

SIR PADAMPAT SINGHANIA UNIVERSITY, UDAIPUR

COURSE CONTENTS

Fourth year (I Semester) Batch: 2008-2012

L T P C

3 0 0 3

Course Code: CE 410

Course Name: Finite Element Methods (Elective-I)

Objective: This course discusses different finite element methods used in analyzing indeterminate structures.

Introduction: Concepts of FEM – Steps involved – merits & demerits – energy principles – Discretization – Rayleigh –Ritz method of functional approximation.

UNIT -II

Principles of Elasticity: Equilibrium equations – strain displacement relationships in matrix form – Constitutive relationships for plane stress, plane strain and Axi-symmetric bodies of revolution with axi-symmetric loading.

UNIT -III

One Dimensional FEM : Stiffness matrix for bar element - shape functions for one dimensional elements – one dimensional problems.

UNIT –iV

Two Dimensional FEM : Different types of elements for plane stress and plane strain analysis – Displacement models – generalized coordinates – shape functions – convergent and compatibility requirements – Geometric invariance – Natural coordinate system – area and volume coordinates

UNIT –V

Generation of element stiffness and nodal load matrices for 3-node triangular element and four node rectangular elements.

UNIT –VI

Isoparametric formulation – Concepts of, isoparametric elements for 2D analysis - formulation of CST element, 4 –noded and 8-noded iso-parametric quadrilateral elements –Lagrangian and Serendipity elements.

UNIT-VII

Axi-symmetric analysis- Basic principles-Formulation of 4-node iso-parametric axi-symmetric element

UNIT-VIII

Solution Techniques: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

TEXT BOOK:

1. Finite Elements Methods in Engineering by Tirupati.R. Chandrepatla and Ashok D. Belegundu - Pearson Education Publications.
2. Finite element analysis by S.S. Bhavakatti-New age international publishers
3. .Finite element analysis by David V Hutton, Tata Mcgraw Hill, New Delhi

REFERENCES:

1. Concepts and Applications of Finite Element Analysis by Robert D.Cook, David S. Malkus and Michael E.Plesha. Jhon Wiley & Sons.
2. Finite Element analysis – Theory & Programming by C.S.Krishna Murthy- Tata Mc.Graw Hill Publishers.
3. Text book of Finite Element analysis by P.Seshu – Prentice Hall of India.

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Course Code: CE 411 (Elective-I)

Course Name: Transport and Environment

Objective:

This course discusses the various factors responsible for noise and air pollution, and the methods used for the measurement, analysis, prediction and control of pollution levels.

Course Contents :

Modes of Transportation, Mixed traffic flow, Transport related pollution, Technology Vision– 2020. Urban and non-urban traffic noise sources, Noise level factors, Effects of traffic noise, Measurement and prediction, Control measures, Noise studies, Noise standards, Road transport related air pollution, Sources of air pollution, Effects of weather conditions, Vehicular emission parameters, Pollution standards, Measurement and analysis of vehicular emission, Mitigative measures. EIA requirements of highway projects, rocedures, MOEF/World Bank/IRC/UK Guidelines, EIA practices in India.

Reference Books :

1. Salter, R. J. "Highway Traffic Analysis and Design", Macmillan Press Limited, London, 1974.
2. Wilson, C.E. "Noise Control Measurement, Analysis and Control of Sound and Vibration", Harper and Row Publishers, New York, 1989.
4. Grand Jean, E. Gilgen A., "Environmental Factors in Urban Planning", Taylor and Francis Limited, London, 1976.

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Course Code: CE 412 (Elective-I)

Course Name: **Noise Pollution and Thermal Pollution**

Objective: This course discusses the effects of noise on human beings, the various methods for monitoring and controlling noise levels and also the sources, effects and methods of controlling thermal pollution.

1 Physics and effects of noise :- Frequency and Sound Levels, Units of Noise based power ratio , Contours of Loudness . Effects on Human, Environment and properties

2 Sources and Monitoring of Noise Pollution :- Natural and Anthropogenic Noise Sources , Measuring Instruments for Frequency and Noise levels , Masking of sound

3 Reactor Design :Types, Kinetics, Selection of different reactors used for waste water treatment.

4 Control Of Noise Pollution :- Treatment of noise at source, Path and receptors..

5 Basics of Thermal Pollution: waste heats into Water and other environments

6 Sources and , Effects and control, :- Effects on Environment , Macro and Micro aquatic organisms . Effects case studies ,Methods of Control: Cooling towers and nuclear reactor cooling systems

Reference Books:

1.Environmental Engineering Hand Book Lee and Liptak Chiltan Book Co., Philadelphia.

2.Environmental Protection by Chanlett - McGraw Hill

3.Energy its physical Impact on Environment by Delbert W. Devins

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Course Code: CE 413 (Elective-I)

Course Name: **Principles of Reinforced Soil Structures**

Objective: This course discusses methods for designing reinforced soil structures and the latest reinforcement products.

Fundamental principles; Conventional and modern reinforcement products; Various functions of geotextiles, geo grids, geo membranes and geocomposites; Laboratory tests for determining their properties; Design of reinforced soil structures like retaining walls, embankments, pavements; Case histories of reinforced soil structures.

References:

- 1. Clayton, C.R.I., Milititsky, J. and woods, R.I. (1993) Earth Pressure and Earth Retaining Structures, Blackie Academic & Professional, London, U.K.**
- 2. Dynamic of Structures (2nd Edition) – Ray W. Clough, Joseph Penzien, McGraw Hill International Editions.**

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Course Code: CE-414 (Elective-I)

Course Name: Ground Water Development And Management

Objective: This course discusses ground water hydrology, methods for surface and subsurface investigation, ground water recharging, salt water intrusion and ground water basin management.

UNIT – I

Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention.

UNIT – II

Ground Water Movement: Permeability, Darcy's law, storage coefficient. Transmissivity, differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system. Ground water flow contours their applications.

UNIT – III

Analysis of Pumping Test Data – I: Steady flow groundwater flow towards a well in confined and unconfined aquifers – Dupit's and Theism's equations, Assumptions, Formation constants, yield of an open well interface and well tests.

UNIT – IV

Analysis of Pumping Test Data – II: Unsteady flow towards a well – Non equilibrium equations – Thesis solution – Jacob and Chow's simplifications, Leak aquifers.

UNIT – V

Surface and Subsurface Investigation: Surface methods of exploration – Electrical resistivity and Seismic refraction methods. Subsurface methods –

Geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.

UNIT – VI

Artificial Recharge of Ground Water: Concept of artificial recharge – recharge methods, relative merits, Applications of GIS and Remote Sensing in Artificial Recharge of Ground water along with Case studies.

UNIT – VII

Saline Water Intrusion in aquifer: Occurrence of saline water intrusions, Ghyben-Herzberg relation, Shape of interface, control of seawater intrusion.

UNIT – VIII

Groundwater Basin Management: Concepts of conjunction use, Case studies.

TEXT BOOKS:

1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
2. Groundwater by H.M.Raghunath, Wiley Eastern Ltd.

REFERENCES :

1. Groundwater by Bawvwr, John Wiley & sons.
2. Groundwater Syatem Planning & Managemnet – R.Willes & W.W.G.Yeh, Printice Hall.
3. Applied Hydrogeology by C.W.Fetta, CBS Publishers & Distributers.

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Course Code: ME-410 (Elective-I)

Course Name: **Advanced Fluid Mechanics**

Objective : This course discusses the various statistical characteristics of open channels and normal fluid flow

Boundary Layer Theory **14**

Introduction, Boundary Layer Growth.

Boundary Layer Thickness, Displacement Thickness, Momentum Thickness, Shape Factor or Form Factor.

Laminar Boundary Layer Velocity Distributions.

Von Karman Momentum Integral Equation.

Analysis of Laminar Boundary Layer Flow: Local Friction Coefficient, Overall Friction Coefficient.

Turbulent Boundary Layer Velocity Distribution, Analysis of Turbulent Boundary Layer.

Boundary Layer Separation: Pressure Drag, D'Alembert's Paradox, Stokes Law, Lift and Drag.

Compressible Fluid Flow **8**

Effects of Compressibility.

Speed of Sound : Mach Number, Mach cone.

Isentropic Relationships of Perfect Gases.

Shock waves, Normal Shock Waves.

Ideal Fluid Flow **10**

Introduction to Ideal Fluid Flow, Source and Sink, Rectilinear Flow, Free or Irrotational Vortex.

Combination of basic flows: Rankine Technique.

Rankine Half-Body, Rankine Oval, Doublet.

Flow Past a Circular Cylinder, Flow Past a Rotating Circular Cylinder, Magnus Effect, Kutta-Joukowski Law.

References:

1. Mechanics of Fluids – B.S. Massey
2. Fluid Mechanics including Machines by S.K. Som and G. Biswas
3. Fluid Mechanics by V.L. Streeter and E.B. Wylie
4. Fluid Mechanics by R.K. Bansal