



Course Specifications

Course Title:	Design of Pavement
Course Code:	CE 432
Program:	B.Sc. in Civil Engineering
Department:	Civil Engineering
College:	Jubail University College
Institution:	Jubail University College

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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 308 Structural Materials
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

<p>1. Course Description</p> <p><i>CE 432 Design of Pavement (3-0- 3)</i> <i>Prerequisite: CE 308</i></p> <p>Stresses and strains in flexible pavement; stresses and strains in rigid pavements, advanced materials studies; material characterization; drainage design; advanced highway pavement design (flexible and rigid); design of overlays; Introduction to airport pavement design; airport pavement design, computer applications; practical pavement design project of a road and airport</p>
<p>2. Course Main Objective</p> <p>The main purpose of this course is to prepare students to introduce the concepts of design, performance, and analysis of rigid and flexible pavements. The course will focus on the review of engineering materials used for pavement construction, empirical and mechanistic design methodologies for pavement construction and influence of traffic loading on pavement performance. The course will serve as the primary undergraduate pavements course as well as a stepping-stone for advanced study in pavements.</p>

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding	
	N/A	
2	Skills	
2.1	Analyze the stresses in rigid and flexible pavements	1
2.2	Design the flexible pavements	2
2.3	Design the rigid pavements	2
2.4	Design the overlay of pavements.	2
2.5	Use software in the design of pavements	2
3	Values	
	N/A	

C. Course Content

No	List of Topics	Contact Hours
1	Unit 1. Introduction to pavement Design 1.1 Pavement types 1.2 Typical Cross Section of a Conventional Flexible Pavements 1.3 Typical Cross Section of a Rigid Pavements 1.4 Introduction to design methods of Pavements	3
2	Unit 2. Behavior of pavements under dynamic loads 2.1 Pavement components 2.2 Road Test 2.3 Pavement distress and performance.	3
3	Unit 3. Stresses in flexible pavements. 3.1 Component of Stresses under Axisymmetric Loading 3.2 Vertical Stress due to Circular Loading 3.3 Radial Stress due to Circular Loading 3.4 Vertical Deflection due to Circular Loading 3.5 Flexible Pavements on Layered Systems	6
4	Unit 4. Stresses in rigid pavements. 4.1 Stresses Due to Curling 4.2 Bending of Infinite Plate 4.3 Curling Stresses in Finite Slab 4.4 Stress Correction Factor for Finite Slab 4.5 Closed Form Formulas	6
5	Unit 5. Traffic loads and its characteristics, Material characterization. 5.1 Equivalent Single-Wheel Load 5.2 ESWL Based on Equal Vertical Sub Grade Stress 5.3 Resilient Modulus 5.4 Modulus of Sub grade Reaction	6
6	Unit 6. Design of flexible highway pavements and airport pavements 6.1 Climate Models 6.2 Structural Model 6.3 Asphalt Institute Method 6.4 AASHTO Method	9
7	Unit 7. Design of rigid highway pavements and airport pavements. 7.1 Portland Cement Association Method	9

	7.2 AASHTO METHOD 7.3 Design Chart for Rigid Pavements	
8	Unit 8. Overlay design and computer applications 8.1 Types of Overlays 8.2 Asphalt Institute Method	3
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	Analyse the stresses in rigid and flexible pavements	Independent learning Interactive learning	Quizzes, Midterm, Assignments, Final
2.2	Design the flexible pavements	Interactive learning	Quizzes, Midterm, Assignments, Final,
2.3	Design the rigid pavements	Co-operative learning	
2.4	Design the overlay of pavements.	Independent learning	
2.5	Use software in the design of pavements	Independent learning Interactive learning	Assignments
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	Huang, Y.H. (2004). Pavement Analysis and Design.. New Jersey, USA: Prentice-Hall.
Essential References Materials	Nawy, E. G. (2008), Reinforced Concrete: A fundamental Mallick, R. B. and El-Korchi, T. (2008). Pavement Engineering. Florida ,USA: CRC Press Book Papagiannakis, A.T. and Masad, E. A. (2008) . Pavement Design and Materials. New York USA: John Wiley & Sons
Electronic Materials	None
Other Learning Materials	<i>AASHTO Guide for Design of Pavement Structures</i> , American Association of State Highway and Transportation Officials, 1993. Pavements design software (PAVERS, PaveXpress).

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, a PC and Internet to show the students real cases from pavements construction field.
Technology Resources (AV, data show, Smart Board, software, etc.)	Pavement design software (PAVERS, PaveXpress)
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), 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		

Evaluation Areas/Issues	Evaluators	Evaluation Methods
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			