STC201 Finite Element Method

Teaching scheme: 03 L+01 T=04 **Credit: 04**
Evaluation scheme: 20 IE+10 MSE+70 ESE **Total marks: 100**
Duration of ESE: 4 Hrs.

COURSE OBJECTIVES

After completion of syllabus students will able to
1. Understand basic concepts of Finite Element Method.
2. Apply the Finite Element Method to solve the problems of Structural Analysis
3. Understand modeling techniques for analysis of structures

UNIT – I

Principles and discretization, Elements stiffness formulation based on direct and,variational techniques, Raleigh Ritz Method for Bar and Beam analysis .

UNIT – II

Shape functions, Finite Element Formulation using Cartesian Coordinates, Application to 1D problems, Convergence criteria.

UNIT – III

Triangular and Rectangular element formulation using Cartesian Coordinates, Application to 2D stress analysis.

UNIT – IV

Natural coordinates, Numerical integration, Isoparametric elements, Application to 1D Problems, Isoparametric elements for two-dimensional stress analysis.

UNIT – V

Plate bending element based on classical and Mindlin plate theory, Formulation of stiffness matrix for Mindlin thin and thick plates.

UNIT – VI

Modelling techniques, storage techniques and solution techniques

Text Books:

1. Chandrapatla T.R., Belegundu A. D. Introduction to Finite Elements in Engineering, Prentice HallIndia, 1991
2. Rajasekaran S, Finite Element Analysis in Engineering Design, S. Chand &Co.Ltd.NewDelhi,1999.
3. S.S. Bhavikatti - Finite Element Analysis – New Age International Publishers,Delhi

Reference Books:

1. Zienkiewicz O. C. and Taylor R. L. ,The Finite Element Method (Volume -I), , 1st Edition, TataMcGraw Hill Publishing Company Limited, New Delhi, 1989
2. Cook R. D. , Concepts and Applications of Finite Element Analysis, , 3rd Edition, Wiley India Textbooks, Wiley India Pvt Limited, New Delhi , 1989
3. Krishnamurthi C. S. ,Finite Element Analysis: Theory and Programming , 2nd Edition, Tata McGraw Hill Publishing Company Limited, 1994, Reprint 2005.
4. Bathe K. J., Finite Element Procedure, Prentice-hall of India, New Delhi,1997
5. G.R. Buchanan – Finite Element Analysis Schaum's outlines - Tata McGraw Hill Publishing Co. Ltd

STC202 Structural Dynamics

Teaching scheme: 03 L+01 T=04 **Credit: 04**
Evaluation scheme: 20 IE+10 MSE+70 ESE **Total marks: 100**
Duration of ESE: 3 Hrs.

COURSE OBJECTIVES

After completion of syllabus students will able to,
1) Understand basic concepts of structural dynamics.
2) Calculate the response of building to dynamic loading.
3) Generate the response spectrum for dynamic loading.
4) Understand IS codes related to dynamic loading.

UNIT - I

Fundamentals of Rigid / Deformable body dynamics, Analysis of undamped and viscously dampedsingle degree freedom systems.

UNIT - II

Response of single degree freedom systems to harmonic loading, support motion and transmissibility, Duhamel's integral.

UNIT - III

Multiple degree of Freedom system: Vibration of undamped 2 DOF systems; Response of 2 DOF toharmonic excitation, mode superposition, vibration absorber, Lagrange equation and their applicationto lumped parameter models of MDOF (up to 3 DOF). Free vibration of MDOF (up to 3 DOF) systems,Dynamic response of MDOF (2 DOF) systems-modal superposition method

UNIT - IV

Dynamic analysis of systems with distributed properties, Approximate design method, Transformation factors.

UNIT - V

Response spectra, Introduction to vibrations due to earthquake, Study of IS 1893 applicable to Building and Water Tanks.

UNIT - VI

Vibration of Continuous Systems: Free vibrations of Continuous systems-axial and transverse vibration of bars / beams. Response of continuous systems to dynamic loads. Energy Principle, Rayleigh-Ritz method.

Text Books:

1. Mario Paz, Structural Dynamics Theory & Application, CBS Publ.; N-Delhi, 1995.
2. Chopra A. K., Dynamics of Structures, Theory & Application to Earthquake Engineering, 2nd Edition.Pearson Education (Singapore) Pvt. Ltd, New Delhi, 1995
3. R.C. Roy - Structural Dynamics an Introduction to Computer Methods, John Wiley & Sons Publications

Reference Books:

1. Clough / Penzien, ―Dynamics of Structures‖, McGraw Hill, 1993
2. Humar, J. L., ―Dynamics of Structures‖, Prentice Hall, 1993
3. Timoshenko, S., ―Advanced Dynamics‖, McGraw Hill Book Co; NY, 1948
4. Biggs, J.M., ―Introduction to Structural Dynamics‖, McGraw Hill; NY, 1964
5. Damodarasamy and Kavitha,‖ Basics of structural Dyanamics and Aseismic design, Phi Publisher,New Delhi.

STC203 Design of Substructures

Teaching scheme: 03 L+01 T=04 **Credit: 04**
Evaluation scheme: 20 IE+10 MSE+70 ESE **Total marks: 100**
Duration of ESE: 4 Hrs.

COURSE OBJECTIVES

After completion of syllabus students will able to

1. Understand design of composite foundation systems of shallow foundations.
2. Understand design of deep foundation systems.
3. Analyze and understand various foundation failures.

UNIT – I

Design of different isolated and combined footings including eccentric loading, **Design of inverted arch foundation.**

UNIT – II

Design of raft foundation.

UNIT – III

Design of deep foundation such as pile and well foundation.

UNIT – IV

Introduction to analysis and design of simple machine foundation.

UNIT – V

Theory of sub grade reaction, beam on elastic foundation, **Concrete pavements.**

UNIT – VI

Analysis and design of Abutments, Pier and Retaining walls.

Text Books:-

1. Swami Saran , Analysis and Design of Substructures Limit State Design, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, (2007)
2. Kurian N.P., Design of Foundation Systems- Principles and Practices, Narosa Publishing House, New Delhi (2006)
3. Verghese P.C., Reinforced Concrete Design, Prentice hall of India, New Delhi, 2001.
4. Pillai S. V. and MenonD.,‖Reinforced concrete Design‖, TMH, New Delhi, 2009

Reference Books

1. Bowles, J. E, Foundation Analysis & Design, McGraw Hill Inc, NY (1999)
2. Swami Saran, Soil Dynamics and Machine Foundations, Galgotia Publications (P) Ltd, New Delhi(2006)
3. Srinivasulu P, Vaidyanathan C V, Handbook of Machine Foundation, tataMc-Graw Hill, New Delhi(2002)
4. Kurian N.P., Modern Foundations, Introduction to Advanced Techniques , Tata McGraw-
5. Hill, New Delhi (1982)
6. Ghosh, ―Foundatios design in practice‖, Phi Publisher, New Delhi
7. Som and Das, ―Theory and Practice of Foundation Design, Phi Publisher, New Delhi

STC204 Advanced Construction Management And Technology

Teaching scheme: 03 L+01 T=04 **Credit: 04**
Evaluation scheme: 20 IE+10 MSE+70 ESE **Total marks: 100**
Duration of ESE: 3 Hrs.

COURSE OBJECTIVES:
By understanding this subject the students will get versed with management techniques and advance technology in construction.

Unit:I

Understanding Project Management, Project manager, organization structures, organizing and staffing the project office and team
Management functions – directing, controlling, project authority, interpersonal influences, barriers, team building, communication, time management, conflicts
Construction Planning : Project planning, milestone schedules, WBS, Network techniques, CPM , PERT and Prima Vera , Resources leveling and smoothing.
Cost Control : Understanding control, operating cycles, cost account codes, Job cost report, Projected Cost Estimates, status reporting, variance and earned value

Unit:II
Concrete construction for heavy Engineering projects:-
Selection of equipments for batching , mixing, transporting, placing and compacting for various types of jobs, safety measures during concreting, special concretes and mortars, preplaced aggregate concrete, roller compacted concrete, concreting under water, concreting in different weather condition.

Unit:III
Method statement for large and heavy Engineering projects:-
Method statement for major activities like excavation, concreting, steel fabrication and erection for projects like earthen dams, tunnels, composite structure hydropower projects, nuclear power plant, refineries and other industrial projects like cooling tower, silos, and Chimney

Unit:IV
Road Project Equipment:

Automatic Paving Machine, Road Rollers, Asphalt plant, Batch Plants, Drum Mix Plants, Asphalt storage and heating, Haul truck, asphalt distributor, asphalt paver.

Bridge Construction: - Launching of bridges by incremental launching, using false work, and balanced cantilever construction method.

Unit:V
Ground Improvement Techniques:-
Soil distribution in India, Reclaimed Soils, selection for field compaction procedures, compaction quality control, stone column, sand drain, diaphragm wall, soil reinforcement, thermal methods, improving rock stability and quality.

Unit:VI

Formwork:

Requirement of formwork, loads carried by formwork, types of formwork such as timber formwork, Steel formwork, patent formwork, modular shuttering, slip forms,Vertical slip forming, Horizontal slip forming steelscaffolding.

References:

1. Thomas Baron, Erection of steel structures.
2. Stubbs, handbook of heavy Construction.
3. Mahesh Verma, Construction Equipment and its planning & applications.
4. R.L. Purify & Ledbetter, Construction Equipment and planning, McGraw Hill.
5. Wadell, Concrete Construction Handbook.
6. Dr. P. Purushothamma Raj, Ground Improvement Techniques, LaxmiPublicationsPunnoswami, Bridge Construction
7. Journals of Civil Engineering and Construction Engineering
8. Purifoy, Schexnayder, Construction Planning, Equipment and Methods, Tata Mc Graw Hill
9. Edward Nawy , Concrete Construction and engineering Handbook , CRC Press.

STC 205 Elective -II

A) Construction Contracts And Specification

Teaching scheme: 03 L+01 T=04 **Credit: 04**
Evaluation scheme: 20 IE+10 MSE+70 ESE **Total marks: 100**
Duration of ESE: 3 Hrs.

COURSE OBJECTIVES
By studying this subject student will be aware of contractual obligation and legal provisions and arbitration.

Unit:I

Indian Contract Act 1872

Unit: II

Evaluation of Construction Contracts & Specifications, Contract Administration

Unit: III

Construction Claims, Laws affecting Engineers

Unit: IV

Contract Strategy & Management, Construction Disputes Settlement

Unit: V

Arbitration & Conciliation in India, Professional Practice Ethics, Duties & Responsibilities

Unit: VI

Construction Specifications- Standard Specifications, development, interpretation

Reference:

1.S. RanagaRao Contract Management & Dispute Resolutions Engineering staff College of India January 2008.

B) Advanced Design of Steel Structures

Teaching scheme: 03 L+01 T=04 **Credit: 04**
Evaluation scheme: 20 IE+10 MSE+70 ESE **Total marks: 100**
Duration of ESE: 3 Hrs.

COURSE OBJECTIVES

At the end of the course student will be able to

1. Understand different types of loading with respect to structural parameters.
2. Application of IS code & SP code for detailing and drafting of different structural components.
3. Analysis and design of different types of structures.

UNIT – I

Design of steel industrial buildings , **Design of Gantry girder analysis &Design of gable frame with haunch, Lattice girder.**

UNIT – II

Design of Steel Chimney

UNIT – III

Design of a truss Bridges, **Design of plate girder bridges, Suspension bridges, Design of steel framework.**

UNIT – IV

Design of storage Vessels, **overhead pressed steel tanks, Plastic Analysis.**

Text Books:

1. Pumia B.C. Comprehensive Design of steel structures, Laxmi publication ltd., 2000,
2. Duggal S.K., Design of Steel Structures, Mc Graw Hill publication, 2007
3. RamChandra Design of Steel structures Vol-I &Vol-II Std. book house / Rajsons Publication Pvt. Ltd.Delhi, 2006

Reference:

1. Arya A.S and Ajmani J.L. Design of Steel Structures, Nemchand&bross, Roorkee, 2007.
2. Gaylords, E.H. &Gaylords, C. N., Design of Steel Structures, Blackwell, 1994.
3. Dayaratnam P., Design of Steel Structures, Wheeler Publications, Allahabad, 1992
4. Ghosh, ― Analysis and Design practice of Steel Structure‖, (Forthcoming), Phi Publisher, New Delhi

STC 206 LAB PRACTICE: II

Structural Dynamics And Instrumentation

Teaching scheme: 02P = 02 **Credit: 02**
Evaluation scheme: 25 TW + 25 P/OE **Total marks: 50**

PRACTICALS:

1. To study various instruments
2. Non Destructive Tests- Rebound Hammer and Ultra Sonic techniques, etc.
3. To study various instruments for the response of vibrating structure.
4. To study the response of a single degree of lumped mass system subjected to base excitation.
5. To study the response of a two degree of freedom system building frame subjected to base motion.
6. To study the response of a multi degree of lumped mass system.
7. Verification of natural frequency of SDOF model under free vibration.
8. To study the liquefaction of soil structure.
9. To study the Earthquake induced waves in rectangular water tank.
10. To calculate horizontal seismic force of building using IS-1893.
11. To calculate the lateral forces in water tank due to Earthquake when water tank is empty and watertank is full by IS-1893.

Any six from the above.