KOMAR UNIVERSITY OF SCIENCE AND TECHNOLOGY (KUST)

Sanitary Engineering			
Course Title	Sanitary Engineering		
Course Code	CVE4380	No. of Credits	3
Department	Civil Engineering	College	Engineering
Pre-requisites Course Code	CVE3050	Co-requisites Course Code	
Course Coordinator	Dr. Yaseen A. Hamaamin		
Email	Yaseen.ahmed@komar.edu.iq	IP No.	
Other Course Teacher(s)/Tutor(s)	None		
Class Hours	S1: Monday & Wednesday:{14:00-15:30} S2: Monday &Wednesday{16:00-17:30}		
Contact Hours	Monday & Wednesday:{14:00-15:30}; {16:00-17:30}		
Course Type	College Requirements		
Offer in Academic Year	Spring 2016		

COURSE DESCRIPTION

This course introduces the student to water and wastewater engineering topics including supply of safe and potable water for human uses. Detailed water treatment units design, starting from a water source and following the water flow from the intake to clarifiers then to the filters subsequently the disinfection process and finally the distribution system network are all covered in detail in this course. On the other part of the course, stormwater drain and sanitary sewer collecting systems are also covered along with stormwater management processes. The collecting systems and methods of the treatment for contaminated wastewater are described in this course to be treated before effluent the sewage to the environment.
The topics of wastewater treatment including preliminary treatment, primary treatment, secondary treatment, tertiary treatment, and sludge handling or residuals management are covered as well.

COURSE LEARNING OUTCOMES (ABET)

After participating in the course, students would be able to:

1- Apply knowledge of mathematics, science and engineering in sanitary engineering field (ABET program outcome- a).
2-Design a system, component, or process to meet desired needs of water and wastewater management and treatment (ABET program outcome - c).
3-Identify, formulate, and solve sanitary engineering problems (ABET program outcome - e).
4- Use the techniques, skills, and modern engineering tools necessary for water and wastewater engineering practices (ABET program outcome - k).

GUIDELINES ON GRADING POLICY

A	95-100%		C-	65-69%
A-	94-90%		D+	60-64%
B+	87-89%		D	55-59%
B	83-86%		D-	50-54%
B-	80-82%		F	0-49%
C+	75-79%		I	Incomplete
C	70-74%		W	Withdrawal

Note: Minimum Passing Grade is 65%

Course Content

Course Topics includes (but not limited to) the followings:

1. Different Demands and Uses of Water
2. Sources of Drinking Water.
3. Distribution Pipe Networks.
4. Storage Water Tanks Capacity
5. Design of Water Treatment Plants Units (intake, flocculating and sedimentation basin, filters, etc.)
6. Disinfection of water using Chlorine and UV.
7. Wastewater types and characteristics
8. Design of Wastewater Collecting Pipe Networks
9. Wastewater Treatments Plants
10. Different Stages of Wastewater Treatment
11. Sludge Treatment
12. Wastewater Reuse

COURSE TEACHING AND LEARNING ACTIVITIES

Course Learning and Teaching Activities:

1-Class explanation and interactive discussion
2-Handouts
3- Solving design examples and problems
3-In class group discussion and problem solving
4- Homework and assignments
5- Explanation scientific videos and photos
6- Engineering projects
6-Quizes and tests
7- All students will have opportunity to obtain extra credit points through the semester, depending on his/her academic performance and hardworking. However the extra credit will not exceed one full letter grade of the student's total grade for the quarter.

COURSE ASSESSMENTS TOOLS

Assessment tool	Description	Weight
Quizzes	5	15%
Homework & assignments	4	10%

Project	1	10%
Midterm Test	1	25%
Test	1	10%
Final Exam	1	30%
Extra Mark	All students will have opportunity to obtain extra credit points through the semester, depending on his/her academic performance and hardworking. However the extra credit will not exceed one full letter grade of the student's total grade for the quarter.	

ESSENTIAL READING

Key references:

1- Davis, Mackenzie Leo. "Water and Wastewater Engineering." McGraw-Hill, (2010).
2- Terence J. McGhee." Water Supply and Sewerage." 6th Ed. McGraw-Hill, (1991).

Useful references:

1- A. C. Twort, D. D. Ratnayaka and M. J. Brandt." Water Supply" Elsevier Ltd, (2006).
2- George, Tchobanoglous, L.B Franklin & H.D. Stensel. "Wastewater engineering treatment and reuse." Metacalf &Eddy, Inc., New York (2003).

COURSE POLICY (Including plagiarism, academic honesty, attendance etc)

KUST Academic Policy
http://sar.komar.edu.iq/files/Student%20hand%20Book%202013.pdf

Attendance:
- Students are expected to attend all lectures and must attend all examinations, quizzes, and practical exercises.
- Faculty need not give substitute assignments or examination to students who miss classes without official permission.
- Student must arrange with the faculty to make-up the missed class.
- Students are subject to the regulation and policies mentioned in the KUST Student Handbook.
- KUST guidelines for lateness are as follows: Three occasions of lateness count as one absence. (You can be considered in lateness from the 10th minute).

Make-up Policy
Since all examinations are announced in advance, zero grade will be given to any missed examination unless a student has an acceptable reason such as illness (MUST bring MC), for not being able to take the examination during all those days when the examination was announced.

Homework Policy
Students are expected to complete homework to be turned in the next day of class at the beginning of the period. (unless otherwise specified) The homework must be headed with name, date, and the problems assigned. Late homework / projects will result in a 20% reduction of credit. Students must be prepared in case to present homework problems on the board the next day. Copying of homework will result in a zero grade.

Academic Dishonesty
Students who violate university standards of academic integrity are subject to disciplinary sanctions, including failure in the course and further punishment by the University Consul.

GUIDELINES FOR SUCCESS

1. Keep hands, feet, and objects to self. (Respectful)
2. Use appropriate volume, words, tone, and body language. (Respectful)
3. Follow directions the first time given. (Cooperative)

4. Complete all assigned tasks. (Responsible) 5. Raise hand for help and to leave assigned area. (Responsible)

COURSE CALENDAR

Please check the academic calendar for KUST (Spring 2016)

https://docs.google.com/a/komar.edu.iq/viewer?a=v&pid=sites&srcid=a29tYXIuZWR1LmlxfG9zYXJ8Z3g6MTA1MmU2Mjk0NDM0ZTc0ZQ

Week	Day	Date	Topics (Chapters)	Course Learning Outcomes	Course Objectives per Topic
1	MON	29-Feb-16	Sanitary Engineering	CLO1	Introduction to Sanitary Engineering and water supply
	WED	02-Mar-16	Demands of Water	CLO3	Different demand and consumption of water
2	MON	07-Mar-16	Fire Flow and Fire Hydrant Flow Calculations	CLO 1 &4	Estimating of water flow required for fire fighting and control of fire
	WED	09-Mar-16	Automatic Fire Sprinkler Systems	CLO 1 &4	Design of Sprinkler Fire control System, showing its importance compared to fire hydrants using scientific videos **Quiz no.1**
3	MON	14-Mar-16	Design Period, Design Capacity and Population Forecasting	CLO 1&2	Estimating and prediction the design flow rate for designing water treatment plant units
	WED	16-Mar-16	Design Flow Capacity Example	CLO 2	Calculating design capacity for a community to be used for treatment plant units design **Homework no.1 due date**
	SUN	20-Mar-16	Newroz Holiday		
	THR	24-Mar-16			
5	MON	28-Mar-16	Water Quality Criteria and Limitations	CLO 3	Introducing to water quality criteria and limitation
	WED	30-Mar-16	Surface Water Sources	CLO 1& 3	Surface water sources and reservoir volume calculations **Quiz no.2**
6	MON	04-Apr-16	Ground Water Sources	CLO 3	Ground water sources types and flow calculation

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	WED	06-Apr-16	Methods of Water Distribution and Network Elements	CLO 1	Water distribution network methods, network elements and storage amount calculations
7	MON	11-Apr-16	Dead-end Water Distribution Pipe Networks	CLO 2	Design example for dead-end Water distribution Network systems **Homework no.2 due date**
	WED	13-Apr-16	Design of connected-end water distribution systems (EPANET)	CLO 2&4	Introduction to pipe networks design using EPANET software
8	MON	18-Apr-16	Design examples for water networks using (EPANET)	CLO 4	In class design examples for water distribution networks using EPANET **Quiz no.3**
	WED	20-Apr-16	Water Supply Treatment Plants	CLO 3	Water treatment importance and units used for the treatment, for clarification scientific videos also will be used
9	FRI	22-Apr-16	Mid-Term Exam		
	THR	28-Apr-16			
10	MON	02-May-16	Clarification (Coagulation and Flocculation)	CLO 3 &4	Coagulation and flocculation in water treatment process
	WED	04-May-16	Sedimentation and Settling Theory	CLO 3&4	Sedimentation of suspended particles and settling theory **Homework no.3 due date**
11	MON	09-May-16	Sedimentation Basin Design	CLO 3	Design examples for sedimentation basins in water treatment plants
	WED	11-May-16	Filtration, granular filtration	CLO 4	Mechanism of filtration, also granular filtration types and mechanisms **Quiz no. 4**
12	MON	16-May-16	Design of Rapid Sand Filters	CLO 3&4	Design example for rapid sand granular filters
	WED	18-May-16	Membrane Filtration	CLO 4	Membrane filtration types and usages
13	MON	23-May-16	Disinfection and Clear Well Design	CLO 2&4	Mechanism of different types of disinfections such as chlorination, ozone and UV

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	WED	25-May-16	Wastewater Engineering	CLO 1	Wastewater treatment importance and types of sewer systems with aid of scientific videos **Quiz no.5**
14	MON	30-May-16	Runoff and stormwater calculation	CLO 1&3	Runoff amount calculation using rational formula
	WED	01-Jun-16	Design of Sewer Pipe Systems	CLO 2%3	Design of gravity flow sewer pipe in general
15	MON	06-Jun-16	Gravity Flow Sewer Design Example	CLO 2	Design example on sewer pipes systems
	WED	08-Jun-16	Stages of Wastewater Treatments	CLO 3	Wastewater treatment levels and stages, preliminary, primary, secondary and tertiary **Homework no.4 due date**
16	MON	13-Jun-16	Sludge Handling and Treatment	CLO 3 &4	Solid waste from treatment plant management
	WED	15-Jun-16	Wastewater Reuse	CLO 3&4	Wastewater reuse as a sustainable management saving water resources **Test**
17	MON	20-Jun-16	Wastewater reuse plants	CLO 3&4	Function and units of wastewater reuse units using scientific videos **Project due date**
	WED	22-Jun-16	Wastewater reuse plant units & final exam review	CLO 4	Knowledge and function of wastewater reuse plants and review for final exam
	THR	23-Jun-16	(Last day of Class)		
	FRI	24-Jun-16	Final Exam Week		
	SAT	25-Jun-16			
18	SUN	26-Jun-16			
	MON	27-Jun-16			
	TUE	28-Jun-16			
	WED	29-Jun-16			
	THR	30-Jun-16			
	SUN	03-Jul-16	Last Day of Semester		