Course Specifications

Course Title:	Structural Analysis I
Course Code:	CE 309
Program:	B.Sc. in Civil Engineering
Department:	Civil Engineering
College:	Jubail University College
Institution:	Jubail University College

Table of Contents

A. Course Identification

1. Credit hours: 3	

2. Course type

a.   University ☐   College ☐   Department ☑   Others ☐

b.   Required ☑   Elective ☐

3. Level/year at which this course is offered: Level 4, Second Year

4. Pre-requisites for this course (if any)**:**

CE 204 Structural Mechanics I

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**	0
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	**45**

B. Course Objectives and Learning Outcomes

1. Course Description

CE 309 Structural Analysis I (3-0-3)   *Prerequisite: CE 204*

Shear force and bending moment diagrams for frames; influence lines for beams, frames and 2D trusses; displacement of beams by moment area, and conjugate beam methods; displacements of beams, frames and trusses by virtual work; analysis of statically indeterminate structures; method of consistent deformation, energy methods, slope-deflection and moment distribution; Analysis of columns. Analysis of Continuous beams by Three-moment theorem, Computer applications.

2. Course Main Objective

The main purpose of this course is to enable the students to differentiate between determinate and indeterminate structures and competently be able to solve the problems of determinate and indeterminate structures and to draw the shear and bending moment diagrams.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
	N/A	
2	**Skills**	
2.1	Calculate slope and deflection for determinate structures	1
2.2	Draw Shear force and bending moment diagrams for determinate frame.	1
2.3	Solve indeterminate structures	1
2.4	Determine maximum shear force and bending moment due to moving loads	1
2.5	Analyze the column for the critical load	1
3	**Values**	
	N/A	

C. Course Content

No	List of Topics	Contact Hours
1	**Unit 1: Shear and moment diagrams for frames** 1.1 Review of the concepts of statics and structural mechanics 1.2 Different types of structures and the concept of degree of indeterminacy of structures 1.3 Calculation of load transferred from different component of the structure 1.4 Free body diagram and Principle of superposition 1.5 Method to draw shear force and bending moment diagram for frames.	6
2	**Unit 2: Moment area theorems** 2.1 Introduction to the moment area theorems 2.2 Procedure for analysis 2.3 Examples on application of moment area method for determination of deflection of determinate structures.	3
3	**Unit 3: Conjugate beam** 3.1 Concept of conjugate beam. Theorems on conjugate beams 3.2 Procedure for analysis, examples on application of conjugate beam method for calculation of deflection of flexural members.	3
4	**Unit 4: Method of consistent deformation** 4.1 Analysis of structures by consistent deformation 4.2 Procedure for analysis, Solved examples on method of consistent deformation.	3
5	**Unit 5: Method of virtual work** 5.1 Review of strain energy and external work 5.2 Principle of virtual work, applications of principle of virtual work for determination of deflection of frames and truss 5.3 Procedure for analysis, Examples for determination of deflection by method of virtual work.	6
6	**Unit 6: Slope deflection equations** 6.1 Analysis of structures by slope deflection method 6.2 Equation of slope-deflection, analysis of indeterminate beam by slope-deflection method	6

	6.3	Procedure for analysis, solved examples on slope-deflection method.	
7	**Unit 7: Moment distribution method** 7.1 Introduction to moment distribution 7.2 Concept of stiffness factor, distribution factors and carry-over factor 7.3 Procedure for analysis, solved examples. 7.4 Computer Applications		6
8	**Unit 8: Moving Loads** 8.1 Introduction to the concept of influence lines 8.2 Influence lines for beams and frames 8.3 Influence lines for 2D trusses 8.4 Concept of absolute shear and moment.		6
9	**Unit 9: Analysis of Columns** 9.1 Types of Column with different end conditions 9.2 Slenderness ratio 9.3 Critical Load and Critical Stress of column		3
10	**Unit 10: Three-moment theorem** 10.1 Development of Three-Moment Theorem 10.2 Application of Three-Moment-equation for solving continuous beam problems		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	Calculate slope and deflection for determinate structures	Interactive learning Self-directed learning	Assignments, Written Exams (Quiz, Midterm, Final)
2.2	Draw Shear force and bending moment diagrams for structural frame.		
2.3	Solve indeterminate structures		
2.4	Determine maximum shear force and bending moment due to moving loads		
2.5	Analyze the column for the critical load		
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%

#	Assessment task*	Week Due	Percentage of Total Assessment Score
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 4 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	Hibbeler R.C. (2012), *Structural Analysis*, Singapore: Prentice Hall
Essential References Materials	Leet K. M., Uang C. M. and Gilbert. A. M. (2011), *Fundamentals of Structural Analysis*, Singapore: McGraw Hill. Kassimali A. (2015), *Structural Analysis*, Stamford, USA: Cengage Learning.
Electronic Materials	Online calculators from http://civilengineer.webinfolist.com/cecalc.htm
Other Learning Materials	None

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
		Indirect: Analyzing the

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	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 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			