering, through which students are identified and trained in collecting basic data required to design surface irrigation systems using the most effective design procedure. The course includes the following topics:

- Introduction to the farm irrigation and the basics of system design/ Basic design Factors/Consumptive use /Soil /Irrigation interval and water application depth
- Efficiency ,adequacy ,and uniformity of irrigation, Water infiltration into soil
- Land grading/escription ,criteria ,and preparatory steps, Design of land grading/Slopes and field levels, Earthwork balance and earthwork calculations
- Surface irrigation/Mechanism of surface irrigation process/Infiltration opportunity time and application depth, Water balance concept in surface irrigation
- Border irrigation system/Assumptions ,considerations ,and limitations of design/Miscellaneous notes, Design flow rate/Flow depth/Maximum border length/Border width
- Furrow irrigation/Furrow intake characteristics, Considerations, assumptions, limitations, and design equations, Runoff control techniques/Cutback irrigation, Runoff recovery system
- Basin irrigation/ Considerations, assumptions, limitations, and design equations/Booher method

Reference Book:

1-On-farm irrigation systems engineering\by A.Y.Hachum, and H.I.Yasin. textbook- Mosul University,1992.
2-Design and operation of farm irrigation systems/by M.E.Jensen-1980.
3- Recahrd H. Cuenca Irrigation System Design: An Engineering Approach, 1989.

Graduate outcomes (GOs) addressed by the course:

i) An ability to distinguish, identify, define, formulate, and solve engineering problems by applying principles of engineering, science and mathematics.

University of Mosul

Dams and Water Resources Engineering Department

ii) An ability to produce engineering designs that meet desired needs within certain constraints by applying both analysis and synthesis in the design process.

i	ii	iii	iv	v	vi	vii
✓	✓					

Course Outcomes (CLOs)

Students who successfully complete this course have:
1. Learned characteristics of various methods of surface irrigation systems, (i)
2. Understood economics of irrigation, (i)
3. Able to design various types of gravity irrigation systems after collecting the required design data and analyzing these data in a way that suits the design of the surface irrigation system design, (i) and (ii)
4. Able to select a suitable irrigation system for a given situation, (ii)
5. Able to select the most economic irrigation design alternative, (vi)

Weekly Teaching Plan:

	Topics	Week
1	Introduction to the farm irrigation and the basics of system design	1
2	Basic design Factors/Consumptive use/Soil/Irrigation interval and water application depth	2
3	Efficiency ,adequacy ,and uniformity of irrigation	3
4	Water infiltration into soil	4
5	Land grading/Description ,criteria ,and preparatory steps/ Design of land grading/Slopes and field levels	5
6	Earthwork balance and earthwork calculations	6
7	Surface irrigation/Mechanism of surface irrigation process/Infiltration opportunity time and application depth	7
8	Water balance concept in surface irrigation	8
9	Border irrigation system/Assumptions ,considerations ,and limitations of design/Miscellaneous notes	9
10	Design flow rate/Flow depth/Maximum border length/Border width	10
12	Furrow irrigation/Furrow intake characteristics/ Considerations, assumptions, limitations, and design equations	11
13	Runoff control techniques	12
14	Cutback irrigation, Runoff recovery system	13
	Basin irrigation/ Considerations, assumptions, limitations, and design equations/Booher method	14
15	Final Exam	15

University
of Mosul

Dams and Water Resources Engineering Department

Grading Policy:

		Attendance is compulsory and absenteeism of more than 30% of classes will cause grade "NA".
Five Exams, (each 4pt)	20pt	
Midterm Exam	20pt	
Final Exam	60pt	
Total	100pt	

Exam Policy

- All exams will be Closed-Book, Closed-Notes. Bring a calculator, pencil, and eraser for the exams.
- No phones or electronic devices are allowed to use during the exams. Phones and electronic devices must be switched off and put away during the final exam.

Last updated   : April 2023

Design of Gravity and Arch Dams
DWR 443

Academic Year	:	2022-2023
Credit hours	:	2
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (uruxm2p)
Instructor	:	Yousif Hashim Abdullah Al-Aqeeli, PhD
Co-Instructor	:	Ali Ahmad Abdulhadi, Msc
Instructor E-mail	:	y.alaqeeli@uomosul.edu.iq
Pre-requisites	:	There are no

Catalog Description:

The aim of this course is to present number of sessions during fifteen weeks. These sessions include different subjects are introduced to the students. The forth class students should be awareness about the hydrological aspects which related to the hydraulic designs of dams. The objectives of dams and reservoirs construction are explained in detail. This course will cover different subjects related to the design of gravity and arch dams. These subjects are types of gravity and arch dams, types of foundation, modes of failure in gravity dams, Design of gravity dams, in addition to the analyses all of the forces and stresses which effected to the body of the dam with taking into consideration the specificity of each type of dams.

Text Books:
- Hydraulics of Dams and Reservoirs, By: Fuat Senturk, Water Resources Publications, Colorado, U.S.A.,1994.
- Theory and Design of Irrigation Structures, Vol. II, By: R. S. Varshney, S. C. Gupta and R. L. Gupta, Nem Chand & Bros, Roorkee (U.P.),India,1982.

Graduate outcomes (GOs) addressed by the course:

i	ii	iii	iv	v	vi	vii
✓	✓	✓				

Course Outcomes (CLOs)

In case of completion of this course, students will be able to:
- An ability to specify the type of gravity dam according to the conditions of valley. (i)
- An ability to specify the type of arch dam according to the conditions of valley. (i)
- Formulate a preliminary design of gravity and arch Dams base on the chosen type. (ii)

- Formulate a preliminary design of arch Dams base on the chosen type. (ii)
- An ability to analyses the forces that affected to gravity (i), (ii)
- An ability to identify the solutions for the problems that may be appear in the analyses of gravity dams. (iii)

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Introduction to Dams Engineerin, Storage Works, Hydrological Aspects, Geological Investigations, Reservoir Site Selection, Storage Zones of a Reservoir	6	3
Reservoir Storage Capacity Estimation Live Storage (Tabulation Method, Sequent Peaks Analysis, Optimization Analysis)	4	2
Reservoir Sedimentation	2	1
The probable life of the reservoir	2	1
Classification of dams, Factors governing the selection of a particular type of dam	2	1
Gravity dams	10	5
Arch dams	4	2
Total	**30**	**15**

Grading Policy:

1 quizzes	10pts
2 homework	10pts
Term Exam	20pts
Final Exam	60pts
Total	100pts
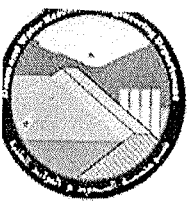
University of Mosul

Dams and Water resources Engineering Department

Engineering Economic
ENGC426

Academic Year	:	2022-2023
Credit hours	:	2
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (ddjjyle)
Instructor	:	Dr. Rasha Mohammadsime Fadhil
Instructor E-mail	:	Rasha. Fadhil@uomosul.edu.iq
Pre-requisites	:	There is no.

Catalog Description

The course aims to acquaint the student with the basics and concepts of engineering economics to evaluate projects and make economic estimations and comparisons between alternatives to choose the most economically optimal project from among several projects (financial feasibility).

Graduate outcomes (GOs) addressed by the course:

i	ii	iii	iv	v	vi	vii
✓	✓	✓				

Course Outcomes (CLOs)

On successful completion of this course students will be able to:
- Understand and apply fundamental concepts of engineering economy (i).
- Classify the interest rate & define the Cash Flow Diagram (i).
- Recognize water resources project planning and management(i).
- Economically evaluate and analysis engineering projects (ii).
- Compare engineering alternatives to choose the most feasible and efficient one. (iii).
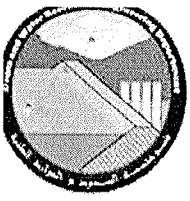
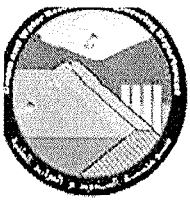| Course References Books |
|---|
| 1- Engineering Economy (7th ed.), L. Blank and A. Tarquin (2012), McGraw-Hill.
 2-Water Resources Systems Planning and Management, S.K. Jain and V.P. Singh (2003), Elsevier.
 3-Water Resources Handbook for Economics, NRCS (1998).
 4- Engineering Economic Analysis, Oxford, New York,2004 |

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Fundamentals of Engineering Economics		
Water Resources Economy Principles of Engineering Economics Cash Flow Diagram	2	1
Uniform Annual Series Uniform Gradient Series Nominal and Effective Interest Rates Payback Period: Simple Payback – Discounted payback.	4	2
Evaluation and Comparison of Engineering Projects		
Present Worth (PW) Method	4	2
Future Worth (FW)Method	2	1
Annual Worth (AW) Method	2	1
Benefit/Cost Ratio Method	2	1
Internal Rate of Return Method	2	1
Minimum Attractive Rate of Return (MARR) Capitalized Equivalent Method (CE)	2	1
Monthy Exam	2	1
Project Financial Management		
Project Pricing. Progress Payments.	2	1
Cash Flow Forecasting	4	2
Mid-Term Exam	2	1
Total	30	15

University of Mosul

Dams and Water resources Engineering Department

Grading Policy:

Exam	point
Two- Quizzes	5pts
One-Monthly Exam	15pts
One-Term Exam	20pts
Final Exam	60pts
Total	100pts

Rasha

Instructor: Dr. Rasha Mohammad sami Fadhil
Email ID : Rasha_m_sami@yahoo.com
Last updated   : 2023

University
of Mosul
Dams and Water Resources Engineering Department

Design of Hydraulic Structures II
DWR 446

Academic Year	:	**2022-2023**
Credit Hour	:	**3**
Course type	:	**Required (R)**
Course web page	:	**https://classroom.google.com (Class Code atrh3d2)**
Meet address	:	**https://meet.google.com/ybz-vsra-esa**
Instructor	:	**Dr. Nashwan K. Alomari**
Instructor E-mail	:	**nashwan.alomari@uomosul.edu.iq**
Pre-requisites	:	**Design of Hydraulic Structures I**

Catalog Description:

The course would cover the design aspects of the following hydraulic structures:

1. Design of canal structures (canal head work). The design includes an introduction, defining the components of the barrage, and design steps of the undersluice, other barrage, and side main canal.

2. Introduction of transitions (R.S Chaturvedi's, Mitra's, and Hind's transitions). Design of transitions (Hind's transitions).

3. Types of cross drainage works. Design example of syphon.

4. Introduction and design example of the culvert.

5. Design of canal falls (Sharda-type fall).

Reference Book:

1. Asawa, G. L. (2008) "*Irrigation and Water Resources Engineering*" New age International(P) Limited, Publishers.

2. Chanson, Hubert., (2004) "*The Hydraulics of Open Channel Flow: An Introduction*" Elsevier.

3. Chow,Ven te., (1959) "*Open Channels Hydraulics*" Mc Graw Hill.

4. Schall, J.D., Thompson, p. L., Zeryes, S. M., Kilgore, R. T., and Morris, J. L. (2012) "*Hydraulic design of Highway culverts* " (Report No . FHWA – HIF – 12 – 026 HD55).

5. Varshney, R.S., Gupta, S. C., Gupta, R. L., (1979) "*Theory & design of irrigation structures*". Nem Chand & Bros; Roorkee, India.

Graduate outcomes (GOs) addressed by the course:

i	ii	iii	iv	v	vi	vii
✓	✓	✓				✓

Course Outcomes (CLOs)

Upon completing this course, the students will learn the steps of designing hydraulic structures. From a practical view, students can increase their design experience and skills.

In DWR 446, students will initially learn how to design many hydraulic structures and their uses. Upon successful completion of this course, the student will be able to:

1. Recognize the common methods of calculating seepage and uplift pressure under different hydraulic structures, (i)

2. Apply the basic concepts of engineering to design the required hydraulic structures' floor thickness, (ii)

3. Formulate preliminary hydraulic design steps of some hydraulic structures, (ii)

4. Develop and solve design problems and analyze the data to evaluate the feasibility of components of the canal Head works (barrage types), some types of flow transition, cross drainage works, and culverts, (ii).

5. Evaluate and analyze the safety of the canal Head works structure (barrage types) and culvert, (iii).

6. Demonstrate the ability to lead and productively participate in group situations via assigning multidisciplinary design projects for some of the hydraulic structures (vii).

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Design of canal Head works (barrage types)	3	1
Design of undersluice	3	1
Design of other barrage	3	1
Design of head regulator	3	1
Design example of the barrage	6	2
Transitions: (some types of flow transition, design, and applied example)	6	2
Cross drainage works – siphon design - design example & applied example	6	2
Introduction and design example of culverts.	6	2
Design of Sharda type fall - applied example	6	2

General Revision	3	1
Total	**45**	**15**

Teaching Techniques:

Powerpoint presentations and boards are used in the classroom. Examples and problems will be solved and illustrated on the classroom board. Tutorials are also organized to establish closer contact with students.

Grading Policy:

2 Quizzes	8 pts	
2 Assignments	8 pts	Attendance is compulsory
Monthly Exam	10 pts	and absenteeism in more
Term Exam	14pts	than 30 % of classes will
Final Exam	60pts	cause a grade "NA".
Total	100pts	

Exam Policy

o   All exams will be Closed-Book, Closed-Notes. Bring a calculator, pencil, and eraser for the exams.

o   No phones or electronic devices are allowed to use during the exams. Phones and electronic devices must be switched off and put away during the final exam.

o   The final exam must be completed to complete the course.

o   Sharing of items during the exams is prohibited (e.g. calculators, rulers, erasers, etc.) under any circumstances.

Last updated   : March 2023

University
of Mosul

Dams and Water Resources Engineering Department

Design of Sprinkler and Drip Irrigation Systems
DWR 447

Academic Year	:	2022-2023
Credit hours	:	3
Course type	:	Compulsory
E-Class (Code)	:	Google Classroom (code: xhcqk65)
Instructor	:	Dr. Haqqi Ismail Yasin and Dr. Zeyad Ayoob Sulaiman
Instructor E-mail	:	z.alsinjari@uomosul.edu.iq
Pre-requisites	:	Design of Gravity Irrigation Systems

Course Description:

This course provides a comprehensive overview of various types of pressurized irrigation systems in term of description and design. This course is one of the essential courses for students of the Department of Dams and Water Resources Engineering, through which students are identified and trained in collecting basic data required to design sprinkler and drip irrigation systems using the most effective design procedure. The course includes the following topics:

- Sprinkler irrigation/Sprinkler irrigation basic concept/Advantages and problems of sprinkler irrigation /Basic and supplementary components sprinkler irrigation system/Types of sprinkler irrigation systems
- Fundamentals of sprinkler irrigation/Single sprinkler water distribution/Layout of stationary system/Hydraulic of sprinkler nozzle , Uniformity of sprinkler water distribution, Alternate setting of sprinkler laterals/Sprinkler spray losses and sprinkler irrigation efficiency
- Sprinkler lateral pipes/Fundamentals of flow hydraulic pipes/Allowable pressure variation /Sprinkler pipe size, Friction head loss/Layout of sprinkler pipes/Moving and operation sprinkler pipes/Sprinkler pipe material
- Sprinkler irrigation major pipes distribution system/Types of major pipes distribution system/Design requirements/ Distribution system layout, Design methods (flow velocity method, allowable friction method, economical analysis method), Economical analysis general procedure/ Total dynamic head
- Trickle irrigation/Advantages and problems of drip irrigation/Trickle system basic component/Soil-water-crop factors, Emitters selection/Hydraulic of trickle network
- General notes about evaluation of farm irrigation systems

Reference Book:

1-On-farm irrigation systems engineering\by A.Y.Hachum, and H.I.Yasin. textbook- Mosul University,1992.
2- Recahrd H. Cuenca Irrigation System Design: An Engineering Approach, 1989.

Graduate outcomes (GOs) addressed by the course:

Dams and Water Resources Engineering Department

i) An ability to distinguish, identify, define, formulate, and solve engineering problems by applying principles of engineering, science and mathematics. ii) An ability to produce engineering designs that meet desired needs within certain constraints by applying both analysis and synthesis in the design process. vi) An ability to perceive the continual necessity for professional knowledge growth and how to find, assess, assemble and apply it properly

i	ii	iii	iv	v	vi	vii
✓	✓				✓	

Course Outcomes (CLOs)

Students who successfully complete this course have:
1. Learned characteristics of sprinkler and drip irrigation systems, (i)
2. Understood economics of irrigation, (i)
3. Able to design various types of pressurized irrigation systems after collecting the required design data and analyzing these data in a way that suits the design, (i) and (ii)
4. Able to select a suitable irrigation system for a given situation, (ii)
5. able to select the most economist irrigation design alternative , (vi)

Weekly Teaching Plan:

No	Topics	Week
1	Sprinkler irrigation/Sprinkler irrigation basic concept/Advantages and problems of sprinkler irrigation /Basic and supplementary components sprinkler irrigation system/Types of sprinkler irrigation systems	1
2	Fundamentals of sprinkler irrigation/Single sprinkler water distribution/Layout of stationary system/Hydraulic of sprinkler nozzle	2
3	Uniformity of sprinkler water distribution	3
4	Alternate setting of sprinkler laterals/Sprinkler spray losses and sprinkler irrigation efficiency	4
5	Sprinkler lateral pipes/Fundamentals of flow hydraulic pipes/Allowable pressure variation /Sprinkler pipe size	5
6	Friction head loss/Layout of sprinkler pipes/Moving and operation sprinkler pipes/Sprinkler pipe material	6
7	Sprinkler irrigation major pipes distribution system/Types of major pipes distribution system/Design requirements/ Distribution system layout	7
8	Design methods (flow velocity method, allowable friction method, economic analysis method)	8
9	Economic analysis general procedure/ Total dynamic head	9
10	Applications on design of main pipe sstems	10
11	Trickle irrigation/Advantages and problems of drip irrigation/Trickle system basic component/Soil-water-crop factors	11
12	Emitters selection/Hydraulic of trickle network	12
13	General notes about evaluation of on- farm irrigation systems	13
14	Applications of Drip Irrigations	14
15	Final Exam	15

University
of Mosul

Dams and Water Resources Engineering Department

Grading Policy:

Five Exams, (each 4 pt)	20pt	Attendance is compulsory and absenteeism of more than 30% of classes will cause grade "NA".
Midterm Exam	20pt	
Final Exam	60pt	
Total	100pt	

Exam Policy

o   All exams will be Closed-Book, Closed-Notes. Bring a calculator, pencil, and eraser for the exams.

o   No phones or electronic devices are allowed to use during the exams. Phones and electronic

	Topics	Week
1	Introduction to the farm irrigation and the basics of system design	1
2	Basic design Factors/Consumptive use/Soil/Irrigation interval and water application depth	2
3	Efficiency ,adequacy ,and uniformity of irrigation	3
4	Water infiltration into soil	4
5	Land grading/Description ,criteria ,and preparatory steps/ Design of land grading/Slopes and field levels	5
6	Earthwork balance and earthwork calculations	6
7	Surface irrigation/Mechanism of surface irrigation process/Infiltration opportunity time and application depth	7
8	Water balance concept in surface irrigation	8
9	Border irrigation system/Assumptions ,considerations ,and limitations of design/Miscellaneous notes	9
10	Design flow rate/Flow depth/Maximum border length/Border width	10
12	Furrow irrigation/Furrow intake characteristics/ Considerations, assumptions, limitations, and design equations	11
13	Runoff control techniques	12
14	Cutback irrigation, Runoff recovery system	13
	Basin irrigation/ Considerations, assumptions, limitations, and design equations/Booher method	14
15	Final Exam	15

devices must be switched off and put away during the final exam.

Last updated   : April 2023

Estimation and Materials Specification
DWR448

Academic Year	:	2022-2023
Credit Hour	:	(1-2) 3
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (p65xxjr)
Instructor	:	Mohammed Awni Khattab
Instructor E-mail	:	m.almukhttar@uomosul.edu.iq
Pre-requisites	:	

Catalog Description:

This course is designed for Dams and Water Resources Engineering and Environmental Engineering students in their Fourth year. It intends to give students a comprehensive idea about the estimation of materials (excavation volumes,steel, cement, sand, gravel and plaster). Addition to estimation of wood form. Then the course transferred the students to the Draw (Map of house, foundation map, section in wall, slab reinforced and bridges reinforced map), Gradually Finishing works, Earth works and volumes calculations for irregular cross-sections.

Reference Book:

1. VANZIRANI, V.N., CHANDOLA, S.P. "Civil Engineering Estimating and Costing ". first edition, 1982

2. Civil Engineering and Costing, S.P. Mahajan, 624. 1042, M214.

3. Estimating Building and Construction, 692.5, H816, 73-119.

Graduate outcomes (GOs) addressed by the course:

   i)   An ability to distinguish, identify, define, formulate, and solve engineering problems by applying principles of engineering, science and mathematics.

   ii)   An ability to produce engineering designs that meet desired needs within certain constraints by applying both analysis and synthesis in the design process.

i	ii	iii	iv	v	vi	vii
✓	✓					

Course Outcomes:

In ENDWR404, initially students will learn how to estimation the quantities of materials for buildings and Earth works calculations for irregular cross-sections structural in additional structural drawing Upon successful completion of this course the student shall be able to:

1. Excavation i

2. Foundations, stripe and raft i

3. Cubed wall works and estimation of materials. **i**

4. Block building, bricks building, stone building **i**

5. Wood form works **i**

6. Analysis Reinforced of slabs **ii**

7. Analysis Reinforced of beams **ii**

8. Design and Draw (Map of house+ foundation map+ section in wall) **ii**

9. Design and Draw (Reinforced of slab map) **ii**

10. Design and Draw (Reinforced of beam map) **ii**

11. Design and Analysis of Finishing works **ii**

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Introduction to Estimation and Materials Specification, Introduction; syllabus; Draw (house plan).	3	1
Excavation of Foundations Excavation of stripe and raft foundation, draw (elevations, sectional elevation, foundation plan, wall section).	3	2
Foundations Estimation of (cement, sand, gravel) for stripe and raft foundation, draw (stair ways plan. reinforced of stair). Estimation of steel reinforced Estimation of steel reinforced for stripe and raft foundation, draw (slabs and beams).	6	3 and 4
Exam I		
Cubed wall works Cubed wall works and estimation of materials	3	5
Walls stone building, bricks building, block building. Bricks building estimation of materials Block building, estimation of materials	9	6 and 8
Exam II		
Wood form works estimation of materials for wood form types Midterm Exam	6	9 and 10
Reinforced estimation of materials for reinforced of slab. Reinforced of beams	9	11,12 and 13

estimation of materials for reinforced of beams, draw (reinforced of Structural construction)		
Finishing works Estimation of materials for finishing works, Draw (types of steel connection)	6	14 and 15
Total	**60**	**15**

Grading policy

Assessment Instrument	Mark	
Sheets (each 1 pt)	10 pt	Attendance is compulsory and absenteeism of more than 30% of classes will cause grade "NA"
Two Monthly exam(each 10 pt)	20 pt	
Midterm Exam	20 pt	
Final Exam	50 pt	
Total	100 pt	

Exam Policy

- o All exams will be Closed-Book, Closed-Notes. Bring a calculator, pencil, and eraser for the exams.
- o No phones or electronic devices are allowed to use during the exams. Phones and electronic devices must be switched off and put away during the final exam.
- o The final exam must be completed in order to complete the course.
- o Sharing of items during the exams is prohibited (eg, calculators, rulers, erasers, etc.) under any circumstances.

Last updated   : Feb 2023

Foundation Engineering of Hydraulic Structure

DWR 450

Academic Year	:	2022-2023
Credit hours	:	2
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (sbjquyh)
Instructor	:	Prof. Ibrahim M. Al-kiki & Dr.Zuheir Karabash
Instructor E-mail	:	i.alkiki@uomosul.edu.iq , karabash@uomosul.edu.iq
Pre-requisites	:	Foundation Engineering (DWR 444)

Course Objectives:

The objective of this course is to study the types of deep foundations: piles, and drilled shafts. Classification of piles. Load transfer mechanism. Methods of estimation of pile capacity. Settlement of piles and pile groups. Uplift resistance of piles. Structural design of piles: pile design issues and procedures. Drilled shafts: load transfer mechanism, load bearing capacity, settlement. Structural design of other types of foundations.

Catalog Description:

Application of soil mechanics to design and analysis of deep foundations. Understand and calculate the ultimate load of deep foundation, and deep foundation settlements. It also gains knowledge about deep foundation analysis and design. It also gains knowledge about the Structural design of foundations.

Reference Book:

-Peak, R. B., Hanson, W. E. and Thorburn, T.H., " Foundation Engineering ", John Wiley and Sons, 2nd ed., 1974

-Bowles, J.E., P.E., S.E., " Foundation Analyses and Design ", The McGraw-Hill Companies, Inc, 5th ed., 2006.

-Das, B. M., "Principle of Foundation Engineering ", Thomson Books/Cole, California State University, Sacramento, 5th ed., 2004.

-Das, B. M., & Sivakugan, N.," Principles of foundation engineering", Cengage learning, 2018.

- الشكرجي ، يوسف والمحمدي، نوري، " هندسة الأسس " ، جامعة بغداد ،الطبعة الاولى، 1985.

University of Mosul

Dams and Water Resources Engineering Department

i) An ability to distinguish, identify, define, formulate, and solve engineering problems by applying principles of engineering, science and mathematics.

ii) An ability to produce engineering designs that meet desired needs within certain constraints by applying both analysis and synthesis in the design process.

i	ii	iii	iv	v	vi	vii
✓	✓					

Course Outcomes (CLOs):

- In DWR 450, initially, students will learn how to analyze and design foundation elements.
- On successful completion of this course students will be able to:

CLO:1 Evaluation of factors considered in the design of deep foundations (i).

CLO:2 Classification of piles, load transfer mechanism (i).

CLO:3 Methods of estimation of pile capacity (i).

CLO:4 Settlement of piles and pile groups (ii).

CLO:5 Design and analysis of pile foundations (ii).

CLO:6 Structural design of foundations (ii).

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Introduction to Deep foundation engineering Types of deep foundations	2	1
Ultimate Bearing capacity of pile Ultimate load capacity of pile in clay, (Tomlinson method, Mayerhof method and λ- method)	2	2
Ultimate load capacity of pile in sand, (Brooms method and Norland method)	2	3
Ultimate load capacity of pile groups, (groups pile in Clay and groups pile in Sand)	2	4
Bearing capacity of piles subjected to negative friction	2	5
Bearing capacity of piles subjected to swell and tension force	2	6
Bearing capacity of piles subjected to moment	2	7
Settlements of pile foundations and pile group	2	8
Design of pile cap	2	9
1st Term Examination	2	10
The structural design of foundations, (Single Footing and foundations subjected to moment)	2	11
Design of Combined foundation and reinforcement footing (Design of Rectangle, Trapezoidal and Strep Footing)	2	12
Design of raft foundation and reinforcement footing	2	13
Design of wall footing	2	14
2nd Term Examination	2	15
Final Examination		
Total	30	15

Grading Policy:

Two Exams, (each 5pt)	10pt	Attendance is compulsory and absenteeism of more than 30% of classes will cause grade "NA".
Term Exam	30pt	
Final Exam	60pt	
Total	100pt	

Exam Policy

o   All exams will be Closed-Book, Closed-Notes. Bring a calculator, pencil, and eraser for the exams.

o   No phones or electronic devices are allowed to use during the exams. Phones and electronic devices must be switched off and put away during the final exam.

Last updated   : Feb 2023

University of Mosul

Dams and Water Resources Engineering Department

Earth and Earth Rock Fill Dams
DWR 449

Academic Year	:	2022-2023
Credit hours	:	2
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (scgwhdf)
Instructor	:	Yousif Hashim Abdullah Al-Aqeeli, PhD
Co-Instructor	:	Ali Ahmad Abdulhadi, Msc
Instructor E-mail	:	y.alaqeeli@uomosul.edu.iq
Pre-requisites	:	There are no

Catalog Description:

The aim of this course is to present number of sessions during fifteen weeks. These sessions include different subjects are introduced to the students. This course will cover different subjects related to the design of earth dams. These subjects are types of earth and rock fill dams, types of foundation for earth dams, modes of failure in earth dams, design consideration of earth dams, seepage through the body of the dam, seepage control through the body of the dam, seepage control through the foundation, stability of slopes, and spillway.

Text Books:
- Earth-Rock Dams, Engineering Problems of Design and Construction, By: J. L. Sherard, R. J. Woodward, S. F. Gizienske and W. A. Clevenger, John Wiley and Sons, Inc., New York, 1963.
- Engineering for Dams, By: W. P. Greager, J. D. Justin and J. Hinds, In three Volumes,, John Wiley and Sons, Inc., New York, 1961.

Graduate outcomes (GOs) addressed by the course:

i	ii	iii	iv	v	vi	vii
✓	✓	✓				

Course Outcomes (CLOs)

In case of completion of this course, students will be able to:
- An ability to specify the type of dam according to the conditions of valley. (i)
- Formulate a preliminary design of an earth dam base on the chosen type. (ii)

- An ability to specify the valley problems that considered during constructing an earth dam and ability to find solutions for these problems. (i), (ii)
- An ability to identify the solutions for the problems that may be appear in an earth dam during operation of reservoir. (iii)
- Formulate a preliminary design of an ogee spillway. (ii)

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Earth and Rock fill Dams (Rolled fill dam), Earth and Rock fill Dams (Foundation for earth dams, Suit available materials)	2	1
Earth and Rock fill Dams (Modes of failure in earth dams)	4	2
Earth and Rock fill Dams (Seepage through the body of the dam)	2	1
Earth and Rock fill Dams (Design Consideration of an Earth Dams)	2	1
Earth and Rock Fill Dams (SEEPAGE CONTROL A-Seepage Control through the body of the Dam)	4	2
Earth and Rock fill Dams (SEEPAGE CONTROL B- Seepage Control Through the Foundation)	4	2
Earth and Rock fill Dams (Location of a phreatic line)	2	1
Earth and Rock fill Dams (Stability of Slopes)	4	2
Earth and Rock fill Dams (Pore Water Pressure)	2	1
Spillway(Component of spillways, Types of spillways)	2	1
Spillway (Design Principles of Ogee Spillway)	2	1
Total	**30**	**15**

Grading Policy:

1 quizzes	10pts
2 homework	10pts
Term Exam	20pts
Final Exam	60pts
Total	100pts
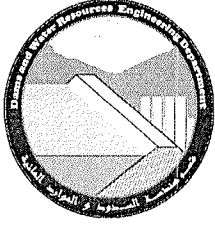
Sediment Transport
DWR 451

Academic Year	:	2022-2023
Credit hours	:	2
Course type	:	Required (R)
E-Class (Code)	:	Google Classroom (faubyr5)
Instructor	:	Dr. Nashwan K. Alomari
Instructor E-mail	:	nashwan.alomari@uomosul.edu.iq
Pre-requisites	:	None
Co-instructor	:	Dr Talal Ahmed Basheer
Co-instructor E-mail	:	t.basheer@uomosul.edu.iq

Catalog Description:

The aim of this course is to introduce the students to the area of sediment transport, sediment properties, and sediment measurement. In addition to river morphology and river classification. At the end of the course, the students will have a working knowledge of the sediment transport fundamental. This will be achieved through descriptive lectures with design projects and supervised tutorials.

Text Books:
- Simons, D. B., & Şentürk, F. (1992). Sediment transport technology: Water and sediment dynamics. Littleton, Colorado: Water Resources Publication.

Support Books:
- Annandale, G. W. (1987). Reservoir Sedimentation. Elsevier Science Publication.
- Dey, S. (2014). Fluvial Hydrodynamics: Hydrodynamics and Sediment transport phenomena. Berlin: Springer.
- Julien, Pierre Y. (2010). Erosion and Sedimentation. Second edition. Cambridge university press: New York.
- Vanoni, V. A. (2006). Sedimentation Engineering. New York: ASCE Publications.
- Yalin, M. S. (1977). Mechanics of Sediment Transport. Pergamon Press.

Graduate outcomes (GOs) addressed by the course:

i	ii	iii	iv	v	vi	vii
✓	✓					

Course Outcomes:

The student who passes the requirements of the semester will be able to:

- Recognize the common characteristics of River morphology (i).

- Understand sediment properties and its effect on sediment transport (i).

- Distinguish the sediment motion and how its begin (i).

- Apply the basic concepts of sciences and engineering to solve issues associated with the sediment transport problems (i).

- Gain the knowledge to deal with sediment problems (ii).

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Introduction	2	1
River morphology	2	1
Properties of the sediment	4	2
Beginning of sediment motion	4	2
Monthly exam (1)	2	1
Sedimentary Bed forms	4	2
Resistance to Flow	6	3
Monthly exam (2)	2	1
Measurement of sediment discharge.	2	1
General revision review	2	1
Total	**30**	**15**

Grading Policy:

Two Quizzes	10pts
Two Homework and Classwork	5pts
One Monthly Exam	10pts
Term Exam	15pts
Final Exam	60pts
Total	100pts

Water supply system
DWR 493

Academic Year	:	2022-2023
Credit hours	:	2
Course type	:	Elective (E)
Instructor	:	Dr. Mena Ahmed Alsawaf
Instructor E-mail	:	m.alsawaf@uomosul.edu.iq
Pre-requisites	:	None

Catalog Description:

The aim of this course is to introduce the students the main types of water city supply systems, the main networks and how to control it. Also, the requirement to supply water and cover a whole area, with the fitting that have to use with networks. The branched channel and how to connect also covered and pumping system. Small networks have been analyzed flowed by a discussion to improve the efficiency of the networks. This will be achieved through descriptive lectures with supervised tutorials.

Text Books:
- Mays, L.W., 2000. *Water distribution system handbook*. McGraw-Hill Education.
- McGhee, T.J. and Steel, E.W., 1991. *Water supply and sewerage* (Vol. 6). New York: McGraw-Hill.

Graduate outcomes (GOs) addressed by the course:

i	ii	iii	iv	v	vi	vii
√	√					

Course Outcomes (CLOs)

On successful completion of this course students will be able to:
- Recognize the common types of networks to supply water in a city (i)
- Recognize the common limitations and requirements to supply water (i)
- Apply the basic concepts of sciences and engineering to solve issues associated with small networks(i)
- Formulate the main parameter to affect the networks of supplying water, fitting and pumps(ii)

Weekly Teaching Plan:

Subject	Credit hours	No. of Weeks
Introduction to the main types of city supply systems, with limitations	4	2
Measuring the required to supply water, discharge and pressure.	4	2

Identify the main usage for each type of the networks	2	1
Minor losses of the fittings	4	2
Connect pipes in parallel and series	4	2
Branched channel, connect with tanks	4	2
Hardy- cross method to measure discharge in each pipe of a networks	4	2
Pumps: connections and efficiency	4	2
Total	**60**	**15**

Grading Policy:

5 class works	10pts
2 monthly Exam	30pts
Final Exam	60pts
Total	100pts