

Master Study in Structures

It will contain 4 modules:

Module 1: ETABS offers 3D object-based modelling and visualization tools, fast linear and nonlinear analytical power, comprehensive design capabilities and insightful graphic displays, reports, and schematic drawings that allow users to quickly and easily decipher and understand analysis and design results.

Module 2: SAFE is tool used for designing concrete floor and foundation systems. From framing layout all the way through to detail drawing production, SAFE integrates every aspect of the engineering design process in one easy and intuitive environment.

Module 3: SAP2000 has proven to be the most integrated, productive and practical general purpose structural program on the market today. It is used for creating complex models and 3D object based graphical modelling environment to the wide variety of analysis and design options completely integrated across one powerful user interface.

Module 4: CSI BRIDGE, RCDC, PROKON, STAAD PRO

Modelling, analysis and design of bridge structures can be done in CSI Bridge which helps to create the ultimate in computerized engineering tools. RCDC is the industry leading concrete detailed engineering software. PROKON Structural Analysis and Design is a suite of over forty structural analysis, design and detailing programs. STAAD or (STAAD.Pro) is a structural analysis and design software application originally developed by Research Engineers International in 1997.

The detailed syllabus of above-mentioned module has been included along with this document.

ETABS Basic

Introduction to ETABS

1. Software algorithm.
2. Capabilities of the software.
3. Strengths and weaknesses of the software.
4. ETABS manual.
5. Significance of menu buttons and icons.
6. Sample models and templates.
7. Hands on software on sample templates.

Modelling: process and techniques

1. Geometry creation process
2. Modelling through import method: 2d import, 3d import
3. Other import techniques.
4. Property assignment through automation existing templates.
5. Loadings: dead, live, wind, earthquake, temperature, notional, live load reduction.
6. Details of wind tunnel & its loadings, standardization of wind model & ETABS model.
7. Releases, diaphragms, all definition parameters.
8. Checks on modelling techniques.
9. Modelling of steel & composite structure
10. Hands on software to perform the modelling process and techniques.

Analysis: process and techniques

1. Static analysis
2. Dynamic analysis
3. Second order p-delta analysis
4. Sequential analysis
5. Time history analysis
6. Significance of each analysis and its uses.
7. Checks on lateral stability, deflection, storey drift, torsional irregularity, mass irregularity and stiffness irregularity.
8. Hands on software to perform the analysis and its checks.

Design: methods and techniques

1. Design of columns and beams: methodology & limitations.
2. Design of composite columns.
3. Design of walls & slabs

ETABS Advance

Introduction, modelling process and techniques

1. Introduction to the Various complexities like Geometrical Complexity, Code based Complexities, Structural Engineering fundamental Based complexity.
2. Introduction to the Stiffness Modification Factors for Various elements of the building.
3. Introduction of the complex modelling techniques.
4. Modelling of various type of composite Columns.
5. Modelling with insertion point and its significance.

Analysis: Process and Techniques

1. Different types of Complexities in the project and how to deal with efficiently.
2. Stiffness Modification Factor for the various Building elements and their uses and application along with the codal norms.
3. International norms for Highrise building analysis and design.
4. Gust factor analysis for the application of wind load on the tall building.
5. Wind tunnel analysis and its use in Highrise buildings.
6. Highrise committee norms, its structural significance, its optimization and reporting.
7. Why Non-linear (Buckling, Creep and Shrinkage) analysis is important for Highrise buildings? When to perform, how to perform and what are the parameters to be considered practically.
8. Modal analysis: study and its use in model dynamics time history analysis.
9. Vibration analysis and its use in the steel structure.
10. Energy v/s virtual work diagrams. Its application and use.
11. Modelling of composite structure, analysis and design techniques.
12. Torsional Irregularity and Orthogonal axis analysis and its application.
13. Soft storey checks and its application using various codes.

Design of structural elements

1. Design of columns, beams, slabs, shear walls, transfer slabs and brace elements.
2. Structural design optimization after all advance analysis.

SAFE

Introduction Theory

1. Software Algorithm
2. Capabilities of the software.
3. Strengths and weaknesses of the software.
4. SAFE manual
5. Significance of menu buttons and icons.
6. Sample models and templates.
7. Hands on experience on sample templates.

Modelling: Process and Techniques

1. Geometry creation process
2. Modelling through import methods
3. Combined, complex foundation system
4. Modelling of foundations, basements, footings and flat slabs.
5. Property assignment of rigid zones for walls and ramps.
6. Usage of insertion point for beams and columns.
7. Property assignment for spring supports.
8. Uses of design strips.
9. Definition of post-tensioning in slabs.
10. Tendon load and its losses.
11. Loading: dead, live, wind, earthquake, temperature, notional, live load reduction.
12. releases, supports, diaphragms, all definition parameters.
13. Checks on modelling techniques.

Analysis: Process and techniques

1. Interaction between ETABS and SAFE.
2. Soil structure and interaction.
3. Checks on foundation system
 - a. Deflection.
 - i. Short term deflection.
 - ii. Long term deflection considering creep.
 - b. Crack Width
 - c. Punching Shear
 - i. One-Way Shear.

- ii. Two-Way Shear.
- d. Reinforcement checks.
- 4. Differential settlement of foundation and its control.
- 5. Nonlinear analysis by considering long term creep.
- 6. Nonlinear analysis for cracked conditions.
- 7. Analysis of flat slab.
- 8. Checks on foundation system and flat slabs against lateral forces (static/dynamic).
- 9. Significance of each analysis and its uses using various codes.

Design: Methods and techniques

- 1. Design of stirrups.
- 2. Design of slabs based on finite element method.
- 3. Design of raft & pile foundations.
- 4. Design methodology.
- 5. Design of punching shear reinforcement (stud rails).
- 6. Flat slabs with post tensioning.
- 7. Checks on post tensioning stress.
- 8. Generating output & display of deformed geometry.
- 9. Detailing & reporting techniques.
- 10. Codes & software interaction by considering national and International Codes.

SAP2000

Introduction Theory

1. Software algorithm.
2. Capabilities of the software.
3. Strengths and weaknesses of the software.
4. SAP2000 manual.
5. Significance of menu buttons and icons

Modelling: Process and techniques

1. Creation of geometry for beams.
2. Creation of sloped, vertical & Pratt truss.
3. Combined, complex modelling of roof truss, transmission tower & guyed tower.
4. Modelling of portal, braced (concentric & eccentric) frames.
5. Modelling of open frame building, perimeter frame building and beam slab building frames.
6. Modelling of flat slabs and walls.
7. Complex modelling of cylinder, barrel shell, multi bay cylindrical shell, hyperbolic, paraboloid, partial sphere, spherical dome, parabolic dome.
8. Creation of dog legged & spiral staircases.
9. Modelling of overhead tank, underground tank & storage silos.
10. Creation of geometry for complex thick arch, variable arch, prism & block models.
11. Loading: dead, super dead, live, wind, earthquake & live load reduction.
12. Releases, supports, diaphragms, all definition parameters.
13. Checks on modelling techniques.
14. Oceanic Engineering for offshore structures analysis and design.

Analysis: Process and techniques

1. Interaction between AutoCAD and sap2000.
2. Discussion on the Thermal conductivity matrix analysis and its requirement on various structure like Chimney, etc.
3. Checks on underground structures.
 - a. Deflection
 - i. Short term Deflection.
 - ii. Pressure bulb for t/c reinforcement.

- b. Crack width.
- c. Reinforcement checks.
4. Linear & Non-linear, Static and Dynamic analysis (Time History, Pushover, Performance Based Design, etc.)
5. Nonlinear Staged, static construction analysis.
6. Significance of each analysis and its uses using various codes.

Design: Methods and Techniques

1. Design of steel structures
2. Design of concrete structures.
3. Output & display of deformed geometry.
4. Detailing & reporting techniques.
5. Codes & software interaction by considering national & international codes.

CSI BRIDGE DESIGN

Introduction to the software

1. Software algorithm.
2. Capabilities of the software.
3. Strengths and weaknesses of the software.
4. CSI bridge manual.
5. Significance of menu buttons and icons.
6. Sample models and templates.
7. Hands on software on sample templates

Modelling: process and techniques

1. Create a concrete box girder bridge
2. Bridge wizard
3. Layout line
4. Deck section
5. Bridge object
6. Parametric variation
7. Bridge object assignment
8. Load the bridge model

Analysis: process and techniques

1. Bridge responses
2. Run analysis
3. Display results
 - A. Graphical Displays
 - B. Output Tables

RCDC SYLLABUS

Introduction to the software

1. Software algorithm.
2. Capabilities of the software.
3. Strengths and weaknesses of the software.
4. Import and Export from/to the Various design software.
5. Significance of menu buttons and icons.
6. Sample models and templates.
7. Hands on software on sample templates

Modelling: process and techniques

1. Sample Slab Detailing
2. Sample Beam Detailing
3. Sample Column Detailing
4. Sample Shear wall Detailing
5. Sample Footing Detailing
6. Exporting of various files to AutoCAD.
7. Template Good for construction drawing showcase.

Analysis: process and techniques

1. Importing of template design
2. Setting of various detailing parameters
3. Detailing of various elements.
4. Exporting of various detailing into the AutoCAD
5. Hands on software to perform the design process and techniques
 - Graphical displays
 - Output tables

Prokon Syllabus

Introduction: Theory

1. Software algorithm.
2. Capabilities of the software.
3. Strengths and weaknesses of the software.
4. Prokon manual
5. Significance of menu buttons and icons.
6. Sample models and templates.
7. Hands on experience on sample templates

Analysis and designing: process and techniques - for individual elements

1. Geometry creation process
2. Designing of reinforced concrete structural elements
3. Designing of complex structural elements
4. Property assignments
5. Loading: dead, live, wind, earthquake, temperature, notional, live load reduction
6. Designing of steel trusses
7. Steel connection design - base plates, gusset plate
8. Designing of timber structural elements
9. Hands on software to perform the design process and techniques