



Course Specifications

Course Title:	Hydraulic Engineering
Course Code:	CE 427
Program:	B.Sc. in Civil Engineering
Department:	Civil Engineering
College:	Jubail University College
Institution:	Jubail University College

Table of Contents

A. Course Identification	3
6. Mode of Instruction (mark all that apply)	3
B. Course Objectives and Learning Outcomes	3
1. Course Description	3
2. Course Main Objective.....	3
3. Course Learning Outcomes	4
C. Course Content	4
D. Teaching and Assessment	5
1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods	5
2. Assessment Tasks for Students	5
E. Student Academic Counseling and Support	6
F. Learning Resources and Facilities	6
1. Learning Resources	6
2. Facilities Required.....	6
G. Course Quality Evaluation	6
H. Specification Approval Data	7

A. Course Identification

1. Credit hours:	3
2. Course type	
a.	University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b.	Required <input type="checkbox"/> Elective <input checked="" type="checkbox"/>
3. Level/year at which this course is offered:	Level 6, Third Year Level 7, Fourth Year
4. Pre-requisites for this course (if any):	CE 205 Engineering fluid Mechanics
5. Co-requisites for this course (if any):	None

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	✓	100
2	Blended		
3	E-learning		
4	Correspondence		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
Contact Hours		
1	Lecture	45
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	Total	45

B. Course Objectives and Learning Outcomes

1. Course Description
<i>CE 427 Hydraulic Engineering (3-0-3)</i> <i>Pre-requisite: CE 205</i>
Open channel concepts leading to the development of gradually varied flow computation, Flood routing, Spillways and their types, Spillways profiles, Design of hydraulic structures, Hydraulic models and similitudes; fundamentals of pumps and turbines, selection of pumps, Pumps in Series, Pumps in parallel, computer aided profile computation
2. Course Main Objective
The main purpose of this course is to prepare students to understand open channel flow under various hydraulic conditions and to have the knowledge of various hydraulic factors involved in the design of hydraulic structures, pumps and turbines.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding N/A	
2	Skills :	
2.1	Apply the knowledge of hydraulic engineering, hydraulic models and similitude and its application in similarity studies.	1
2.2	Measure the efficiency of pumps and turbines	1
2.3	Design the elements of hydraulic structures	2
2.4	Analyze uniform flow computation, flood routing and development of gradually varied flow in an open channel	1
2.5	Prepare water surface profiles in an open channels using computer application	1
3	Values N/A	

C. Course Content

No	List of Topics	Contact Hours
1	Unit 1: Open Channel Flow OR Gravity Flow 1.1 Properties of open channels 1.2 Definition of geometric elements of a channel 1.3 Flow classification, equation of motion and continuity equation 1.4 Conservation of energy & energy coefficient 1.5 Uniform flow computations, Chezy & Manning equation 1.6 Specific energy concept and curve 1.7 Computation of critical flow Hydraulic jump	9
2	Unit 2: Gradually Varied Flow 2.1 Uniform, rapidly varied and gradually varied flow 2.2 Water surface profiles and classification 2.3 Characteristics of water surface profile curves 2.4 Computation of water surface profiles 2.5 Computation of gradually varied flow 2.6 Hydraulic Design of Open Channels (economical section) 2.7 Flood routing	9
3	Unit 3: Hydraulic Structures 3.1 Functions of hydraulic structures, 3.2 Dams, functions and classification (Gravity, arch, buttress, earth) 3.3 Stability of dams 3.4 Weirs 3.5 Spillways and their types 3.6 Spillways profiles 3.7 Culverts (types and hydraulic design) 3.8 Reservoirs 3.9 Stilling basins	9
4	Unit 4: Hydraulic Models and Similitude	9

	4.1 Application of models and similitude, 4.2 Dimensional homogeneity 4.3 Geometric, kinematic and dynamic similarity	
5	Unit 5: PUMPS AND TURBINES 5.1 Types of pumps and turbines, 5.2 Components of pumps and working principle 5.3 Efficiency of pump 5.4 Pumps in Series 5.5 Pumps in parallel 5.6 Hydraulic turbine	9
Total		45

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge and Understanding		
	N/A		
2.0	Skills		
2.1	Apply the knowledge of hydraulic engineering, hydraulic models and similitude and its application in similarity studies.	Interactive learning Self-directed and independent learning	Quiz 2, assignment 2 & final
2.2	Measure the efficiency of pumps and turbines		Assignment 2 & final
2.3	Design the elements of hydraulic structures		Midterm, quiz 2, assignment 2 & final
2.4	Analyze uniform flow computation, flood routing and development of gradually varied flow in an open channel		Quiz 1, assignment 2, midterm & final
2.5	Prepare water surface profiles in an open channels using computer application		Assignment 2, quiz 2, midterm & final
3.0	Values		
	N/A		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quiz 1	4	10%
2	Assignment 1	6	10%
3	Mid-term LT	8	20%
4	Quiz 2	12	10%
5	Assignment 2	14	10%
6	Final Exam LT	17-19	40%

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

- Office hours 6 hr/week; students can go in times of office hours for teacher to explain what could not be understood from the lesson.
- Students can communicate with a staff member outside the official working hours by email.
- Students are also encouraged to visit their academic advisors.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Gupta, R.S. (2008), <i>Hydrology and Hydraulic Systems</i> , Illinois, USA: Waveland Press, Inc,
Essential References Materials	Robert, J. H., Ned, H. C. H., and Akan, A. O. (2010), <i>Fundamentals of Hydraulic Engineering Systems</i> , New Jersey, USA: Pearson Education, Inc, Chanson, H. (2004), <i>Hydraulics of Open Channel flow</i> , Melbourne, Australia: Elsevier Ltd
Electronic Materials	http://ascelibrary.org/journal/jhend8
Other Learning Materials	N/A

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Lecture rooms with a capacity of at least 25 students and fitted with multimedia projector and a computer.
Technology Resources (AV, data show, Smart Board, software, etc.)	None
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment as per QMS-Policy-006 Feedback Survey, QMS-QAP-116 Monitoring Students' Satisfaction	Students	Indirect: Analyzing the results of the following surveys Course Evaluation Survey (CES), Program Evaluation Survey (PES),

Evaluation Areas/Issues	Evaluators	Evaluation Methods
		Student Experience Survey (SES)
Quality of Exam papers and Verifying Standards of Student Achievement as per QMS-Policy-004 Policy for Examinations and Marking, QMS-ACP-102 Procedure for Marking Examinations	Examination Committee	Direct: Peer review of examination papers and review or double check a minimum of three or 10% of answer papers. Verifying the entries in the Activity Mark Sheet.
Achievement of learning outcomes as per QMS-Policy-001 Course Review, QMS-CDP-106, QMS-CDP-112 Curriculum Review	Faculty	Direct: Course Report (Section B-3)
Implementation of the action plans based on previous semester as per QMS-Policy-001 Course Review, QMS-CDP-106 Procedure for Course Review, QMS-CDP-112 Procedure for Curriculum Review	Faculty	Direct and Indirect: Course report (Section G-1, G-2)
Monitoring Teaching and Learning as per QMS-Policy-005 Monitoring of Teaching and Learning	Chairperson/Program Director/Course Director	Indirect: Feedback by Chairperson/Program director/Course director. Program Delivery Record.
Effectiveness of planned Teaching Strategies QMS-Policy-001 Course Review	Faculty	Indirect: Course Report (Section B-4)
Course effectiveness and planning for improvement as per QMS-Policy-001 Course Review, QMS-CDP-106 Procedure for Course Review, QMS- CDP-112 Procedure for Curriculum Review	Faculty	Direct and Indirect: Course report (Section G-3)
Verifying Standards of Student Achievement and Quality of Exam papers as per QMS-ACP-119 External Assessment Review	Assessment External Reviewer	Direct: Report of assessment external reviewer. Review of sample of ten or 10% of student's assessments and coursework scripts.

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Civil Engineering Department Council
Reference No.	REG MIN-CED-10
Date	27-04-2020

Appendix A
Revision Details

Revision no.	DESCRIPTION	Reference MoMs			
		DC		CDC	
		Sem	#	Sem	#
1	Revision of Course Teaching Strategies and action verbs based on the comments of NCAAA reviewer	392	4	392	4
2	Course Specification Template 2018	402			