

**1. Preamble**

This course, CAD and Finite Element Analysis, deals with various modeling techniques and uses different numerical methods for solving a system of governing equations over the domain of a continuous physical system, which is discretized into simple geometric shapes called finite element.

**2. Pre-requisite**

1150ME202	Engineering Graphics
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**3. Links to other courses**

- Engine Design & Development

**4. Course Educational Objectives**

Students undergoing this course are expected to

- Achieve fundamental understanding of CAD models to solve diverse problems in Mechanical engineering.
- Gain practical experience in handling 3D modeling software's.
- Know the basic concepts in Finite Element Analysis and governing equation.
- Apply Finite Element Techniques to solve diverse problem in Mechanical Engineering

**5. Course Outcomes**

Upon the successful completion of the course, learners will be able to

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's)
C01	Describe the basics of CAD models and solid removal algorithm and Create 3D modeling and assembly of components	K2
C02	Describe the use of tolerance analysis and mass properties	K2
C03	Illustrate the knowledge of mathematical principles of finite element analysis.	K2
C04	Apply finite element techniques to solve 1D problems	K3
C05	Apply finite element techniques to solve 2D problems	K3

**6. Correlation of COs with Programme Outcomes :**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		L	M									L	H	H
CO2		L	M									L	H	H
CO3		L	M			L						L	H	H
CO4		L	M			L						L	H	H
CO5		L	H			L						L	H	H

H- High; M-Medium; L-Low

## **7. Course Content**

### **UNIT – I: INTRODUCTION TO CAD**

**L-6 T-6**

Creation of Lines, Surfaces, Solids, Using Solid Modeling Pack (Prismatic and Revolved Parts).Hidden - Line - Surface - Solid Removal Algorithms Shading - Coloring. Introduction to CAM Software - Edge Cam

### **UNIT – II: VISUAL REALISM AND ASSEMBLY OF PARTS**

**L-6 T-6**

Introduction to Parametric and Variational Geometry Based on Software's and Their Principles Creation of Prismatic and Lofted Parts Using These Packages. Assembly of Parts, Tolerance Analysis Mass Property Calculations, Mechanism Simulation.

### **UNIT – III: INTRODUCTION TO FINITE ELEMENT ANALYSIS**

**L-6 T-6**

Review of Basic Analysis – Stiffness and Flexibility Matrix for Simple Cases – Governing Equation and Convergence Criteria of Finite Element Method.

### **UNIT – IV: DISCRETE ELEMENTS**

**L-6 T-6**

Bar, Frame, Beam Elements – Application to Static, Dynamic and Stability Analysis.

### **UNIT – V: CONTINUUM ELEMENTS**

**L-6 T-6**

Various Types of 2-D-Elements Application to Plane Stress, Plane Strain and Axis Symmetric Problems.

**TOTAL: 60 periods**

## **8. Text Books**

1. Ibrahim Zeid “CAD/CAM -- Theory and Practice” 2<sup>nd</sup> Edition- McGraw Hill,International Edition, 2012.
2. David V.Hutton, “Fundamentals of Finite Element Analysis”, Tata McGraw-Hill Edition 2005.

## **9. References**

1. Reddy J.N. “An Introduction to Finite Element Method”,3<sup>rd</sup>Edition McGraw-Hill, 2005.
2. P.Seshu, “Text Book of Finite Element Analysis”, Prentice-Hall of India Pvt. Ltd. NewDelhi, 2009.
3. Tirupathi.R. Chandraputla and Ashok D. Belegundu, “Introduction to Finite Elements in Engineering”,4<sup>th</sup>Edition Prentice Hall India, Third Edition, 2011.