



SMART TRAINERS

LESSON PLAN FOR ETABS STRUCTURAL ANALYSIS COURSE

COURSE TITLE:	Basic to Intermediate ETABS		
COURSE CODE:	ETB 001		
CREDIT HOURS:	02		
DURATION:	08 Weeks (03 Classes Each Week)		
COURSE INSTRUCTOR:	Batch:	Course Starting Date:	Course Suspension Date:

COURSE LEARNING OUTCOMES: Upon successful completion of the course, the student will be able to: Navigate the ETABS interface confidently and set up structural models with correct grid systems, stories, and material properties. Define structural elements — frames, columns, beams, slabs, walls, and foundations — and assign appropriate section properties and material grades. Apply gravity, lateral, wind, seismic, and load combination cases in accordance with international design codes (ACI, AISC, UBC, ASCE 7). Run linear static, modal, response spectrum, and time-history analyses and interpret output results including displacements, reactions, and internal forces. Design and check reinforced concrete members (beams, columns, slabs, walls) and steel members using ETABS built-in design modules. Produce detailed analysis and design reports, generate drawings, and export model data to documentation formats. Apply advanced features including P-Delta analysis, diaphragm assignment, performance-based design checks, and multi-storey building case studies.

LESSON CONTENTS AND ASSOCIATED CLO(s)		
CLO	Description	Level
01	Navigate the ETABS interface; define grid systems, stories, material properties, and section profiles for a new structural project.	C1
02	Model structural elements — frames, columns, beams, slabs, shear walls, and mat foundations — and assign accurate loads (dead, live, wind, seismic).	C2
03	Define load cases, load combinations, and mass sources in compliance with ACI 318, AISC 360, and ASCE 7 code requirements.	C2
04	Run and interpret linear static, modal (eigenvalue), response spectrum, and time-history analyses; review displacements, reactions, and internal forces.	C3
05	Perform reinforced concrete and steel member design checks using ETABS design modules; review and optimise reinforcement and section sizes.	C4
06	Apply advanced analysis features (P-Delta, diaphragm, nonlinear static pushover) and produce professional analysis/design reports and drawings.	C4

Contents	Week	CLO No.	Marks Assigned	Delivery Methods	Assessment Methods
PHASE 1 — BASIC ETABS (Weeks 1–4)					
<p>1. Introduction to ETABS</p> <ul style="list-style-type: none"> • Overview of structural analysis software and ETABS workflow • ETABS interface: menus, toolbars, view controls, status bar • Creating a new model — units, coordinate system, grid wizard • Defining stories: story heights, master story, and similar stories • Saving, templates, and project settings <p>2. Materials & Section Properties</p> <ul style="list-style-type: none"> • Defining material properties: concrete (fc), steel (Fy, Fu) • Frame sections: rectangular, circular, I-section, T-beam • Slab and wall section properties: thickness, type (shell/membrane) • Section Designer for custom sections • Importing sections from section libraries 	Week 1	01	5%	Online Lectures & Practical Work	Practical Project
<p>3. Modelling Columns, Beams & Frames</p> <ul style="list-style-type: none"> • Drawing columns and beams using point and line objects • Frame insertion points, cardinal points, and offsets • Replicating elements: copy, mirror, array, and replicate • Assigning frame end releases and moment releases • Editing and modifying frame objects in plan and 3D views <p>4. Modelling Slabs, Walls & Openings</p> <ul style="list-style-type: none"> • Drawing floor and roof slabs (shell elements) • Defining slab types: membrane, plate, shell — thin vs. thick • Modelling shear walls and core walls • Adding openings in slabs and walls • Area object meshing: auto and manual mesh options 	Week 2	01–02	5%	Online Lectures & Practical Work	Practical Project

<p>5. Load Definition & Assignment</p> <ul style="list-style-type: none"> • Dead load (DL) and superimposed dead load (SDL) • Live load (LL) — floor, roof, reducible live loads • Assigning point, line (uniform/trapezoidal), and area loads • Self-weight multiplier and automatic dead load • Lateral load patterns: wind (user-defined) and seismic (static) <p>6. Load Cases & Combinations</p> <ul style="list-style-type: none"> • Defining static linear load cases • Modal load case — Ritz vs. Eigenvector methods • Response spectrum load case setup • Load combinations: ACI, ASCE 7 (1.2D+1.6L, 1.2D+1.0E, etc.) • Envelope combinations and design combinations 	Week 3	02–03	10%	Online Lectures & Practical Work	Practical Project
<p>7. Supports, Diaphragms & Mass</p> <ul style="list-style-type: none"> • Assigning restraints: fixed, pinned, roller, and spring supports • Foundation modelling: mat slab, spread footings, pile caps • Rigid and semi-rigid diaphragm assignment per floor • Mass source definition: from loads and from elements • Centre of mass and centre of rigidity display <p>8. Running Analysis & Reviewing Results</p> <ul style="list-style-type: none"> • Checking the model: warnings, errors, and auto-correct • Running the analysis — analysis options and solver settings • Viewing deformed shapes and animated mode shapes • Reviewing floor displacements, storey drifts, and reactions • Reading internal forces: BMD, SFD, torsion, and axial diagrams 	Week 4	02–03	10%	Online Lectures & Practical Work	Practical Project

<p>9. Seismic Analysis — Response Spectrum</p> <ul style="list-style-type: none"> • Defining response spectrum function (UBC, ASCE 7, local codes) • Setting up response spectrum load case: directions, scale factors • Modal combination methods: SRSS, CQC • Reviewing modal periods, mass participation, and mode shapes • Interpreting base shear, storey forces, and inter-storey drift <p>10. Wind Load Analysis</p> <ul style="list-style-type: none"> • Automatic wind load per ASCE 7 / UBC — exposure categories • Manually assigning wind pressure to exterior walls and frames • Windward and leeward pressure coefficients • Wind overturning moment and uplift forces • Comparing wind vs. seismic governing lateral load 	Week 5	04	10%	Online Lectures & Practical Work	Practical Project
<p>11. RC Member Design — Beams & Columns</p> <ul style="list-style-type: none"> • Setting up design preferences: ACI 318, concrete cover, bar sizes • Running concrete frame design and reviewing design ratios • Beam reinforcement output: top, bottom, shear stirrups • Column interaction diagrams (P-M-M curves) • Overwriting design parameters for individual members <p>12. RC Slab & Shear Wall Design</p> <ul style="list-style-type: none"> • Two-way slab design: direct design and equivalent frame • Punching shear check at column-slab connections • Pier and spandrel labelling for shear wall design • Shear wall design output: boundary elements, horizontal & vertical rebar • Design summary tables and colour-coded ratio display 	Week 6	04–05	10%	Online Lectures & Practical Work	Practical Project

<p>13. Steel Member Design</p> <ul style="list-style-type: none"> • Setting up steel design preferences: AISC 360 LRFD / ASD • Assigning design groups and auto-selection sections • Checking beam and column capacity ratios • Lateral bracing assignments and unbraced length • Optimising steel sections using auto-select lists <p>14. Advanced Analysis Features</p> <ul style="list-style-type: none"> • P-Delta analysis: large-displacement and geometric nonlinearity • Nonlinear static (pushover) analysis setup and performance points • Time-history analysis: importing ground motion records • Moving load analysis for bridge/transfer structures • Staged construction analysis — load sequence modelling 	Week 7	05–06	20%	Online Lectures & Practical Work	Practical Project
<p>15. Reporting, Drawings & Export</p> <ul style="list-style-type: none"> • Generating analysis and design reports (customise, filter, print) • Exporting model to AutoCAD DXF / DWG format • Exporting to SAFE for foundation design • Excel-based data extraction: tables, forces, and reinforcement • Exporting to BIM formats: IFC and Revit Structure link <p>16. Capstone Projects & Course Review</p> <ul style="list-style-type: none"> • Capstone A: 5-storey RC residential building — full analysis & RC design • Capstone B: Steel-framed industrial structure — wind + seismic + design • Model review: common errors, best modelling practices • Project presentations and result interpretation Q&A; • Pathways: SAFE, SAP2000, PERFORM-3D, Tekla Structural Designer 	Week 8	05–06	30%	Online Lectures & Practical Work	Practical Project