Date: 01-11-2023

Board of Studies of Civil Engineering Dept.

On behalf of ELLENKI COLLEGE OF ENGINEERING AND TECHNOLOGY (Autonomous), Patelguda, Sangareddy-502319. I am pleased to constitute the Board of Studies in the Department of Civil Engineering for B.Tech and M.Tech Courses as per details given below:

S.NO	NAME	DESIGNATION	DESIGNATION IN BOS
1	Mr. B. Sharath Chandra	Assistant Professor & Head of the Department	Chairman
2	Dr. S. Vidyavathi	Professor of CE, JNTUH UCESTH	JNTUH Nominee
3	Dr. G. Narendra Goud	Professor of CE, MVSR	Member other College
4	Dr. B. Narender	Professor of CE, Anurag University	Member other College
5	Mr. K. Srinu Babu	Managing Director & MS ASSOCIATES	Member Industry
6	Mrs. B. Sumalatha	Assistant Professor, ECET	Member-College
7	Mrs. M. Swathi	Assistant Professor, ECET	Member-College
8	Mrs. R. Saleema Begum	Assistant Professor, ECET	Member-College
9	Ms. B. Navatha	Alumini	Member-Alumini
10	Prof. P. John Paul	Principal ECET	Special Invitee

- The above staff members of the Board of Studies in Civil Engineering shall hold the office for a period of three years with effect from the date of issue of this order.
- The members attending the meeting of the Board of Studies are eligible for T.A. and D.A as per rules of the Institution in force.
- The members are also requested to intimate this office in case of any changes in their address and designations.
- We request you to kindly consent your willingness to the member of this BOS.

Principal
Prof. P. John Paul

Principal
Ellenki College of Engg & Tech.
Patelguda (V), Ameenpur (M)
Sangareddy Dist., T.S.- 502 319

Board of Studies of Civil Engineering Dept.
Attendance Sheet

S.NO	NAME	DESIGNATION	DESIGNATION IN BOS	Signature
1	Mr. B. Sharath Chandra	Assistant Professor & Head of the Department	Chairman	
2	Dr. S. Vidyavathi	Professor of CE, JNTUH UCESTH	JNTUH-Nominee	21/11/2023
3	Dr. G. Narendra Goud	Professor of CE, MVSR	Member-other College	
4	Dr. B. Narender	Professor of CE, Anurag University	Member-other College	23/11/23
5	Mr. K. Srinu Babu	Managing Director & MS ASSOCIATES	Member-Industry	
6	Mrs. B. Sumalatha	Assistant Professor, ECET	Member-College	
7	Mrs. M. Swathi	Assistant Professor, ECET	Member-College	
8	Mrs. R. Saleema Begum	Assistant Professor, ECET	Member-College	
9	Ms. B. Navatha	Alumini	Member-Alumini	
10	Prof. P. John Paul	Principal ECET	Special Invitee	

Department of Civil Engineering

Minutes of Board of Studies Meeting

Date: 21/11/2023

Ellenki College of Engineering & Technology was founded in the year 1999 with a vision to achieve excellence in providing all round education. Established for over two decades, ELLENKI College of Engineering & Technology is one of the premier private engineering colleges in Hyderabad. The College has got Autonomous Status from the A.Y. 2023-24 for a period of 5 years.

The first BOS meeting of Civil Engineering Department was held on 21st November, 2023 in dual mode. The minutes of meeting are as follows.

The Chairman welcomed all the members for the 1st Board of Studies meeting of the Civil Engineering Department.

1. Academic course structure for B. Tech (I, II, III & IV year) has been discussed and drafted for ER23 Regulations.
2. Detailed syllabus for B. Tech (I Year) program has been discussed at length. The proposed syllabus has been agreed and no changes were suggested by the BOS members.
3. Academic course structure for M. Tech (Structural Engineering), I & II year has been discussed and drafted for ER23 Regulations.
4. Detailed syllabus for M. Tech (Structural Engineering), I Year program has been discussed at length. The proposed syllabus has been agreed by the BOS Members.

Finally the Chairman thanked to all the members for their presence and also for their valuable suggestions towards the important of the Curriculum and Syllabus of the Mechanical Engineering.

Chairman
Board of Studies

ELLENKI COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

B.Tech. in CIVIL ENGINEERING

PROPOSED COURSE STRUCTURE (ER23 Regulations)

Applicable from AY 2023-24 Batch

I YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.	MA101BS	Matrices and Calculus	3	1	0	4
2.	PH102BS	Applied Physics	3	1	0	4
3.	ME103ES	C Programming and Data Structures	3	0	0	3
4.	ME104ES	Engineering Workshop	0	1	3	2.5
5.	EN105HS	English for Skill Enhancement	2	0	0	2
6.	CE106ES	Elements of Civil Engineering	0	0	2	1
7.	PH107BS	Applied Physics Laboratory	0	0	3	1.5
8.	ME108ES	C Programming and Data Structures Laboratory	0	0	2	1
9.	EN109HS	English Language and Communication Skills Laboratory	0	0	2	1
10.	*MC110	Environmental Science	3	0	0	0
		Induction Programme				
		Total	**14**	**3**	**12**	**20**

I YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.	MA201BS	Ordinary Differential Equations and Vector Calculus	3	1	0	4
2.	CH202BS	Engineering Chemistry	3	1	0	4
3.	ME203ES	Computer Aided Engineering Graphics	1	0	4	3
4.	CE204ES	Applied Mechanics	3	0	0	3
5.	CE205PC	Surveying	2	0	0	2
6.	CE206ES	Python Programming Laboratory	0	1	2	2
7.	CH207BS	Engineering Chemistry Laboratory	0	0	2	1
8.	CE208PC	Surveying Laboratory - I	0	0	2	1
		Total	**12**	**3**	**10**	**20**

II YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Probability and Statistics	3	1	0	4
2.		Building Materials, Construction and Planning	3	0	0	3
3.		Engineering Geology	3	0	0	3
4.		Strength of Materials – I	3	0	0	3
5.		Fluid Mechanics	3	0	0	3
6.		Surveying Laboratory - II	0	1	2	2
7.		Strength of Materials Laboratory	0	0	2	1
8.		Computer Aided Drafting Laboratory	0	0	2	1
9.	*MC	Constitution of India	3	0	0	0
		Total Credits	**18**	**2**	**6**	**20**

21/11/2023

II YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Basic Electrical and Electronics Engineering	3	0	0	3
2.		Concrete Technology	3	0	0	3
3.		Strength of Materials – II	3	0	0	3
4.		Hydraulics and Hydraulics Machinery	3	0	0	3
5.		Structural Analysis - I	3	0	0	3
6.		Fluid Mechanics and Hydraulics Machinery Laboratory	0	0	2	1
7.		Basic Electrical and Electronics Engineering Laboratory	0	0	2	1
8.		Concrete Technology Laboratory	0	0	2	1
9.		Real-time Research Project/ Field-Based Project	0	0	4	2
10.	*MC	Gender Sensitization Laboratory	0	0	2	0
		Total Credits	**15**	**0**	**12**	**20**

III YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Structural Analysis - II	3	0	0	3
2.		Geotechnical Engineering	3	0	0	3
3.		Structural Engineering -I (RCC)	3	0	0	3
4.		Business Economics & Financial Analysis	3	0	0	3
5.		Transportation Engineering	3	0	0	3
6.		Water Resources Engineering - I	3	0	0	3
7.		Transportation Engineering Laboratory	0	0	2	1
8.		Geotechnical Engineering Laboratory	0	0	2	1
9.	*MC	Intellectual Property Rights	3	0	0	0
		Total Credits	**21**	**0**	**4**	**20**

III YEAR II SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1.		Environmental Engineering	3	0	0	3
2.		Foundation Engineering	3	0	0	3
3.		Structural Engineering -II (Steel Structures)	3	0	0	3
4.		Professional Elective – I	3	0	0	3
5.		Open Elective - I	3	0	0	3
6.		Environmental Engineering Laboratory	0	0	2	1
7.		Computer Aided Design Laboratory	0	0	2	1
8.		Advanced English Communication Skills Laboratory	0	0	2	1
9.		Industry Oriented Mini Project/ Internship	0	0	4	2
10.	*MC	Environmental Science	3	0	0	0
		Total Credits	**18**	**0**	**10**	**20**

Environmental Science in III Yr II Sem Should be Registered by Lateral Entry Students Only.

IV YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Quantity Survey & Valuation	2	0	0	2
2.		Project Management	2	0	0	2
3.		Professional Elective – II	3	0	0	3
4.		Professional Elective – III	3	0	0	3
5.		Professional Elective - IV	3	0	0	3
6.		Open Elective - II	3	0	0	3
7.		Civil Engineering Software Laboratory	0	0	2	1
8.		Project Stage - I	0	0	6	3
		Total Credits	**16**	**0**	**8**	**20**

IV YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Professional Elective – V	3	0	0	3
2.		Professional Elective - VI	3	0	0	3
3.		Open Elective - III	3	0	0	3
4.		Project Stage – II including seminar	0	0	22	11
		Total Credits	**9**	**0**	**22**	**20**

***MC – Satisfactory/Unsatisfactory**

Professional Elective – I

CE511PE	Green Building Technologies
CE512PE	Geomatic Applications in Civil Engineering
CE513PE	Smart Cities Planning and Management

Professional Elective – II

CE611PE	Prestressed Concrete
CE612PE	Elements of Earthquake Engineering
CE613PE	Advanced Structural Analysis

Professional Elective-III

CE711PE	Earth Retaining Structures
CE712PE	Ground Improvement Techniques
CE713PE	Stability Analysis of Slopes

Professional Elective -IV

CE721PE	Design of Hydraulic Structures
CE722PE	Advanced Water Resources Engineering
CE723PE	Ground Water Hydrology

Professional Elective –V

CE811PE	Solid Waste Management
CE812PE	Environmental Impact Assessment for Civil Engineers
CE813PE	Air pollution

Professional Elective -VI

CE821PE	Airports, Railways and Waterways
CE822PE	Pavement Asset Management
CE823PE	Pavement Analysis & Design

III Yr II Sem Open Elective (OE – I)
1. Disaster Preparedness & Planning Management
2. Building Management Systems
3. Environmental Impact Assessment
4. Hydrogeology

IV Yr I Sem Open Elective (OE – II)
1. Remote Sensing & Geographical Information Systems
2. Sustainable Infrastructure Development
3. Solid Waste Management
4. Smart Cities

IV Yr II Sem Open Elective (OE – III)
1. Energy Efficient Buildings
2. Multi Criterion Decision Making
3. Environmental Pollution

ELEMENTS OF CIVIL ENGINEERING
PROPOSED SYLLABUS (ER23 Regulations)

B.Tech. I Year I Sem.

L	T	P	C
0	0	2	1

Pre-requisites: Nil

Course objectives:

- To provide practical knowledge about physical properties of minerals and rocks.
- To determine the characteristics of cement, Coarse & Fine aggregates.

Course Outcomes: At the end of the course, the student will be able to:

- Understands the method and ways of investigations required for Civil Engineering projects
- Identify the various rocks, minerals depending on geological classifications
- Evaluate the properties of cement, fine and coarse aggregates and determine its suitability for construction.

List of Experiments:

1. **Identification of Minerals** – Silica Group, Feldspar Group, Crystalline Group, Carbonate Group, Pyroxene Group, Mica Group, Amphibole Group.
2. **Identification of Rocks –** Igneous Petrology, Sedimentary Petrology, Metamorphic Petrology.
3. 1. Study of topographical features from Geological maps. Identification of symbols in maps.
   1. Simple structural Geology Problems (Folds, Faults & Unconformities)
4. **Tests on Cement**
   a. Fineness test & Normal Consistency test.
   b. Specific gravity test, Initial and Final setting time of cement.
5. **Tests on Fine Aggregates**
   a. Specific Gravity test.
   b. Bulking of sand & Fineness modulus of Fine aggregate.
6. **Tests on Coarse Aggregate**
   a. Specific Gravity test.
   b. Fineness modulus of Coarse aggregate.

TEXT BOOK:

1. IS 383 :1993 "Specification for Coarse and Fine Aggregates from Natural Sources for Concrete".

21/11/2023

SURVEYING
PROPOSED SYLLABUS (ER23 Regulations)

B.Tech. I Year II Sem.

L	T	P	C
2	0	0	2

Course Objectives: The first step in engineering practice is surveying and the soundness of any civil engineering work is dependent on the reliability and accuracy of surveying. Therefore, it is imperative that a student of engineering should have good knowledge of surveying. To impart the knowledge of surveying and latest technologies in surveying it is necessary to introduce this subject in the curriculum.

Course Outcomes: At the end of the course, the student will be able to:

- Calculate angles, distances and levels
- Identify data collection methods and prepare field notes
- Understand the working principles of survey instruments
- Estimate measurement errors and apply corrections
- Interpret survey data and compute areas and volumes

UNIT - I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying.

Measurement of Distances and Directions

Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections, indirect methods- optical methods- E.D.M. method.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination and dip.

UNIT - II

Levelling and Contouring Leveling- Basics definitions, types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels- HI Method-Rise and Fall method, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, Direct & Indirect methods of contour surveying, interpolation and sketching of Contours.

Computation of Areas and Volumes

Areas - Determination of areas consisting of irregular boundary and regular boundary (coordinates, MDM, DMD methods), Planimeter.

Volumes - Computation of areas for level section and two level sections with and without transverse slopes, determination of volume of earth work in cutting and embankments, volume of borrow pits, capacity of reservoirs.

UNIT - III

Theodolite Surveying: Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible.

Traversing: Methods of traversing, traverse computations and adjustments, Gale's traverse table, Omitted measurements.

UNIT - IV

Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry.

Curves: Types of curves and their necessity, elements of simple curve, setting out of simple Curves,

UNIT - V

Modern Surveying Methods: Total Station and Global Positioning System: Basic principles, classifications, applications, comparison with conventional surveying. Electromagnetic wave theory - electromagnetic distance measuring system - principle of working and EDM instruments, Components

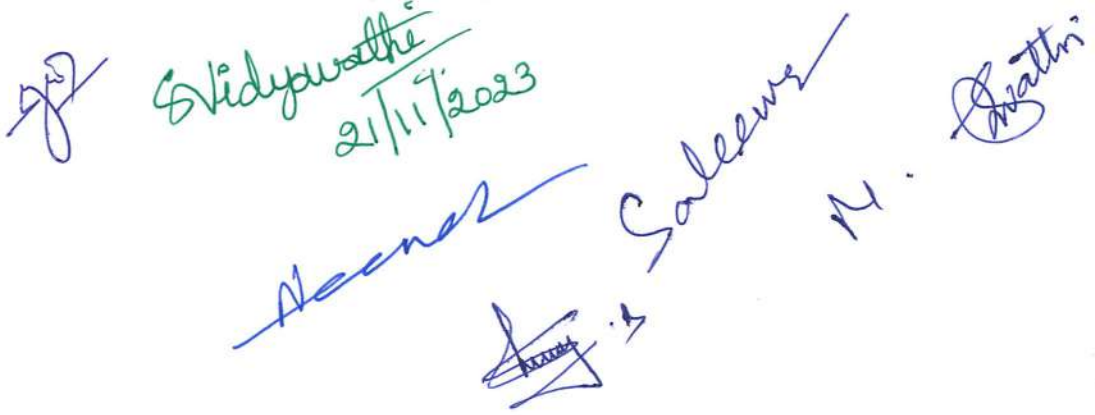
of GPS – space segment, control segment and user segment, reference systems, satellite orbits, GPS observations. Applications of GPS.

TEXT BOOKS:

1. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi.
2. Chandra A M, "Higher Surveying", New age International Pvt. Ltd., Publishers, New Delhi, 2002.
3. Hoffman. B, H. Lichtenegga and J. Collins, Global Positioning System - Theory and Practice, Springer -Verlag Publishers, 2001.

REFERENCE BOOKS:

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill – 2000.
2. Arora K R "Surveying Vol 1, 2 & 3), Standard Book House, Delhi, 2004.
3. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.
4. Chandra A M, "Plane Surveying", New Age International Pvt. Ltd., New Delhi, 2002.
5. Surveying by Bhavikatti; Vikas publishing house ltd.
6. Duggal S K, "Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2004.
7. Surveying and leveling by R. Agor Khanna Publishers 2015.



SURVEYING LABORATORY – I

PROPOSED SYLLABUS (ER23 Regulations)

B.Tech. I Year II Sem.

L	T	P	C
0	0	2	1

Course Objective:

1. Student will be able to learn and understand the various basic concept and principles used in surveying like Chain Surveying, Compass Surveying, Plane Table Surveying, and Levelling Surveying.
2. Student will be able to learn and understand various instrument used in surveying.
3. Student will learn and understand how to calculate Area of plot and Ground.
4. Student will learn and understand about Horizontal Angle, Vertical Angle, Horizontal distance and Vertical distance to study the ground profile.

Course Outcomes: At the end of the course student will be able to:

1. Student will be able to prepare Map and Plan for required site with suitable scale.
2. Student will be able to prepare contour Map and Estimate the Quantity of earthwork required for formation level for Road and Railway Alignment.
3. Student will be able to judge which type of instrument to be used for carrying out survey for a Particular Area and estimate the area.
4. Student will be able to judge the profile of ground by observing the available existing contour map.

CYCLE - I

1. Chaining of a line using chain, measurements of area by cross staff survey.
2. Measurement of distance between two points when there is an obstacle for both chaining and ranging. Compass survey
3. Traversing by compass and adjustments in included angles and measurement of area - graphical adjustments.
4. Distance between two inaccessible points by compass. Plane Table Surveying
5. Measurement & Plotting of the area by Radiation method.
6. Determination of Positions objects by Intersection Method – Plane Table Survey.
7. Traverse by Plane table Survey.

CYCLE – II

Leveling

8. Measurement of elevation of various given points.
9. Elevation difference between two given points by reciprocal leveling.
10. Longitudinal Leveling
11. Cross – section Leveling
12. Plotting of Contours by Indirect Method

S Vidyavathi 21/11/2023

Saleem

ELLENKI COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

M. Tech in STRUCTURAL ENGINEERING

PROPOSED COURSE STRUCTURE (ER23 Regulations)

Applicable from AY 2023-24 Batch

I YEAR I – SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1	Professional Core - I	Advanced Structural Mechanics	3	0	0	3
2	Professional Core - II	Theory of Elasticity and Plasticity	3	0	0	3
3	Professional Elective - I	1. Theory of Plates and Shells 2. Computer Oriented Numerical Methods 3. Structural Stability	3	0	0	3
4	Professional Elective - II	1. Advanced Reinforced Concrete Design 2. Structural Health Monitoring 3. Structural Optimization	3	0	0	3
5	Lab - I	Computer Aided Design Laboratory	0	1	2	2
6	Lab - II	Structural Engineering Laboratory	0	1	2	2
7		Research Methodology & IPR	2	0	0	2
8	Audit - I	Audit Course - I	2	0	0	0
		Total	**16**	**02**	**4**	**18**

I YEAR II – SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1	Professional Core - III	Finite Element Analysis	3	0	0	3
2	Professional Core - IV	Structural Dynamics	3	0	0	3
3	Professional Elective - III	1. Advanced Structural Steel Design 2. Structural Reliability 3. Design of High-Rise Buildings	3	0	0	3
4	Professional Elective - IV	1. Advanced Prestressed Concrete Design 2. Structural Health Monitoring 3. Design of Bridges	3	0	0	3
5	Lab - III	Numerical Analysis Laboratory	0	1	2	2
6	Lab - IV	Advanced Structural Analysis and Design Laboratory	0	1	2	2
7		Mini Project with Seminar	0	0	4	2
8	Audit-II	Audit Course- II	2	0	0	0
		Total	**14**	**02**	**8**	**18**

II YEAR I – SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1.	Professional Elective - V	1. Earthquake Resistant Design of Structures 2. Pre-Engineered Buildings 3. Rehabilitation and Retrofitting of Structures	3	0	0	3
2.	Open Elective	Open Elective	3	0	0	3
3.	Dissertation	Dissertation Work Review - II	0	0	12	6
4.		**Total**	**6**	**0**	**12**	**12**

SVidyavathi 21/11/2023

II YEAR II - SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1.	Dissertation	Dissertation Work Review - III	0	0	12	6
2.	Dissertation	Dissertation Viva-Voce	0	0	28	14
		Total	**0**	**0**	**40**	**20**

For Dissertation Work Review – I, please refer 7.10 in R22 Academic Regulations

Open Electives Offered by the Department:

1. Green Buildings
2. Construction Project Management
3. Safety and Construction Practice Regulations.

M.Tech in STRUCTURAL ENGINEERING I YEAR I – SEMESTER

PROPOSED SYLLABUS

ADVANCED STRUCTURAL MECHANICS

Pre-requisites: Structural Analysis I & II

Course Objectives:

1. To learn how to calculate static and kinematic indeterminacies of various types of structures
2. To formulate the stiffness matrix for continuous beams, portal frames and trusses
3. To formulate the flexibility matrix for continuous beams, portal frames and trusses
4. To obtain the global stiffness matrix by assembling the element stiffness matrices

Course Outcomes: After completion of the course, students should be able to

1. Formulate the stiffness and flexibility matrices for various types of structures
2. Analyze the continuous beams, portal frames and trusses by stiffness method (structure approach)
3. Analyze the continuous beams, portal frames and trusses by flexibility method (structure approach)
4. Solve the Trusses, Continuous beams, Portal frames using element approach of stiffness method

UNIT - I

Unsymmetrical Bending:

Definition of Shear Center in Bending - Symmetrical and Nonsymmetrical Bending - Bending Stresses in Beams Subjected to Nonsymmetrical Bending - Deflections of Straight Beams Subjected to Nonsymmetrical Bending

UNIT - II

Advanced Analysis of Beams :

Curved Beams: Circumferential Stresses in a Curved Beam - Radial Stresses in Curved Beams - Correction of Circumferential Stresses in Curved Beams Having I-, T-, or Similar Cross Sections - Deflections of Curved Beams

Beams on Elastic Foundations - Infinite Beam Subjected to a Concentrated Load: Boundary Conditions - Infinite Beam Subjected to a Distributed Load Segment

UNIT - III

Column Buckling:

Concept of Column Buckling - Deflection Response of Columns to Compressive Loads - Euler Buckling of Columns with General End Constraints - Local Buckling of Columns - Inelastic Buckling of Columns

UNIT - IV

Introduction to matrix methods of analysis: Static indeterminacy and kinematic indeterminacy - degree of freedom - coordinate system - structure idealization stiffness and flexibility matrices - suitability element stiffness equations - elements flexibility equations - mixed force - displacement equations-Transformation of coordinates - element stiffness matrix - and load vector - local and global coordinates - Assembly of stiffness matrix from element stiffness matrix – Analysis of trusses, beams and frames by stiffness matrix methods

UNIT - V

Direct stiffness method: General procedure - banded matrix - semi bandwidth - assembly by direct stiffness matrix method -Application of direct stiffness method to trusses, simple and continuous beams and frames

REFERENCES

1. Structural Analysis by Devdas Menon, Narosa Publishing Housing Pvt Ltd.
2. Indeterminate Structural Analysis by K U. Muttu,IK International Publishing House Pvt.ltd Matrix Analysis of Frames structures by William Weaver J.R and James M.Gere, CBS publications
3. Matrix Structural Analysis by Madhu B. Kanchi
4. Matrix Methods of Structural Analysis by J.Meek
5. Structural Analysis by Ghali and Neyveli

M.Tech in STRUCTURAL ENGINEERING
I YEAR I – SEMESTER
PROPOSED SYLLABUS

THEORY OF ELASTICITY AND PLASTICITY

Prerequisites: Strength of Materials I & II

Course Objectives:

1. To define stresses, strains, equilibrium and compatibility
2. To derive the governing equilibrium equations in Two-dimensional & in three dimensional problems
3. To understand stress -strain relationships
4. To apply the concepts of elasticity & Plasticity to solve Structural Engineering problems

Course Outcomes: After completion of the course, students should be able to

1. Solve simple problems of elasticity and understanding the basic concepts
2. Apply numerical methods to solve continuum problems
3. Solve engineering problems such as thick cylinders, rotating discs
4. Solve engineering problems related to Torsion of shafts.

UNIT - I

Stress: Introduction to Elasticity – Definition of Kinetics and Kinematics - Notation for forces and stress - Components of stresses – Stress tensor - Differential equations of equilibrium in 2D & 3D in Cartesian coordinates and in polar coordinates - boundary conditions – Cauchy's postulate – Stress transformation – Direction Cosines -Principal stresses – Stress invariants – Decomposition of stresses -Hydrostatic and Deviatoric stresses – Octahedral stresses – stress concentration factors

UNIT - II

Strain: Notation for strain - Components of strain – Strain tensor – Strain Components -Strain - displacement relations - Strain Compatibility Conditions - Strain transformation – Direction Cosines - Principal strains – Strain invariants - Octahedral strains – Strain Rosette

UNIT - III

Stress -Strain Relationship: Navier's equation for stress-strain relationships – Relationship between Material constants – Stress - strain relations in 2D and 3D – Complementary conditions for shear - Material symmetry -Reduction of Material constants from anisotropic to orthotropic, monoclinic, isotropic and transversely isotropic – Plane stress, Plane strain and axi-symmetric idealizations - Mohr circle in 2D and 3D – Airy's stress function – Potential function -

UNIT - IV

Solution of 2D and 3D elasticity problems: Problem solving using stress function approach: Beam bending problems – Symmetric stress distribution problems, Plane problems.
Torsion problems in Elasticity – Membrane analogy approach – Application to non- circular thin walled sections

UNIT - V

Plasticity: Introduction to plasticity – Yield criteria for pressure dependent and independent materials - – Tresca's criterion – Von mises criterion – Mohr-Coulomb criterion -Rankine criterion -Flow rule – Associative and Non-Associative-Hardening rules and consistency conditions -Introduction to iterative and return mapping.

REFERENCES:

1. Theory of Elasticity by Timeshenko, McGraw-Hill Publications
2. Theory of Elasticity by Y.C.Fung
3. Advanced Mechanics of solids by LS Srinath,
4. Elasticity and Plasticity for structural Engineers by Wang & Chen

M. Tech in STRUCTURAL ENGINEERING
I YEAR I – SEMESTER
PROPOSED SYLLABUS
THEORY OF PLATES AND SHELLS (Program Elective – I)

Pre-requisites: Theory of Elasticity, Structural Analysis

Course Objectives:

1. To understand the behaviour of Rectangular and circular Plates subjected to various loading
2. To understand the behaviour of various types of Shells subjected to various loading
3. To study the analysis procedures for plates and shells
4. To study the analysis of folded plates

Course Outcomes: After completion of the course, students should be able to

1. Use analytical methods for the solution of thin plates and shells
2. Use analytical methods for the solution of shells and folded plates
3. Apply the numerical techniques and tools for the complex problems in thin plates
4. Apply the numerical techniques and tools for the complex problems in shells

UNIT - I

Introduction: Space Curves, Surfaces, Shell Co-ordinates, Strain Displacement Relations, Assumptions in Shell Theory, Displacement Field Approximations, Stress Resultants, Equation of Equilibrium using Principle of Virtual Work, Boundary Conditions.

UNIT - II

Small Deflection Theory of Thin Rectangular Plates : Assumptions – Derivation of governing differential equation for thin plates – Boundary conditions – simply supported plate under sinusoidal load – Navier solution – Application to different cases – Levy's solution for various boundary conditions subjected to different loadings like uniform and hydrostatic pressure.

UNIT - III

Circular Plates: Differential Equation for symmetrical bending of Laterally loaded circular Plates – Uniformly loaded circular plates –circular plate concentrically loaded – circular plate loaded at center

UNIT - IV

Shells – functional behaviour – examples – structural behaviour of shells classification of shells – Definitions – various methods of analysis of shells – merits and demerits of each method – 2D. Membrane equation.

Equations of equilibrium: Derivation of stress resultants – cylindrical shells – Flugges simulations equations.

UNIT - V

Introduction to the shells of Double curvatures:_ Geometry, analysis and design of elliptic paraboloid, conoid and hyperbolic parabolic shapes, inverted umbrella type.

Axi- Symmetrical shells: General equation - Analysis and axi-symmetrical by membrane theory. Application to spherical shell and hyperboloid of revolution cooling towers.

REFERENCES:

1. Theory of Plates & Shells –Stephen, P. Timoshenko, S. Woinowsky-Krieger – Tata MC Graw Hill Edition
2. Analysis and design of concrete shell roofs By G. S. Ramaswami, CBS publications.
3. Design of concrete shell roofs By Billington – Tata MC Graw Hill, New York
4. Design of Shells and Folded Plates by P.C. Varghese, PHI Learning Pvt. Ltd

M. Tech in STRUCTURAL ENGINEERING
I YEAR I – SEMESTER
PROPOSED SYLLABUS
COMPUTER ORIENTED NUMERICAL METHODS (Program Elective – II)

Pre-requisites: Mathematics I and II

Course Objectives:

1. To apply the basic knowledge of Mathematics in Engineering
2. To provide a formidable base for analysis and programming using computer applications
3. To develop the ability in programming and solutions based on the various analysis tools
4. To check the consistency of system of linear equations

Course Outcomes: After completion of the course, students should be able to

1. Apply numerical methods to find the roots of an equation
2. Identify mathematical model for solution of common engineering problems
3. Formulate simple problems into programming models
4. Solve ordinary and partial differential equations

UNIT - I:
Solutions of linear equations: Direct method – Cramer's rule, Guass – Elimination method- Gauss – Jordan elimination – Triangulation (LU Decomposition) method – Iterative methods Jacobi – Iteration method – Gauss – Siedel iteration, Successive over –relaxation method -Applications

UNIT - II:
Eigen values and eigen vectors: Jacobi method for symmetric matrices- Given's method for symmetric matrices-Householder's method for symmetric matrices-Rutishauser method of arbitrary matrices – Power method, Fast Fourier Transform (FFT)
Interpolation: Linear Interpolation - Higher order Interpolation - Lagrange Interpolation – Interpolating polynomials using finites differences- Hermite Interpolation -piece-wise and spline Interpolation.

UNIT - III:
Finite Difference and their Applications: Introduction- Differentiation formulas by Interpolating parabolas – Backward and forward and central differences- Derivation of Differentiation formulas using Taylor series- Boundary conditions- Beam deflection – Solution of characteristic value problems- Richardson's extrapolation- Use of unevenly spaced pivotal points- Integration formulae by interpolating parabolas- Numerical solution to spatial differential equations.

UNIT - IV:
Numerical Differentiation: Difference methods based on undetermined coefficients- optimum choice of step length- extrapolation method – Partial differentiation.
Numerical Integration: Method based on interpolation-method based on undetermined coefficient – Gauss – legrange interpolation method- radaua integration method- composite integration method – Double integration using Trapezoidal and Simpson's method.

UNIT - V:
Ordinary Differential Equation: Euler's method – Backward Euler method – Midpoint method – single step method, Taylor's series method, Runge-Kutta method Predictor-Corrector Method -Trapezoidal and Midpoint method – Implicit Runge Kutta method – Boundary value problem – Difference method – Shooting method -Structural Engineering Applications

REFERENCES:

1. Numerical Methods for Scientific and Engineering Computations. M. K. Jain - S. R. K. Iyengar – R. K. Jain Willey Eastern Limited.
2. Applied numerical Analysis by – Curtis I. Gerala- Addission Wasley – published campus.
3. Numerical Methods for Engineers Stevan C. Chopra, Raymond P. Canal Mc. Graw Hill book company.
4. C Language and Numerical Methods by C. Xavier – New age international publisher.
5. Numerical methods using MATLAB by George Lindfield and John penny, Academic press

21/11/2023

M.Tech in STRUCTURAL ENGINEERING
I YEAR I – SEMESTER
PROPOSED SYLLABUS
STRUCTURAL STABILITY (Program Elective – I)

Pre-requisites: RCC Design and Analysis

Course Objectives:

1. To derive the differential equations for beam-columns
2. To understand the elastic buckling of bars and frames
3. To understand the Torsional Buckling
4. To analyze lateral buckling of beams and plate

Course Outcomes: After completion of the course, students should be able to

1. Apply the approximate methods based on energy to determine the stability of simple systems
2. Differentiate how the tangent modulus and double modulus theories of inelastic buckling led to the column paradox, thereby preventing further difficulties for a general theory of structures
3. Analyze elastic and in-elastic buckling of bars and frames
4. Analyze the beams for lateral torsional buckling

UNIT – I

Criteria for Design of Structures: Stability, Strength, and Stiffness, Classical Concept of Stability of Discrete and Continuous Systems, Linear and nonlinear behavior.

UNIT – II

Stability of Columns: Axial and Flexural Buckling, Lateral Bracing of Columns, Combined Axial, Flexural and Torsion Buckling.

UNIT – III

Stability of Frames: Member Buckling versus Global Buckling, Slenderness Ratio of Frame Members.

UNIT – IV

Stability of Beams: lateral torsion buckling.
Stability of Plates: axial flexural buckling, shear flexural buckling, buckling under combined loads.

UNIT – V

Introduction to Inelastic Buckling and Dynamic Stability.

REFERENCE BOOKS:

1. Theory of elastic stability, Timoshenko and Gere, Tata Mc Graw Hill,1981
2. Principles of Structural Stability Theory, Alexander Chajes, Prentice Hall, New Jersey.
3. Structural Stability of columns and plates, Iyengar, N. G. R., Eastern west press Pvt. Ltd.
4. Strength of Metal Structures, Bleich F. Bucking, Tata McGraw Hill, New York.

M.Tech in STRUCTURAL ENGINEERING
I YEAR I – SEMESTER
PROPOSED SYLLABUS
ADVANCED REINFORCED CONCRETE DESIGN (Program Elective – II)

Pre-requisites: Design of Reinforced Concrete Structures

Course Objectives:

1. To understand the concept of limit state design
2. To understand the various types of loads in current codes of practice for the design
3. To understand the Design concepts of structural elements
4. To analyze and Design advanced structural elements

Course Outcomes: After completion of the course, students should be able to

1. Explain the concept of limit state design
2. Understand and explain the analysis of advanced structural elements
3. Apply the codal provisions of different limit states
4. Design advanced structural elements

UNIT - I

Limit state Analysis of R.C. Structures: Introduction- Loads – Different types of Loads and load combinations – Different methods of Design- Working Stress Method and Limit State Method –- Materials - Characteristic Values – Reliability based methods of design - Partial safety factors –Stress Block Parameters - Plastic hinge, Redistribution of moments, moment rotation characteristics of RC member

UNIT - II

Limit state of Flexure: I.S. code provisions, loading pattern, Bending Moment Envelop, Application for Fixed Beams and Continuous Beams, Deep Beams and Corbels

UNIT - III

Inelastic Analysis of Slabs :Yield line criterion – Virtual work and equilibrium methods of analysis – For square circular, Rectangular, Triangular and Hexagonal with simple and continuous end conditions- Reinforcement details - **Ribbed slabs :** Analysis of the Slabs for Moment and Shears, Ultimate Moment of Resistance, Design for shear, Deflection, Arrangement of Reinforcements, **Flat slabs:** Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat slabs-Check for one way and two way shears-Introduction to Equivalent frame method. Limitations of Direct design method, Distribution of moments in column strips and middle strip sketch showing reinforcement details.

UNIT - IV

Limit state of Shear, Bond and Torsion: Design for Shear, Bond and Torsion - Mechanism of shear and bond failure - Design of shear using limit state concept – Design for Bond –Anchorage and Development length of bars - Design of sections for torsion - Detailing of reinforcement

UNIT - V

Limit State of Compression: Design of Short and Long columns - slenderness limits, Methods of Design of Slender Columns, Additional Moment Method, Procedure for Design of Slender Columns.

REFERENCES:

1. "Reinforced Concrete Design" S. Unnikrishna Pillai & Devdas Menon; Tata Mc. Graw-Hill Publishing Company Ltd. New Delhi 2010.
2. "Advanced Reinforced Concrete" P.C. Varghese Prentice Hall of INDIA Private Ltd. 2008.

3. "Design of Reinforced Concrete Structures" by N.Subramanian, Oxford University Press
4. "Limit State Theory and Design of Reinforced Concrete" Dr. S. R. Karve and V.L Shah. Standard Publishers, PUNE 2004.
5. Design of concrete structures – Arthus H. Nelson, David Darwin, and Chorles W. Dolar, Tata Mc. Graw-Hill, 3rd Edition, 2005.
6. Reinforced Concrete design by Kennath Leet, Tata Mc. Graw-Hill International, editions, 2nd edition, 1991.
7. "Design Reinforced Concrete Foundations" P.C. Varghese Prentice Hall of INDIA Private Ltd.
8. IS 456- 2000 Plain and Reinforced concrete book of Practice.
9. SP 16 - Design Aids for Reinforced Concrete to IS 456
10. SP 34 - Hand Book as Concrete Reinforcement and retaining

S Vidyavathi
21/11/2023

M. Kathi

M.Tech in STRUCTURAL ENGINEERING
I YEAR I – SEMESTER
PROPOSED SYLLABUS
STRUCTURAL HEALTH MONITORING (Program Elective – II)

Pre-requisites: Concrete Technology.

Course Objectives:

1. To understand the concepts of health monitoring
2. To assess the structural health of the structures using static and dynamic field methods
3. To suggest the possible repair and rehabilitation methods

Course Outcomes: At the end of the course, students will be able to

1. Diagnosis the distress in the structure understanding the causes and factors.
2. Assess the health of structure using static field methods.
3. Assess the health of structure using dynamic field tests.
4. Suggest repairs and rehabilitation measures of the structure

UNIT – I

Structural Health: Factors affecting Health of Structures, Causes of Distress, Regular Maintenance.

UNIT – II

Structural Health Monitoring: Concepts, Various Measures, Structural Safety in Alteration.
Structural Audit: Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

UNIT – III

Static Field Testing: Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement.

UNIT – IV

Dynamic Field Testing: Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.

UNIT – V

Introduction to Repairs and Rehabilitations of Structures: Case Studies (Site Visits), piezo–electric materials and other smart materials, electro–mechanical impedance (EMI) technique, adaptations of EMI technique.

REFERENCE BOOKS:

1. Structural Health Monitoring, Daniel Balageas, Claus_Peter Fritzen, Alfredo Güemes, John Wiley and Sons, 2006
2. Health Monitoring of Structural Materials and Components_Methods with Applications,
3. Douglas E Adams, John Wiley and Sons, 2007.
4. Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z. D. Duan, Taylor and Francis Group, London, UK, 2006.
5. Structural Health Monitoring with Wafer Active Sensors, Victor Giurglutiu, Academic Press Inc,2007.

M.Tech in STRUCTURAL ENGINEERING I YEAR I – SEMESTER
PROPOSED SYLLABUS
STRUCTURAL OPTIMIZATION (Program Elective – II)

Pre-requisites: RCC and numerical methods

Course Objectives:

1. To understand the concepts calculus of variation for optimization
2. To perform linear, non-linear and geometric programing methods
3. To understand the applications of mathematical optimization methods to steel and RCC
4. To perform the designs based on frequency constraint

Course Outcomes: After completion of the course, students should be able to

1. Use Variational principle for optimization
2. Perform linear, non-linear, dynamic and geometric programing methods
3. Apply optimization techniques to structural steel and concrete members
4. Design using frequency constraint

UNIT – I
Introduction: Simultaneous Failure Mode and Design, Classical External Problems.

UNIT – II
Calculus of Variation: Variational Principles with Constraints,

UNIT – III
Linear Programming, Integer Programming, Nonlinear Programming, Dynamic Programming,

UNIT – IV
Geometric Programming and Stochastic Programming.

UNIT – V
Applications: Structural Steel and Concrete Members, Trusses and Frames.
Design: Frequency Constraint, Design of Layouts.

REFERENCE BOOKS:

1. Elements of Structural Optimization, Haftka, Raphael T., Gürdal, Zafer, Springer
2. Variational methods for Structural optimization, Cherkaev Andrej, Springer

S Vidyavathi
21/11/2023

M. Tech in STRUCTURAL ENGINEERING I YEAR I – SEMESTER
PROPOSED SYLLABUS
COMPUTER AIDED DESIGN LABORATORY (Lab – I)

Pre-Requisites:

- Computer Aided Civil Engineering Drawing Principles
- Microsoft Excel
- Structural Engineering -1, Structural Engineering - 2

Course Objectives: The objectives of the course are to

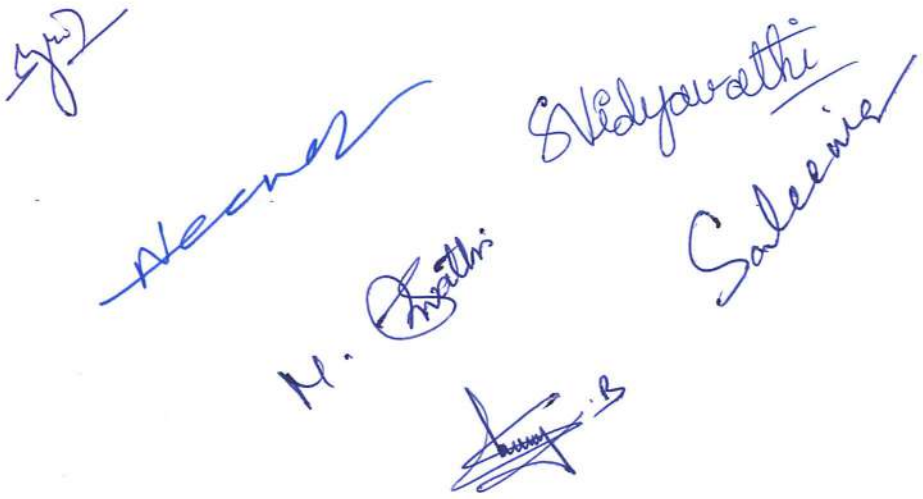
- Learn the usage of any fundamental software for design
- Create geometries using pre-processor
- Analyse and Interpret the results using post processor
- Design the structural elements

Course Outcomes: After the completion of the course student should be able to

- Model the geometry of real world structure Represent the physical model of structural element/structure
- Perform analysis
- Interpret from the Post processing results
- Design the structural elements and system as per IS Codes

List of Experiments:

1. Analysis and design of determinate and indeterminate beams & development of Excel template
2. Analysis and design of plane frames and development of Excel template.
3. Analysis and design of space frame and development of Excel template
4. Analysis and design of a multi-storeyed building subjected to DL, LL and WL
5. Analysis and design of multi-storeyed building subjected to DL, LL and EQ
6. Analysis and design of Roof trusses including WL calculation in Excel Spreadsheet
7. Analysis and design of Gantry girder and development of spread sheet



M. Tech in STRUCTURAL ENGINEERING I YEAR I – SEMESTER
PROPOSED SYLLABUS
STRUCTURAL ENGINEERING LABORATORY (Lab – II)

Pre-requisites: Concrete Technology.

Course Objectives:

1. To understand the behaviour of cementitious composite systems inclusive of the effects of particulate and fibrous ingredients
2. To analyze and evaluate the performance of structural elements in the laboratory an field
3. To decide upon the type of material to be used for a particular exposure condition
4. To evaluate parameters required to determine the service life of structures

Course Outcomes: After completion of the course, students should be able to

1. Design normal and special concretes and evaluate the parameters affecting its performance
2. Conduct Non-Destructive Tests on existing concrete structures
3. Apply engineering principles to understand mechanical and durability characteristics of structural elements
4. Evaluate the corrosion characteristics through RCPT and ACC tests

List of Experiments/Assignments:

A. Tests on following fresh concretes

Self- Compacting Concrete, High Strength Concrete, Normal Strength Concrete The tests shall include

1. Mix Design
2. Workability tests
3. Material characterization of ingredients
    a. Specific gravity test
    b. Water absorption test
    c. Gradation Analysis (Sieve Analysis)
    d. Tests on setting times

B. Tests on Hardened Concrete:

1. Compression test on High strength Concrete Cubes and Cylinders
2. Flexure tests on Normal strength concrete under reinforced, Over reinforced and balanced beams
3. Flexure tests on Normal strength concrete beams with and without Shear reinforcement

C. Durability Tests:

1. Water Permeability
2. Rapid Chloride Permeability Test
3. Carbonation tests
4. Half-cell potential test

D. Non-Destructive testing of concrete using rebound hammer & ultrasonic pulse velocity

REFERENCE BOOKS:

1. Properties of Concrete, Neville A. M., 5th Edition, Prentice Hall, 2012.
2. Concrete Technology, Shetty M. S., S. Chand and Co., 2006.
3. Concrete Technology by A.R. Santha kumar, Oxford University Press.

M. Tech in STRUCTURAL ENGINEERING I YEAR II – SEMESTER
PROPOSED SYLLABUS
FINITE ELEMENT ANALYSIS

Course Objectives: The objectives of this course is to impart knowledge of

1. About the fundamentals of domain discretization, interpolation, application of boundary conditions, assembly of global matrices, and solution of the resulting algebraic systems.
2. Understand the core concepts of variational and weighted residual methods in FEM.
3. Derive the element stiffness matrix for 1-D, 2-D and 3-D problems.
4. Formulate the simple structural problems in to finite elements.

Course Outcomes: At the end of this course, students will be able to

1. Build and analyse the FEA models for various engineering problems.
2. Identify the requirements and sources for analysis, design and evaluation.
3. Use the standard finite element software to solve the structural engineering problems.
4. Interpret the results obtained from FEA software, and arrive at the conclusions

UNIT – I

Introduction to FEM: Types of Problems – Types of Materials – Elastic / Inelastic situations – Types of forces: Body forces / Surface Traction / Point loads – Deformable bodies – Types of Deformations – Homogeneous / Non homogeneous Problems – Equations of equilibrium for elastic 2-D / 3-D continua - Equilibrium equations for 2-D / 3-D boundary elements – Boundary conditions – Strain-displacement relation for 2-D / 3-D – Stress-strain relation for 2-D / 3-D – Plane stress / Plane strain problems.
Virtual Work Formulation: Application to problems of plane trusses with static indeterminacy not exceeding three.

UNIT – II

Variational Formulation: Approximate methods of Analysis- Weighted residual method - Rayleigh-Ritz Method -Strong form weak form -Variational principle - Stationarity Functional or Differential equation
Finite element formulation for1-D problems: Minimum Potential Energy Approach, week form approach, introduction to natural coordinates -Finite element approximations in one dimension- Lagrangian approximation-Hermitian approximations, FE formulation for Axial bar, Euler Bernoulli beam -Numerical Examples
Finite element formulation for 2-D problems: FE Approximation in 2-Dimension, Pascals triangle, Convergence criterion, Compatible and incompatible elements**, FE** Formulation for plane stress, plane strain and Axi-symmetrical problems, Shape functions for 2-Dimensional CST Element-4 noded quadrilateral element -Highier order triangular and rectangular elements- Consistent Nodal load vector -Numerical Examples

UNIT – III → under Unit-III for R-24
Iso-parametric elements: – R-24
Quadrilateral elements: FE Formulation for linear and quadratic isoparametric elements- Construction of shape functions using natural coordinates/Strain-displacement matrices/Load matrices for body force and surface traction/ Expressions for stiffness matrix, load matrices for 4-noded quadrilateral elements/ Gauss Quadrature of numerical integration / Problems with rectangular elements, kinematic indeterminacy not exceeding three- Determination of shape functions for 2nd order quadrilateral elements and for elements of with serendipity / Strain-displacement matrices / Load matrices for body force and surface traction.

UNIT – IV

Finite element formulation for 3 -D elements:

FE Formulation for Tetrahedral and Hexahedral elements: Volume coordinates, Strain-displacement matrix, stiffness matrix, load matrices due to body force and surface traction/ introduction to Hexahedron (brick) elements

Galerkin's Method of Weighted Residuals – Application to problems of mathematics / structural engineering, number of trial functions not exceeding two.

Weak form of Trial Function (Application to problems of mathematics / structural engineering, number of elements limited to two - Strain-displacement relationship/stress-strain relationship / determination of stiffness matrix for 3-noded ring element and load matrices for body force and surface traction/ Problems with kinematic indeterminacy not exceeding three for 3-noded ring elements only)

Propose as Unit-V in R-24

UNIT – V

Numerical examples: Simple 1-D model, 2-D model and a 3-D model/ analysis and post processing of the results using commercially available FEA software and available codes.

delete in R-24

TEXT BOOKS:

1. Reddy, J. N, (1993). —An Introduction to the Finite Element Methodǁ, McGraw Hill, New York.
2. Cook, R. D. (1981). —Concepts and Application of Finite Element Analysisǁ, John Wiley and Sons.
3. Zienkiewicz, O. C. And Taylor, R. L, (1989). —The Finite Element Methodǁ, Vol.1, McGraw Hill Company Limited, London.
4. Chandrupatla, T. R. And Belegundu, A. D, (2001). —Introduction to Finite Elements in Engineeringǁ, Prentice Hall of India, New Delhi.
5. Seshu. P, (2003). —Finite Element Analysisǁ, Prentice Hall of India Private Limited, New Delhi.
6. David V. Hutton, (2005). —Fundamentals of Finite Element Analysisǁ, Tata McGraw-Hill Publishing Company Limited, New Delhi.
7. Bathe, K. J, (2006). —Finite Element Proceduresǁ, Prentice Hall of India, New Delhi

Reference Books :

1.

2.

Vidyavathi 21/11/2023

Saleem

M. Sasthi

M. Tech in STRUCTURAL ENGINEERING I YEAR II – SEMESTER
PROPOSED SYLLABUS
STRUCTURAL DYNAMICS

Prerequisites: Structural Analysis I & II, Mathematics

Course Objectives:

1. To know the fundamental concepts and theory of dynamic analysis
2. To understand the free vibrations concepts and the problem of determining the natural frequency of a system
3. To understand the free vibrations concepts of harmonically excited vibrations
4. To understand the free Vibrations of Multi -degree of freedom

Course Outcomes: After completion of the course, students should be able to

1. Apply the fundamental concepts and definitions used in structural dynamics
2. Calculate the natural frequency of a system using equilibrium or energy methods
3. Determine the effect of viscous damping on the response of a freely vibrating system
4. Determine the response of a system to a harmonic excitation

UNIT - I:

Theory of Vibrations: Introduction - Elements of vibratory system - Degrees of Freedom - Continuous System - Lumped mass idealization - Oscillatory motion - Simple Harmonic motion - Vectorial representation of S.H.M. – Fundamental objectives of dynamic analysis -Types of prescribed loading - Methods of discretization - Formulation of equations of motion by different methods – Direct equilibration using Newton's law of motion / D'Alembert's principle, Principle of virtual work and Hamilton principle.

UNIT - II

Single Degree of Freedom Systems: Free vibrations of single degree of freedom system - undamped and damped vibrations - critical damping - Logarithmic decrement - Forced vibration of SDOF systems – Half Power (Band-Width) Method-Harmonic excitation - Vibration Isolation – Response to support motion-Force transmitted to the foundation-Transmissibility-Dynamic magnification factor – Phase angle.

Response to General Dynamic Loading – Duhamel's Integral-Constant Force, Rectangular load, Triangular load, Response to Periodic loading- Fourier series expression of periodic loading- Response to Fourier series loading

UNIT - III

Multi Degree of Freedom Systems: Selection of the degrees of Freedom - Evaluation of structural property matrices - Formulation of the MDOF equations of motion -Undamped free vibrations - Solutions of Eigen value problem for natural frequencies and mode shapes - Analysis of Dynamic response – Normal co-ordinates - Uncoupled equations of motion - Orthogonal properties of normal modes - Mode superposition procedure.

UNIT - IV

Practical Vibration Analysis: Introduction - Stodola method - Fundamental mode analysis - Analysis of second and higher modes - Holzer method - Basic procedure.

UNIT - V

Continuous Systems: Introduction - Flexural vibrations of beams - Elementary case – Derivation of governing differential equation of motion - Analysis of undamped free vibrations of beams in flexure - Natural frequencies and mode-shapes of simple beams with different end conditions.

REFERENCES:

1. Dynamics of Structures by Ray W.Clough & Joseph Penzien, Second Edition, CBS Publishers & Distributors
2. Dynamics of Structures by Anil K. Chopra, Pearson Education (Singapore), Delhi.
3. Structural Dynamics by Mario Paz and William Leigh, Fifth Edition, Springer
4. Theory of Vibrations by W.T. Thomson, Pearson
5. Fundamentals of Structural Dynamics by Roy. R. Craig, John wiley & sons

Text Books
1.
2.

References
1.
2.
3. Fundamentals of Structural Dynamics - Roy R. Craig

M.Tech in STRUCTURAL ENGINEERING I YEAR II – SEMESTER
PROPOSED SYLLABUS Professional Elective
ADVANCED STRUCTURAL STEEL DESIGN (~~Program Elective~~ – III)

Pre-requisites: Design of Steel Structures & Structural Analysis

Course Objectives:

1. To analyze bolted and welded eccentric connections
2. To sketch the Influence line diagrams for truss members
3. To estimate the various types of loads such as Dead, Live and Wind loads on roof trusses
4. To determine the shape factor and define the theorems of plastic analysis

Course Outcomes: After completion of the course, students should be able to

5. Design the eccentric and moment connections
6. Design the truss members subjected to tension, compression
7. Determine the collapse loads for continuous beams and portal frames
8. Estimate the various types of loads such as Dead, Live and Wind loads on PEB's

UNIT - I

Simple Connections –Bolted Pinned And Welded Connections: Bolted Connections –Load Transfer Mechanism – Failure of Bolted Joints – Specifications for Bolted Joints – Bearing – Type Connections – Tensile Strength of Plate – Strength and Efficiency of the Joint – Combined Shear and Tension – Slip-Critical connections – Prying Action – Combined Shear and Tension for Slip-Critical Connections. Design of Groove Welds - Design of Fillet Welds – Design of Intermittent Fillet Welds – Failure of Welds.

UNIT - II

Plastic Analysis:

Introduction – Plastic Theory – Plastic neutral Axis plastic moment, Elastic & Plastic Section modulii shape factors plastic Hinge – Fundamental condition conditions in plastic analysis, methods of plastic analysis – collapse load – simply supported, propped cantilever beam, fixed beams continuous beams, portal frame single bay single storey portal frame at different level subjected to vertical and horizontal loads.

UNIT - III

Eccentric and Moment Connections: Introduction – Beams – Column Connections – Connections Subjected to Eccentric Shear – Bolted Framed Connections –Bolted Seat Connections – Bolted Bracket Connections. Bolted Moment Connections – Welded Framed Connections- Welded Bracket Connections – Moment Resistant Connections.

UNIT - IV

Analysis and Design of Industrial Buildings:

Dead loads, live loads and wind loads on roofs. Design wind speed and pressure, wind pressure on roofs; wind effect on cladding and louvers; Design of angular roof truss, tubular truss, truss for a railway platform, Design of purlins for roofs, design of built up purlins, design of knee braced trusses and stanchions, Design of bracings.

UNIT - V

Design of Steel Truss Girder Bridges:

Types of truss bridges, component parts of a truss bridge, economic Proportions of trusses, self weight of truss girders, design of bridge Compression members, tension members; wind load on truss girder

Bridges; wind effect on top lateral bracing; bottom lateral bracing; portal Bracing; sway bracing Design of Lacing.

REFERENCES:

1. Limitstate Design of Steel Structures by N. Subramanian
2. Limit State Design of Steel Structures S.K. Duggal Mc Graw Hill Education Private Ltd. New Delhi.
3. Design of Steel Structures. P.Dayaratnam, Publisher : S. Chand, Edition 2011-12.
4. Design Steel Structures Volume – II, Dr. Ramachandra & Vivendra Gehlot Scientific Publishes Journals Department.
5. Design of Steel Structures Galyord & Gaylord, Publisher: Tata Mc Graw Hill, Education. Edition 2012.
6. Indian Standard Code – IS – 800-2007.
7. Indian Standard Code – IS – 875 – Part III – 2015

M. Tech in STRUCTURAL ENGINEERING I YEAR I – SEMESTER

PROPOSED SYLLABUS

STRUCTURAL RELIABILITY (~~Program~~ Elective – II)

Professional

COURSE OBJECTIVES:

1. To acquire basic knowledge of Statistics and Probability Theory
2. To understand resistance distribution and parameters
3. To develop the ability to do computation of structural reliability
4. To understand reliability design criteria

COURSE OUTCOMES: After completion of the course, students should be able to

1. Understand Basics of Statistics and explain Probability Theory
2. Characterize the dimensional variations of materials
3. Explain and apply Monte Carlo method
4. Develop reliability-based designs

UNIT - I

Concepts of Structural Safety: General - Design methods- Basic Statistics: Introduction -Data reduction – Histograms - Sample correlation - Probability Theory: Introduction, Random events - Random variables - Functions of random variables - Moments and expectation - common probability distribution - Extremal distribution.

UNIT - II

Resistance Distributions and Parameters: Introduction - Statistics of properties of concrete, steel, strength of bricks and mortar - dimensional variations - characterization of variables - Allowable stresses based on specified reliability.

UNIT - III

Basic Structural Reliability: Introduction - Computation of Structural reliability- Monte Carlo Study of Structural Safety: General- Monte Carlo method - Applications.

UNIT - IV

Reliability Methods: Introduction - Basic variables and failure surface - First-order second-moment methods (FOSM)

UNIT - V

Reliability Based Design: Introduction - Determination of partial safety factors - Safety checking formats - Development of reliability-based design criteria - Optimal safety factors -Summary of results of study for Indian standard – RCC Design.

TEXT BOOKS:

1. R. Ranganathan, Structural Reliability Analysis and Design, Jaico Publishing House, 2006.
2. R.E. Melchers, Structural Reliability – Analysis & Prediction, 2/e, Wiley – Blackwell, 1999.

REFERENCES:

1. Maurice Lemaire, Structural Reliability,Wiley (2009).
2. Dan M. Frangopol, Mitsuo Kawatani & Chul-Woo Kim, Reliability and Optimization of Structural Systems, Taylor & Francis (2006)

SVidyavathi 21/11/2023 Saleema Aleem M. Jyothi

4. Gupta Y.P.(Editor), Proceedings of National Seminar on High Rise Structures - Design and Construction Practices for Middle Level Cities, New Age International Limited, New Delhi,1995.
5. Lin T.Y and Stotes Burry D, "Structural Concepts and systems for Architects and Engineers", John Wiley, 1988.

M. Tech in STRUCTURAL ENGINEERING I YEAR II – SEMESTER
PROPOSED SYLLABUS
DESIGN OF HIGH-RISE BUILDINGS (~~Program~~ Professional Elective – III)

Pre-requisites: Structural analysis I and II

Course Objectives:

1. To understand the design aspects of Transmission Towers and Masts
2. To understand the analysis and design of Steel and RC Chimneys
3. To develop through understanding of the loading and structural forms of Tall Buildings
4. To understand the modelling for analysis of Tall Buildings

Course Outcomes: After completion of the course, students should be able to

1. Analyze and Design Transmission Line Towers and Masts
2. Analyze and Design Steel Chimney
3. Analyze and Design RC Chimney
4. Understand various loadings and structural forms of Tall Buildings and perform modal analysis

UNIT - I

Loading and Design Principles: Loading- sequential loading, Gravity loading, Wind loading, Earthquake loading, - Equivalent lateral force, modal analysis - combination of loading, – Static and Dynamic approach - Analytical and wind tunnel experimental methods - Design philosophy - working stress method, limit state method and plastic design.

UNIT - II

Behaviour of Various Structural Systems: Factors affecting growth, height and structural form. High rise behaviour, Rigid Frames, braced frames, In filled frames, shear walls, coupled shear walls, wall-frames, tubulars, cores, outrigger - braced and hybrid mega systems.

UNIT - III

Analysis and Design: Modeling for approximate analysis, Accurate analysis and reduction techniques, Analysis of buildings as total structural system considering overall integrity and major subsystem interaction, Analysis for member forces, drift and twist - Computerized three dimensional analysis – Assumptions in 3D analysis – Simplified 2D analysis.

UNIT - IV

Structural Elements: Sectional shapes, properties and resisting capacity, design, deflection, cracking, prestressing, shear flow, Design for differential movement, creep and shrinkage effects, temperature effects and fire resistance.

UNIT - V

Stability of Tall Buildings: Overall buckling analysis of frames, wall-frames, Approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first-order and P-Delta analysis, Translational, Torsional instability, out of plumb effects, stiffness of member in stability, effect of foundation rotation.

REFERENCES:

1. Taranath B.S., "Structural Analysis and Design of Tall Buildings", McGraw Hill, 1988.
2. Beedle.L.S., "Advances in Tall Buildings", CBS Publishers and Distributors, Delhi, 1986.
3. Bryan Stafford Smith and Alexcoull, "Tall Building Structures - Analysis and Design", John Wiley and Sons, Inc., 2005.

4. Gupta.Y.P.(Editor), Proceedings of National Seminar on High Rise Structures - Design and Construction Practices for Middle Level Cities, New Age International Limited, New Delhi,1995.
5. Lin T.Y and Stotes Burry D, "Structural Concepts and systems for Architects and Engineers", John Wiley, 1988.

M. Tech in COMPUTER AIDED STRUCTURAL ENGINEERING I YEAR II – SEMESTER
PROPOSED SYLLABUS Professional
ADVANCED PRESTRESSED CONCRETE DESIGN (~~Program~~ Elective – IV)

Pre-requisites: Reinforced Concrete Design & Structural Analysis.

Course Objectives:

1. To critically review the techniques of pre-stressing both Pre-tensioning and Post-tensioning
2. To design the pre-stressed concrete members for ultimate limit state and limit state of serviceability
3. To realize the importance of the Statically Indeterminate structures and Load Balancing •
4. To analyze and design continuous pre-stressed concrete beams with bent cables having straight and parabolic profiles

Course Outcomes: After completion of the course, students should be able to

1. Realize the importance of pre-stressing the long span structures and heavily loaded members
2. Acquire the knowledge of various pre-stressing techniques; their merits and demerits
3. Develop skills in planning, analysis and design of pre-stressed concrete beams, and slabs
4. Develop skills to satisfy the serviceability and strength provisions of the Indian Standards (IS:1343-2012)

UNIT - I:

Introduction – Prestressing Systems – Pre-tensioning Systems – Post-tensioning Systems – High Strength Steel and Concrete - Analysis of Prestress - Resultant Stresses at a Section – Pressure Line or Thrust Line – Concept of Load Balancing.

Losses of Prestress – Loss Due to Elastic Deformation of Concrete – Shrinkage of Concrete – Creep – Relaxation of Stress in Steel – Friction – Anchorage Slip.

UNIT - II:

Deflections of Prestressed Concrete Members: Importance of Control of Deflections – Factors Influencing Deflection – Short-term Deflections of Uncracked Members – Prediction of Long-time Deflections – Deflections of Cracked Members – Requirements of IS 1343-2012.

Ultimate Flexural Strength of Beams: Introduction, Flexural theory using first principles – Simplified Methods – Ultimate Moment of Resistance of untensioned Steel.

UNIT - III:

Composite Constructions: Introduction, Advantages, Types of Composite Construction, Analysis of Composite beams- Differential shrinkage- Ultimate Flexural and shear strength of composite sections- Deflection of Composite Beams. Design of Composite sections.

UNIT - IV:

Prestressed Concrete Slabs: Types Of Prestressed Concrete Floor Slabs- Design of Prestressed Concrete One Way and Two Way Slabs.

Prestressed Concrete Pipes: Circular prestressing- Types of Prestressed Concrete Pipes- Design of Prestressed Concrete Pipes.

UNIT - V:

Continuous Beams: Advantage of Continuous Members – Effect of Prestressing Indeterminate Structures – Methods of Achieving Continuity – Methods of Analysis of Secondary Moments – Concordant Cable Profile – Guyon's Theorem, Redistribution of moments in a continuous beam.

Anchorage Zone Stresses in Beams: Introduction, Stress distribution in End Block – Anchorage zone stresses –Magnel's method- Guyon's Method - Anchorage zone Reinforcement as per IS1343-2012.

REFERENCES:

6. Prestressed concrete, Krishnanraju N., Tata Mc Graw Hill, New Delhi.
7. Prestressed concrete by K.U. Muthu, PHI Learning Pvt. Ltd
8. Design of prestressed concrete structure, Lin T. Yand Burns, Asia Publication house, 1995.
9. Limit state design of prestressed concrete, Gutan Y, Applied science publishers, 1972.
10. IS:1343-2012-code of practice for Prestressed concrete

M. Tech in STRUCTURAL ENGINEERING I YEAR II – SEMESTER
PROPOSED SYLLABUS Professional
STRUCTURAL HEALTH MONITORING (~~Program~~ Elective –IV)

Pre-requisites: Concrete Technology

Course Objectives:

1. To understand the concepts of health monitoring
2. To assess the structural health of the structures using static and dynamic field methods
3. To suggest the possible repair and rehabilitation methods

Course Outcomes: At the end of the course, students will be able to:

1. Diagnosis the distress in the structure understanding the causes and factors.
2. Assess the health of structure using static field methods.
3. Assess the health of structure using dynamic field tests.
4. Suggest repairs and rehabilitation measures of the structure

UNIT – I

Structural Health: Factors affecting Health of Structures, Causes of Distress, Regular Maintenance.

UNIT – II

Structural Health Monitoring: Concepts, Various Measures, Structural Safety in Alteration.
Structural Audit: Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

UNIT – III

Static Field Testing: Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement.

UNIT – IV

Dynamic Field Testing: Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.

UNIT – V

Introduction to Repairs and Rehabilitations of Structures: Case Studies (Site Visits), piezo– electric materials and other smart materials, electro–mechanical impedance (EMI) technique, adaptations of EMI technique.

REFERENCE BOOKS:

6. Structural Health Monitoring, Daniel Balageas, Claus Peter Fritzen, Alfredo Güemes, John Wiley and Sons, 2006
7. Health Monitoring of Structural Materials and Components Methods with Applications,
8. Douglas E Adams, John Wiley and Sons, 2007.
9. Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z. D. Duan, Taylor and Francis Group, London, UK, 2006.
10. Structural Health Monitoring with Wafer Active Sensors, Victor Giurglutiu, Academic Press Inc, 2007.

M.Tech in STRUCTURAL ENGINEERING I YEAR II – SEMESTER

PROPOSED SYLLABUS

DESIGN OF BRIDGES (~~Program~~ Professional Elective – IV)

Prerequisites: Structural Analysis I &II, Reinforced Concrete Design

Course Objectives:

1. To understand the bridge hydrology
2. To list the components of bridge substructure, superstructure and types of bearings
3. To understand the codal provisions for loading and design standards of bridges
4. To design RC and PSC bridges

Course Outcomes: After completion of the course, students should be able to

1. Determine flood discharge, waterway, economic span
2. Select type of super structure, sub structure and the bearings
3. Calculate the various types of loads acting on the bridges
4. Design the Slab bridges, Girder bridges and Prestressed Concrete bridges

UNIT - I

Concrete Bridges: Introduction-Types of Bridges-Economic span length-Types of loading-Dead load-live load-Impact Effect-Centrifugal force-wind loads-Lateral loads-Longitudinal forces-Seismic loads-Frictional resistance of expansion bearings-Secondary Stresses-Temperature Effect-Erection Forces and effects-Width of roadway and footway-General Design Requirements.
Solid slab Bridges: Introduction-Method of Analysis and Design.

UNIT - II

RCC Girder Bridges: Introduction-Method of Analysis and Design-Courbon's Theory, Grillage analogy

UNIT - III

Box Culverts: - Single Cell Box Culvert – Design Loads, Design Moments, Shears and Thrusts. Design of Critical sections.

UNIT - IV

Pre-Stressed Concrete Bridges: Basic principles-General Design requirements-Mild steel reinforcement in prestressed concrete member-Concrete cover and spacing of pre-stressing steel-Slender beams-Composite Section-Propped-Design of Propped Composite Section-Unpropped composite section-Two-stage Prestressing-Shrinking stresses-General Design requirements for Road Bridges.

UNIT - V

Sub-structure of bridges: Substructure- Beds block-Piers- Pier Dimensions- Design loads for piers-Abutments- Design loads for Abutments.

REFERENCES:

1. Design of Concrete Bridges by M. G. Aswani, V. N. Vazirani and M. M. Ratwani.
2. Bridge Deck Behaviour by E. C. Hambly.
3. Concrete Bridge Design and Practice by V. K. Raina.
4. Essentials of Bridge Engineering by Johson Victor, Oxford & IBH
5. Design of Bridges by V. V. Sastry, Dhanpat Rai & Co.

S Vidyavathi 21/11/2023

Saleema

M. Jyothi

M.Tech in STRUCTURAL ENGINEERING I YEAR II – SEMESTER
PROPOSED SYLLABUS
NUMERICAL ANALYSIS LAB (Lab - III)

Course Objectives:

1. To solve a system of linear and non-linear equations
2. To draw best fit curve for the given data set
3. To find numerical solutions by FDM and FEM
4. To solve ordinary and partial differential equations numerically

Course Outcomes: After completion of the course, students should be able to

1. Analyze the beams by solving a system of equations
2. Generate the best fit curves, Sketch the basic 2D, 3D plots
3. Apply the concepts of FDM and FEM to solve Structural Engineering Problems
4. Solve the ODE and PDE and apply to the Structural Engineering Problems

LIST OF EXPERIMENTS:

1. Overview of MATLAB, Matrix operations (Addition, Subtraction, Multiplication, Transpose)
2. Solution of simultaneous equations using matrix inversion – Resolution of forces and moments and finding the reactions on a beam.
3. Solution of system of linear equations using Gauss Elimination method - Application to the analysis of indeterminate beams
4. Solution of System of linear equations using Gauss Seidal iteration Method – Application to the analysis of portal frames
5. Finding the Roots of non-linear equations using Newton – Raphson Method - Application for finding the slopes and deflections in determinate beams
6. Finding the Solution of an Eigen Value problem – Application to a multistory RC building for determining the Time periods and Mode shapes.
7. Numerical Integration using Trapezoidal & Simpson's Rule – Application for finding the Areas and Volumes of a given plot.
8. Numerical solution of ordinary differential equations by Runge- Kutta method
9. Numerical solution of second and higher order differential equations
10. Plotting Simple Graphs, Basic 2D Plots, 3D Plots

M. Tech in COMPUTER AIDED STRUCTURAL ENGINEERING I YEAR II – SEMESTER
PROPOSED SYLLABUS
ADVANCED STRUCTURAL ANALYSIS AND DESIGN LAB (Lab – IV)

Pre-requisites: RCC and Steel design

Course Objectives:

1. To model the beams, frames and trusses
2. To analyze the beams, frames and trusses
3. To interpret the results from post processing

Course Outcomes: After completion of the course, students should be able to

1. Analyze the Beams, Portal Frames and Trusses
2. Analyze and Design of Multistory RC Buildings for various loads
3. Analyze and Design of PEB components
4. Analyse and design raft foundations

List of Experiments

1. Analysis of a Bridge Deck by Grillage Analogy
2. Analysis and Design of a PEB Structure
3. Analysis and design of a Gantry Girder
4. Analysis and design of a High Rise Multi storied Building
5. Analysis and design of a Highrise Multi storey Building with shear wall
6. Analysis and design of a Highrise Multi storey Building with Flat Slab System
7. Analysis and design of Flat Slab Raft foundation
8. Analysis and design of Beam Slab Raft foundation

Plaxi Software

Staad Pro & E-tabs