



## Course Specifications

<b>Course Title:</b>	Structural Analysis II
<b>Course Code:</b>	CE 411
<b>Program:</b>	B.Sc. in Civil Engineering
<b>Department:</b>	Civil Engineering
<b>College:</b>	Jubail University College
<b>Institution:</b>	Jubail University College

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## A. Course Identification

<b>1. Credit hours:</b>	3
<b>2. Course type</b>	
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"/>
<b>3. Level/year at which this course is offered:</b>	Level 6, Third Year (Elective) Level 7, Fourth Year (Elective)
<b>4. Pre-requisites for this course (if any):</b>	CE 309 Structural Analysis I
<b>5. Co-requisites for this course (if any):</b>	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
<b>Contact Hours</b>		
1	Lecture	45
2	Laboratory/Studio	0
3	Tutorial	0
4	Others (specify)	0
	<b>Total</b>	<b>45</b>

## B. Course Objectives and Learning Outcomes

<p><b>1. Course Description</b></p> <p><i>CE 411 Structural Analysis II (3-0-3)</i> <span style="float: right;"><i>Prerequisite: CE 309</i></span></p> <p>Maxwell's law of reciprocal deflection, Application of Castigliano's theorems for solving indeterminate structures, Analysis of sway frames, Analysis of pin-jointed space frames, Analysis of cables, Analysis of three -hinged arch, two- hinged arch, and fixed arch, Approximate analysis of statically indeterminate structures, introduction to the flexibility and stiffness matrix methods for truss, beam and frame, computer applications.</p>
<p><b>2. Course Main Objective</b></p> <p>The main purpose of this course is to enable the students to solve determinate and indeterminate structures of beam and frame by using classical and advance methods of Structural Analysis.</p>

### 3. Course Learning Outcomes

CLOs		Aligned PLOs
1	<b>Knowledge and Understanding</b>	
	N/A	
2	<b>Skills</b>	
2.1	Apply suitable methods to solve the problems of pin-jointed frames	1
2.2	Apply appropriate method to solve the problems of indeterminate beams and frames	1
2.3	Analyze the problems of cables and arches with different end conditions	1
2.4	Use computer applications for analysis of structures	1
3	<b>Values</b>	
	N/A	

### C. Course Content

No	List of Topics	Contact Hours
1	<b><u>Unit 1: Energy methods for Indeterminate structures</u></b>	6
	1.1 Maxwell's law of reciprocal deflection	
	1.2 Application of Castigliano's theorem for solving indeterminate truss	
	1.3 Application of Castigliano's theorem for solving indeterminate beams and frames	
2	<b><u>Unit 2: Analysis of frames</u></b>	6
	2.1 Analysis of sway frames	
	2.2 Analysis of pin-jointed space frames by method of tension coefficients	
3	<b><u>Unit 3: Cables and Arches</u></b>	9
	3.1 Analysis of cables subjected to concentrated loads	
	3.2 Analysis of cables subjected to uniformly distributed loads	
	3.3 Analysis of arches; three-hinged, two-hinged and fixed-fixed	
4	<b><u>Unit 4: Approximate methods of analysis</u></b>	6
	4.1 Approximate analysis of indeterminate structures	
	4.2 Portal method of analysis	
	4.3 Cantilever method of analysis	
5	<b><u>Unit 5: Flexibility and Stiffness methods of analysis</u></b>	12
	5.1 Review of matrix algebra	
	5.2 Introduction to flexibility and stiffness matrix for structures	
	5.3 Truss Analysis using stiffness method	
	5.4 Beam and frame analysis by stiffness method	
6	<b><u>Unit 6: Computer applications in structural analysis</u></b>	6
	6.1 Application of computer software for analysis of plane frames and 3D frames	
	6.2 Application of computer software for analysis of space frames	
	6.3 Practice problems	
<b>Total</b>		<b>45</b>

## 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	<b>Knowledge and Understanding</b>		
	N/A		
2.0	<b>Skills</b>		
2.1	Apply suitable methods to solve the problems of pin-jointed frames	Interactive learning Self-directed learning	Assignments, Written Exams (Quiz, Midterm, Final)
2.2	Apply appropriate method to solve the problems of indeterminate beams and frames		
2.3	Analyze the problems of cables and arches with different end conditions		
2.4	Use computer applications for analysis of structures		
3.0	<b>Values</b>		
	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 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

<b>Required Textbooks</b>	Hibbeler R.C. (2012), <i>Structural Analysis</i> , Singapore: Prentice Hall
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<b>Essential References Materials</b>	Leet K. M., Uang C. M. and Gilbert. A. M. (2011), <i>Fundamentals of Structural Analysis</i> , Singapore: McGraw Hill. Kassimali A. (2015), <i>Structural Analysis</i> , Stamford, USA: Cengage Learning.
<b>Electronic Materials</b>	Online calculators from <a href="http://civilengineer.webinfolist.com/cecalc.htm">http://civilengineer.webinfolist.com/cecalc.htm</a>
<b>Other Learning Materials</b>	None

## 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	Lecture rooms with a capacity of at least 25 students and fitted with multimedia projector and a computer.
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	STAAD Pro Software
<b>Other Resources</b> (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 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,		

Evaluation Areas/Issues	Evaluators	Evaluation Methods
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

<b>Council / Committee</b>	Civil Engineering Department Council
<b>Reference No.</b>	REG MIN-CED-10
<b>Date</b>	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			