

Department of Mechanical Engineering

Semester: 7

Academic Year : 2021-22

Subject Code: ME18701

Subject Name: Finite Element Analysis

Teaching Methods	Type of learning
Online resources – Videos	Participative Learning
Use of digital pads	Participative Learning
PowerPoint presentations	Participative Learning
Assessment Methods	Type of learning
Quizzes	Participative Learning
Descriptive Assignments	Participative Learning
Activity Assignment	Experimental Learning
Flipped Classroom using Edpuzzle	Participative Learning


Col. Maheshwar, AP/ME

Course Instructor



Head of the Department

Sample Proof for Teaching Methods:

Online resources

S.No	Topics	Online resources Link	Mapping
1	Basics of FEM and its practical application	https://www.youtube.com/watch?v=Rp4PRLqKXXQ	UNIT 1
2	What is Finite Element Analysis	https://www.youtube.com/watch?v=boSLQYhDXoE	
3	Introduction to FEM	https://www.youtube.com/watch?v=C6X9Ry02mPU&t=627s	
4	Application of Vibration analysis in FEM	https://www.youtube.com/watch?v=pihYx0a3t-4	UNIT 4
5	Random Vibration analysis in ANSYS	https://www.youtube.com/watch?v=m7fAvQa59N4	

Use of Digital pads in Microsoft OneNote

OneNote for Windows 10 | MAHESWARAN M

Home Insert Draw View Help Class Notebook

Book Antiqua 18 B I U [Drawing Tools] [List Tools] [Table Tools] [Checkmark] Heading 1 Dictate

FEA

- UNIT 1
- UNIT 2
- CAT 1
- New Section 1
- UNIT 3
- UNIT 4

S3

14 August 2021 11:55 AM

Consider the differential equation for a problem such as $\frac{d^2y}{dx^2} + 300x^2 = 0, 0 \leq x \leq 1$

with the boundary conditions, $y(0) = y(1) = 0$, the functional corresponding to this problem to be extremized is given by

$I = \int_0^1 \left[-\frac{1}{2} \left(\frac{dy}{dx} \right)^2 + 300x^2y \right] dx$

Find the solution of the problem using Rayleigh Ritz method using a one term solution $y = ax(1-x^3)$

Weighted Residual

Rayleigh Ritz

energy

$y = ax(1-x^3)$

$x=0, y=0$
 $x=1, y=0$

$I = \int_0^1 \left[-\frac{1}{2} \left(\frac{dy}{dx} \right)^2 + 300x^2y \right] dx$

$y = a(x - x^4)$
 $\frac{dy}{dx} = a(1 - 4x^3)$

Sample Proof for Assessment Methods:

Activity Assignment



CAT 2 Assignment 2

Posted Sep 22, 2021

Activity Problem:

Take 3 photos in your house which can be analyzed as Plane stress, Plane strain and Axi-symmetric problem.

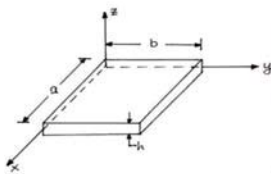
Upload the Photos and explain Why and how you will consider that as Plane stress/ Plane Strain / Axisymmetric .

Mark distribution:

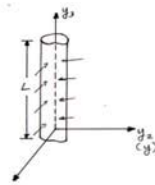
Legible Photos indicating Plane stress/ Plane strain / Axisymmetric example - 50 marks

Explanation - 50 marks

Plane Stress:



Plane Strain:



Axisymmetric:



Flipped Classroom using Edpuzzle

edpuzzle

+ Add Content

Introduction to Finite Element Method (FEM) for Beginners

By MAHESWARAN M. Due on Aug. 16th, 11:50pm

Introduction

- Nature operates via gradients
- Most of the systems are mathematically represented via the gradients ($\frac{df}{dx}, \frac{d^2f}{dx^2}, \nabla f$) or the differential equations

Solid Mechanics	Fluid Mechanics
$\frac{\partial \sigma_{xx}}{\partial x} + \frac{\partial \sigma_{xy}}{\partial y} + \frac{\partial \sigma_{xz}}{\partial z} + b_x = 0$ $\frac{\partial \sigma_{xy}}{\partial x} + \frac{\partial \sigma_{yy}}{\partial y} + \frac{\partial \sigma_{yz}}{\partial z} + b_y = 0$ $\frac{\partial \sigma_{xz}}{\partial x} + \frac{\partial \sigma_{xy}}{\partial y} + \frac{\partial \sigma_{zz}}{\partial z} + b_z = 0$	$\rho \left(\frac{\partial u}{\partial t} + u \cdot \nabla u \right) = -\nabla p + \nabla \cdot \left(\mu (\nabla u + \nabla u^T) - \frac{2}{3} \mu (\nabla \cdot u) I \right) + F$
Electromagnetics	
$\nabla \cdot E = \rho / \epsilon_0 \quad \nabla \cdot B = 0$ $\nabla \times E = -\frac{\partial B}{\partial t} \quad \nabla \times B = \mu_0 (J + \epsilon_0 \frac{\partial E}{\partial t})$	

- In engineering problems, along with the differential equations, we also have additional constraints called the boundary conditions (BCs)
- Differential equations + BCs \rightarrow Boundary value problem (defined for a specific domain or geometry)

MULTIPLE CHOICE QUESTION

The differential equation along with Boundary condition is called as Boundary value problem

False

True

Rewatch Skip Submit