

## SYLLABUS: Computer Aided Engineering

**Date / Revision** Sept 2017  
**Faculty** Engineering  
**Study Program** Mechanical Engineering

### SUBJECT: COMPUTER AIDED ENGINEERING

#### 1 Basic Information

1.01	<b>Subject Name</b>	<b>COMPUTER AIDED ENGINEERING</b>
1.02	<b>Semester</b>	6
1.03	<b>Level</b>	
1.04	<b>SKS</b>	3
1.05	<b>Mandatory / Curriculum</b>	
1.06	<b>Subject Code</b>	SCAEN
1.07	<b>Subject Code</b>	
1.08	<b>Year</b>	2017
1.09	<b>Quality Control</b>	Final Test, see evaluation
1.10	<b>Limitations</b>	Min 12 and Max 32 students in one class
1.11	<b>Combined with</b>	
1.12	<b>Perquisite</b>	Engineering Drawing, Computer Aided Design
1.13	<b>Responsible</b>	
1.14	<b>Revision</b>	September 2017

#### 2 Description of Subject

The computer aided engineering course is focused to solve mechanical engineering problem by using finite element analysis.  
 The finite element analysis is an integral part of computer aided engineering by which, the students will learn basic procedures of FEM and implement the procedures for analysing beams, frames and plates.

### 3 Objectives

After completing the course, the student will:

- understand basic principles of computer aided engineering
- be able to describe the basic procedures of FEM
- be able to analyse simple beam, frame and plates

### 4 Competency

- Understand the basic principles of finite element method as an integral part of computer aided engineering
- To be able to perform stress and dynamics analysis on mechanical components using finite element analysis (FEA)

### 5 Learning Approach / Methodology

- Lectures/ Class contact (time-tabled) supplemented with interactive questions and answers;
- Student Study Effort: homework/assignment; preparation for test/quizzes/ examination.

### 6 Evaluation

5.1	<b>Absence maximum</b>	25%
5.2	<b>Participation in Discussion</b>	05 Points
5.3	<b>Homework / Classwork</b>	05 Points
5.4	<b>Presentation /Simulation</b>	10 Points
5.5	<b>Daily Quiz</b>	20 Points
5.6	<b>Final Examination</b>	60 Points
	<b>Total</b>	100 Points

### 7 Text Book and Reference

1	<b>Main Text Book:</b> The Finite Element Method in Engineering, (Fourth Edition); <i>Singiresu S. Rao</i> ; ISBN: 978-0-7506-7828-5; Publisher: Elsevier Inc.
2	<b>Supplement Textbooks:</b> -

8 Content / Topics of Lecture

Week	Content/Topics of Lecturing	Text Book	Remark
1	Introduction to Computer Aided Engineering <ul style="list-style-type: none"> <li>Overview of Finite Element Method: The finite element method is used to find solution of a complicated problem by replacing it by a simpler one.</li> </ul>	Chapter 1	
2	Discretization of the Domain: <ul style="list-style-type: none"> <li>The first step of finite element method is the discretization of the domain.</li> <li>It involves the discretization of the irregular domain into smaller and regular subdomains, known as finite elements.</li> </ul>	Chapter 2	
3	Interpolation Models: <ul style="list-style-type: none"> <li>interpolation functions or approximating functions or interpolation models</li> </ul>	Chapter 3	Quiz 1
4	Higher Order and Isoparametric Elements	Chapter 4	
5	Derivation of Element Matrices and Vectors: <ul style="list-style-type: none"> <li>The approaches used for derivation of characteristic matrices and characteristic element vectors.</li> </ul>	Chapter 5	
6	Assembly of Element Matrices and Vectors and Derivation of System Equations: <ul style="list-style-type: none"> <li>Assembly of vectors to obtain the characteristic equations of the entire system of elements</li> </ul>	Chapter 6	Quiz 2
7	Numerical Solution of Finite Element Equations: <ul style="list-style-type: none"> <li>Known problems in engineering mechanics: continuous or discrete problems.</li> <li>Introducing matrix techniques that are useful for the solution of finite element equations</li> </ul>	Chapter 7	
8	Semester Break		
9	Basic Equations and Solution Procedure: <ul style="list-style-type: none"> <li>General equations of solid and structural mechanics and their derivation and solution.</li> <li>The distribution of displacements and stresses under the stated loading and boundary conditions.</li> </ul>	Chapter 8	
10	Analysis of Trusses, Beams, and Frames: <ul style="list-style-type: none"> <li>The derivation of element equations for one-dimensional structural elements.</li> </ul>	Chapter 9	Quiz 3
11	Exercise: Analysis of Trusses, Beams, and Frames		
12	Analysis of Plates: <ul style="list-style-type: none"> <li>the inplane and bending analysis of plates</li> </ul>	Chapter 10	
13	Analysis of Three-Dimensional Problems: <ul style="list-style-type: none"> <li>The three-dimensional finite elements are used for the realistic analysis of certain three-dimensional problems.</li> </ul>	Chapter 11	
14	Exercise: Analysis of Plates		Quiz 4
15	Dynamic Analysis <ul style="list-style-type: none"> <li>The derivation of finite element equations for a dynamic problem.</li> </ul>	Chapter 12	