KOMAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
(KUST)

HYDRAULICS ENGINEERING AND LAB SYLLABUS			
Course Title	Hydraulics Engineering and Lab		
Course Code	CVE3340C	**No. of Credits**	3 CH
Department	PTE, CVE, ENV	**College**	Engineering
Pre-requisites Course Code	PHY1410C/MEE3315C	**Co-requisites Course Code**	
Course Coordinator(s)	Hamid Farangis Zadeh		
Email	hamid.zadeh@komar.edu.iq	IP No.	114
Other Course Teacher(s)/Tutor(s)			
Class Hours	Section : Sunday / Tuesday 10:00 – 11:30, Room: 110		
Office Hours	Monday 10:00 – 12:00 (on the third floor, Room 308)		
Course Type	College Requirement		
Offer in Academic Year	Fall 2015		

COURSE DESCRIPTION

This course serves as a quantitative introduction to the principles of Hydraulics and its applications in industrial and engineering problems. The course covers the fundamentals of fluid mechanics and hydraulics, including analyzing forces related to hydrostatics and hydrodynamics, water flows in closed and open channels, and losses in piping systems. Additional topics to be covered include hydraulic machinery such as pumps and turbines, measurement of flow, and the design of hydraulic structures. The Lab offers experiments in fundamental and applied fluid mechanics.

COURSE OBJECTIVES

The primary aim of this course is to give engineering majors a strong background of flow systems in closed and open hydraulic systems, so that students will get in depth understanding of several water motion behaviors like steady and unsteady flows. It is designed to provide detail computation for studying, analyzing and design of components of hydraulic systems such as pipes, channels and machines. In this course experimental works are included that can help students to learn and visualize different hydraulic phenomena in a laboratory environment.

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COURSE LEARNING OUTCOMES

After participating in the course, you should be able to:

1) Describe the major fundamentals of fluid mechanics (ABET a, e),
2) Calculate water pressures and forces on submerged and floating bodies (ABET a, e),
3) Calculate velocity and pressure at any point in a closed conduit using Bernoulli's equation (ABET a, b, e),
4) Determine frictional losses in a pipeline using the Darcy-Weisbach and Hazen-Williams formulas (ABET a, b, e),
5) Analyze typical pipeline networks using the Hardy Cross method and computer spreadsheets (ABET a, e, k),
6) Select a pump using standard manufacturer pump performance charts (ABET a, e),
7) Calculate the normal depth and velocity of flow in an open channel using Manning's Equation (ABET a, e),
8) Use specific energy principles to analyze hydraulic jumps (ABET a, b, e),
9) Perform analyzes of typical hydraulic structures such as dams, weirs, spillways, and culverts (ABET a, e), and,
10) Estimate flows in pipes and open channels using data from various fluid flow devices, such as Venturi meters, orifices, and weirs(ABET a, b, e),

*ABET criteria:

http://www.abet.org/eac-criteria-2014-2015/

GUIDELINES ON GRADING POLICY

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

Note: Passing Grade is 65% and above

COURSE CONTENT

1) Properties of fluids,
2) Fluid/Hydro statics,
3) Fluid/Hydro dynamics,
4) Dimensional analysis,
5) Flows in closed conduits,
6) Losses in pipes,
7) Open channel flows,
8) Hydraulic machinery, and,
9) Fluid flow measurements.

CLASS REQUIREMENT

1) A scientific calculator, and,
2) Notebook.

COURSE TEACHING AND LEARNING ACTIVITIES

This course will carried out in 3 hours, 2 times lecture per week. The semester has 15-instructional weeks followed by one week of exam. Course instructor will:

- Utilize power point presentation to present the course information.
- The board space to calculate problems with students.
- There will be in class group work, where student will do in class exercises and turn the assignment to the instructor.

COURSE ASSESSMENT TOOLS

Assessment Tool	Description	Weight
Lab activities	There will be 4-5 labs during the course in the semester. Lab quizzes will be given based on preparation of the course (ABET a and b).	**20%**
Homework	The HWs will be conducted during the semester; each HW will be given as scheduled and posted on Google Classroom (ABET a, e, and k).	**10%**
Quizzes	Quizzes are scheduled as shown in the semester schedule. Students will take 4 quizzes; all quiz grades will be counted toward your final grade (ABET a and e).	**10%**
Tests	Two tests will be conducted during the semester, each with 7.5% of the total grade. The tests will include multiple-choice questions, True/False, short answers, and problem solving (ABET a and e).	**15%**
Mid-term Exam	The students should find the mid-term exam easer because it will be similar to the cases studied during the semester, but more updated (ABET a and e).	**15%**
Final Exam	The final exam will be designed to cover all the students' learning outcomes for this course. It will be a closed book exam and no materials are allowed except the one that will be given by the instructor (ABET a and e).	**30%**

ESSENTIAL READINGS: (Textbook and References)

Textbook:

Civil Engineering Hydraulics
Authors: Featherstone, R. E. and Nalluri, C.
Publisher: Blackwell Science; 3 edition (1995)
ISBN: 0632038632

References:

- Introduction to Fluid Mechanics,
  by Fox, R., McDonald, A., and Pritchard, P., 6th edition, ISBN: 0471202312,
- Fluid Mechanics,
  by Kundu, P., Cohen, I., and Dowling, D., 5th edition, ISBN: 9780123821003,
- Fluid Mechanics and Hydraulics,
  by Giles, R., Evett, J., and Liu, C., 3th edition, ISBN: 0070205094.

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.
- There is no make-up work for 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 late the first minute of the lecture time).

GUIDELINES FOR SUCCESS

1) Work both independently and in groups of your study of peers, who can help you understanding the course material.
2) Pay a full attention in the class when your instructor explain the lesson, if you understand 70% directly from the instructor, then the 30% will be just practice exercises.
3) Understanding more than memorizing will help you a lot in passing exams.
4) Working many problems beyond the assigned homework will help mastering.
5) Ask a question when something is not clear.
6) Finally, attend every lecture and getting missed material is your responsibility.

E-MAILETIQUETTEOF COMMUNICATION

Please note the following in regards to e-mail communication:

1) It is your responsibility to update your Komar-email address daily for course updates. Faculty will not be able to contact you if you fail to have an email address and you could potentially miss important information about the course.
2) Email will only be answered if it comes from Komar-email address. Faculty will not respond to unprofessional email addresses.
3) Mail should have a subject heading which reflects the content of the message.
4) Your message should begin with an appropriate salutation, including the name of the person being addressed, and end with thanks followed by your full name of the sender.
5) Emails that do not follow the above guidelines, or are written in an unprofessional and / or disrespectful manner as well as anonymous emails will not be addressed.
6) Failure to check e-mail or Google Classroom may result in you missing important assignments and subsequently affect your grade.

CELL PHONES

All cell phones and beepers are expected to be switched to vibrating mode if available and turned off completely if this feature is not an option. Disruption of class due to beepers or a cell phone will not be tolerated and the student will be asked to leave class. All other electronic equipment that the faculty member deems not essential to the provision of academic learning is prohibited from being used in class.

REVISIONTO THE SYLLABUS

This syllabus is subject to change. It is the duty of the instructor to inform students of changes in a timely fashion after approval of Quality Assurance Office (QAO).

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LAB REPORT FORMAT

Lab Reports are due one week after the scheduled lab session and no credit will be given for late lab reports. The lab report grades are based on how well the reports meet the below criteria and constitute 20% of the final grade.

- *Absent from Lab*: If you are absent from a lab period, you may make-up the lab in another section, given there is available space and approvable from instructor
- *Lab Report Format*: Lab reports must be typed using Microsoft Word or legibly hand written. All hand calculations and data collected in the lab must be attached to the lab report in order to receive credit.

All Lab reports will consist of the following sections. (Sample Lab Report Format can be found on Google Classroom)

- **Cover Sheet:** your name, group members' names, lab name, date lab was conducted [see Cover Sheet Template]
- **Introduction/Objective:** The purpose of the experiment, the physical phenomenon observed and the concept or numerical constant to be verified.
- **Data**
  Original data obtained from your procedure is usually presented in tables with units.
- **Calculations and Results:** Display the data collected and the results obtained expressed as a neatly organized table of data, the mathematical models used and the calculations derived from the data, graphs of results with clearly labeled axes. Calculations used in the experiment should be included in a clear and organized manner.

  Discussions/Conclusions: An explanation and interpretation of the results and how they compare to the stated objective. Patterns and trends should be identified and related to supporting or refuting your hypothesis. Possible sources of errors should be discussed and the percent error from the accepted values should be indicated when appropriate. Questions related to the experiment should be included and answered as completely as possible. This section will have the strongest determination for your grade.

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Course calendar: Please check the academic calendar for Fall 2015

***Note: any attempt from your side for rescheduling any of the quizzes, exam or even homework is not accepted**

Date	Week	Subject	Activities
28 Sep-01 Oct	**1**	Introduction to fluid mechanics	
04 – 08 Oct	**2**	**Chapter 1:** Properties of fluids	
11 – 15 Oct	**3**	**Chapter 2:** Fluid/Hydro statics	
18 – 22 Oct	**4**	**Chapter 3**: Fluid/Hydro dynamics…	HW # 1
25 – 29 Oct	**5**	**Test 1 (1, 2, 3)**	
		Chapter 3: … continue …	
01 – 05 Nov	**6**	**Chapter 4:** Dimensional analysis	Quiz #2
08 – 12 Nov	**7**	**Chapter 5:** Flow in closed conduits	Exp. 1
			HW # 2
16 – 21 November Midterm Week (1, 2, 3, 4 & 5)			
22 –26 Nov	**8**	**Chapter 5:** … continue …	
29 Nov-03 Dec	**9**	**Chapter 6**: Losses in pipes	Quiz #3
06 – 10 Dec	**10**	**Chapter 7:** Open channel flows	Exp. 2
			HW # 3
13 – 17 Dec	**11**	**Chapter 7:** … continue …	
		Test 2 (5, 6 & 7)	
20 – 24 Dec	**12**	**Chapter 8:** Hydraulic machinery	Exp. 3
27 – 31 December New Year Holidays			
03 – 07 Jan	**13**	**Chapter 8:** … continue …	Quiz #4
10 – 14 Jan	**14**	**Chapter 9:** Fluid flow measurement	Exp. 4
			HW # 4
17 – 21 Jan	**15**	**Review week**	Exp. 5
24 – 31 January Final Exam			

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Based on the availability of the labs (devices), totally five experiments are going to be done during this semester.
A list of these experiments is:

	Experiment
1	Reynolds Number
2	Bernoulli Theorem Apparatus
3	Pipe Friction
4	Minor Losses
5	Hydraulic Jump