The Meeting began with chairman, Board of studies extending a warm welcome to all the members of participating in the meeting.

The following points were discussed and approved during the meeting

1. The following proposed AMR 24 Course Structure and the detailed syllabi of I-I, I-II were presented, discussed and approved.

1. For Group – A

GROUP –A – COURSES (SD ,SE)		
I Year – I SEM		
S. No.	**Title**	**Credits**
1	Theory of Elasticity	3
2	Structural Dynamics	3
3	Matrix Analysis of Structures	3
4	Bridge Engineering	3
5	Advanced Concrete Technology	2
6	Advanced Concrete Technology Laboratory	2
7	Advanced Structural Engineering Laboratory	2
8	Audit Course –1	0
9	Health and wellness, Yoga and Sports	0.5
I SEM - TOTAL CREDITS		**18.5**
I Year – II SEM		
S. No.	**Title**	**Credits**
1	Finite Element Methods in Structural Engineering	3
2	Theory of Plates and Shells	3
3	Stability of Structures	3
4	Earth Retaining Structures	3
5	Computer Aided Design Laboratory	2
6	Structural Design laboratory	2
7	Mini Project With Seminar	2
8	Audit Course -2	0
9	NSS/NCC/Scouts & Guides/Community Service	0.5
II SEM - TOTAL CREDIT		**18.5**

The following points were suggested for future possible implementations:

Prescribed Textbooks:

Advised to add recent prescribed textbooks or updated editions for the course.

Advanced Concrete Technology:

The BoS were Suggested to implement 3 Lectures for Advanced Concrete Technology theory syllabus it is better to understanding of Advanced Concrete Technology theory syllabus.

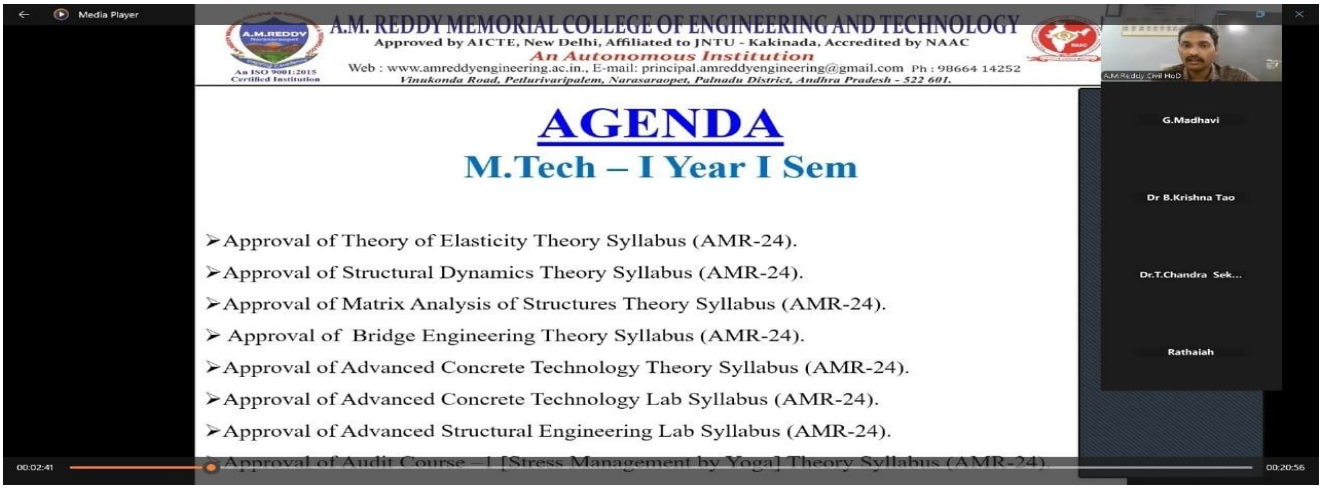
References:

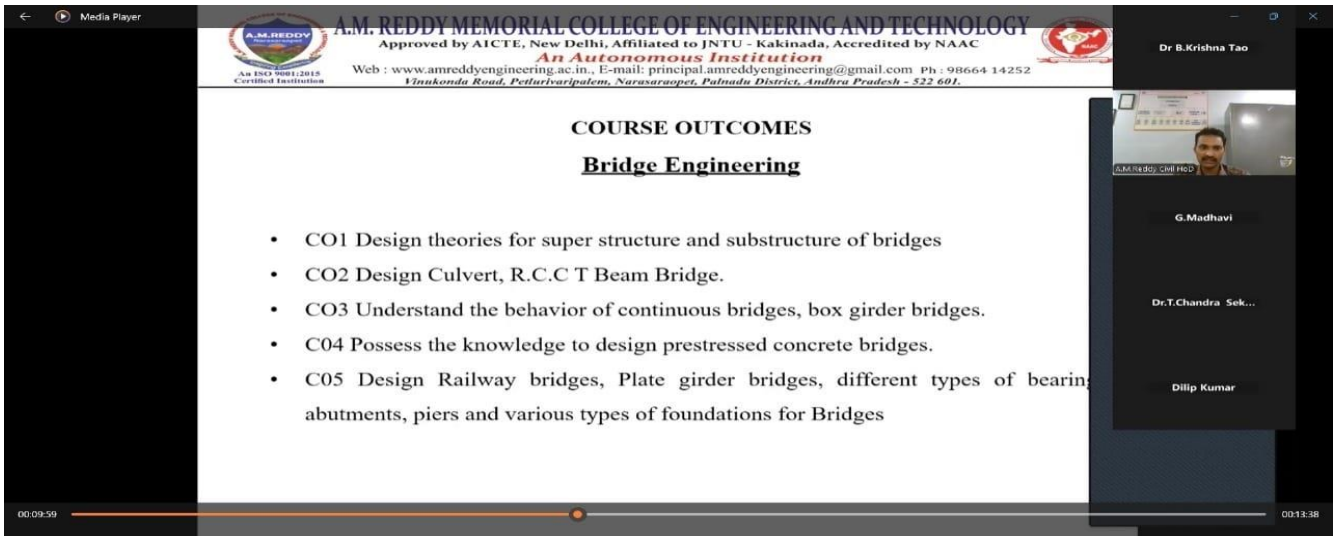
More references are recommended to be added for various topics.

Information Sharing:

All the updated information should be shared at least 15 days before the next Board of Studies (BOS) meeting.

The BOS chairman concluded the session and informed that the suggested points will be implemented and mail the same for approval and requested the experts to approve and ended with Vote of Thanks.





Chairman

BoS – Dept. of CE

Copy to:

1. **Principal**
2. **IQAC**

ANNEXURE -1
AMR- 24

L	T	P	C
3	0	0	3

Theory Of Elasticity

(common to structural engineering and structural design)

Program Educational Objectives:

- Impart advanced technical knowledge and skills for specialized careers in structural Engineering and related fields that caters to the Global needs.
- To Provide expertise in carrying out project works in advanced structural engineering by using state -of -art computing, numerical and experimental techniques and to develop interdisciplinary research.
- Train the students to possess good communication and presentation skills with ability to work in teams and contributing significantly to the technological development of the Nation.

Course Outcomes: A student after completion of the course will be able to

CO1: Know the definition of stress and deformation and how to determine the components of the stress and strain tensors..

CO2: Understand how to express the mechanical characteristics of materials, constitutive equations and generalized Hook law

CO3: Use the equilibrium equations stated by the displacements and compatibility conditions stated by stresses.

CO4: Understand index notation of equations, tensor and matrix notation and define state of plane stress, state of plane strain.

CO5: Be able to analyze real problem and to formulate the conditions of theory of elasticityApplications.

CO6: Determine the boundary restrictions in calculations. Solve the basic problems of the theory of elasticity by using Airy function expressed as bi- harmonic function.

UNIT I

Notation for forces and stresses – components of stresses and strains – Hooke's Law - Plane Stress – Plane strain – Differential Equations of equilibrium – Boundary conditions – Compatibility equations - Stress function – Boundary Conditions.

UNIT II

Control Structures

Two dimensional problems in rectangular co-ordinates – Solution by polynomials – Saint Venant's principle – Determination of displacements – Bending of simple beams – Application of Fourier series for two dimensional problems for gravity loading.

UNIT III

Two dimensional problems in polar co-ordinates - General equations in polar co-ordinates – Stress distribution for problems having symmetrical about an axis - Strain components in polar co-ordinates– Displacements for symmetrical stress distributions - Stresses for plates with circular holes subjected to far field tension – stress concentration factor.

UNIT IV

Analysis of stress and strain in three dimension - Principal stresses – Stress ellipsoid and stress director surface – Determination of principal stresses - Maximum shear stress – Homogeneous Deformation – General Theorems - Differential equations of equilibrium – Conditions of compatibility– Equations of equilibrium in terms of displacements – Principle of superposition –Uniqueness of solution –Reciprocal theorem.

UNIT V

Torsion of Prismatic bars Torsion of Prismatic bars – Bars with elliptical cross section – Other elementary solution –Membrane analogy – Torsion of rectangular bars – Solution of Torsional problems by energy method **.**

TEXT BOOKS:

1. Theory of Elasticity- Stephen Timoshenko & J. N. Goodier, Mc.Grawhill Publishers
2. Advanced Mechanics of Solids L.S. Srinath, McGraw Hill Publishers

REFERENCE BOOKS:

1. Theory, Applications and Numeric- Martin H. Sadd, Wiley Publishers
2. Theory of Elasticity -Sadhu Singh 3rd Edition, Khanna Publishers

ANNEXURE -2

AMR- 24

L	T	P	C
3	0	0	3

Structural Dynamics Theory Syllabus

(common to structural engineering and structural design)

Course Outcomes:

CO1: Understand the response of structural systems to dynamic loads
CO2: Realize the behavior and response of linear and nonlinear SDOF and MDOF structures with various dynamic loading.
CO3: Understand the behavior and response of MDOF structures with various dynamic loading.
CO4: Possess the ability to find out suitable solution for continuous system
CO5: Understand the behavior of structures subjected to dynamic loads under free vibration.
CO6: Understand the behavior of structures subjected to dynamic loads Harmonic excitation and earthquake load.

UNIT - I

Theory of vibrations: Introduction - Elements of vibratory system - Degrees of Freedom - Continuous System - Lumped mass idealization - Oscillatory motion - Simple Harmonic motion - Victorian representation of S.H.M. - Free vibrations of single degree of freedom system -undamped and damped vibrations - critical damping - Logarithmic decrement - Forced vibration of SDOF systems - Harmonic excitation - Vibration Isolation -Dynamic magnification factor –Phase angle.

UNIT II

Introduction to Structural Dynamics : 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.Single Degree of Freedom Systems : Formulation and solution of the equation of motion – Free vibration response - Response to Harmonic, Periodic, Impulsive and general dynamic loadings –Duhamel integral**.**

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.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 -Principles of application to continuous beams.

UNIT V

Introduction to Earthquake Analysis: Deterministic Earthquake Response: Systems on Rigid Foundations -Types of Earthquake Excitations – Lumped SDOF Elastic Systems, Translational Excitations -Generalized coordinate -SDOF Elastic Systems, Translational Excitations, Linear Static Method – Analysis for obtaining response of multi storied RC Building.

TEXT BOOKS

1. Structural Dynamics Anil K Chopra, 4edition, Prentice Hall Publishers
2. Structural Dynamics Theory & Computation – Mario Paz, CBS Publishes and Distributors
3. Elementary Structural Dynamics- V.K. Manika Selvam, Dhanpat Rai Publishers

REFERENCE BOOKS:

1. Dynamics of Structures by Clough & Penzien 3e, Computers & Structures Inc.
2. Theory of Vibration -William T Thomson, Springer Science.
3. Mechanical Vibrations- S. S. Rao, 5e, Pearson Publications.
4. Structural Dynamics of Earthquake Engineering - Theory and Application using Mathematical and Matlab- S. Rajasekharan

L	T	P	C

ANNEXURE – 3

3	**0**	**0**	**3**

AMR – 24

Matrix Analysis Of Structures
Theory sllabus

(common to structural engineering and structural design)

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

CO1: Perform the structural analysis of determinate and indeterminate structures using classical compatibility methods, such as method of consistent displacements, force and equilibrium Methods.
CO2: Perform structural analysis using the stiffness method.
CO3: Solve multiple degree of freedom two and three dimensional problems involving trusses, beams, frames and plane stress.
CO4: Understand basic finite element analysis.

UNIT I

Introduction of matrix methods of analysis – Static and kinematic indeterminacy – Degree of freedom– Structure idealization-stiffness and flexibility methods – Suitability: Element stiffness matrix for truss element, beam element and Torsional element- Element force - displacement equations.

UNIT II

Stiffness method – Element and global stiffness equation – coordinate transformation and global assembly – structure stiffness matrix equation – analysis of simple pin jointed trusses –continuous beams – rigid jointed plane frames

UNIT III

Stiffness method for Grid elements – development of stiffness matrix – coordinate transformation. Examples of grid problems – tapered and curved beams

UNIT IV

Additional topics in stiffness methods – discussion of band width – semi band width – static condensation – sub structuring –Loads between joints-Support displacements- inertial and thermal stresses-Beams on elastic foundation by stiffness method.

UNIT V

Analysis of plane truss - continuous beams with and without settlement - plane frame including side sway single storey, single – bay and gable frame by flexibility method using system Approach.

TEXT BOOKS:

1. Matrix analysis of structures, Robert E Sennet- Prentice Hall-Englewood cliffs-New Jercy
2. Advanced structural analysis, P. Dayaratnam- Tata McGraw hill publishing company limited.
3. Structural Analysis Matrix Approach - Pandit and Gupta, Mc Graw Hil Education

REFERENCE BOOKS:

1. Indeterminate Structural analysis, C K Wang, Amazon Publications
2. Analysis of Tall buildings by force – displacement – Method M. Smolira Mc. Graw Hill.
3. Foundation Analysis and design, J.E. Bowls, 5e, Amazon Publications.
4. Matrix Analysis of Framed Structures 3e-William Weaver, Jr, James M. Gere, Van Nostrand Reinhold, Newyork
5. Matrix Methods of Structural Analysis Madhu B. Kanchi, Wiley Publications.
6. Indeterminate Structural Analysis by K. U. Muthu, IK International Publishing house

ANNEXURE – 4
AMR -24
Bridge Engineering Theory Syllabus
(common to structural engineering and structural design)

L	T	P	C
3	0	0	3

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

CO1: Design theories for super structure and substructure of bridges
CO2: Design Culvert, R.C.C T Beam Bridge.
CO3: Understand the behavior of continuous bridges, box girder bridges.
CO4: Possess the knowledge to design prestressed concrete bridges.
CO5: Design Railway bridges, Plate girder bridges, different types of bearings, abutments, piers and various types of foundations for Bridges

UNIT: I

Concrete Bridges: Introduction-Types of Bridges-Economic span length-Types of loading-Deadload-liveload-ImpactEffect-Centrifugalforce-windloads-Lateralloads-Longitudinal forcesSeismicloads-Frictionalresistanceofexpansionbearings-Secondary Stresses-Temperature Effect-ErectionForcesandeffects-Width of roadway and footway-General Design Requirements.

UNIT: II

Pigeaud's method-design of longitudinal girders- Guyon-Messonet method- Hendry Jaegar method- Courbon's theory. (Ref: IRC-21), voided slabs, Super Structure: Slab bridge- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length-Design of interior panel of slab- T-Beam bridges.

UNIT: III

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

UNIT: IV

Plate girder bridges- Elements of plate girder and their design-web-flange- intermediate stiffener-vertical stiffeners- bearing stiffener-design problem.

UNIT: V

Sub structure- Abutments- Stability analysis of abutments- piers- loads on piers – Analysis of piers- Design problem(Ref: IRC-13, IRC-21, IRC-78)- Pipe culvert- Flow pattern in pipe culvers-culvert alignment-culvert entrance structure- Hydraulic design and structural design of pipe culverts- reinforcements in pipes .(Ref: IRC: SP-13)

TEXT BOOKS:

1. Design of Bridges by N. Krishna Raju CBS Publishers and Distributors
2. Design of Concrete Bridges- M.G. Aswini, V.N. Vazirani, M.M Ratwani, Khanna Publishers
3. Essentials of Bridge Engineering- Jhonson Victor D, 7e, Oxford IBH Publications

REFERENCE BOOKS:

1. Bridge Deck Behavior- E.C. Hambly 2e- CRC Press
2. Concrete Bridge Design and Practice- V.K. Raina, Tata McGraw- Hill Publishing Company Limited
3. Bridge Engineering by S. Ponnuswamy, Mc Grawhill Publications
4. IRC 6- 2016 Standard Specifications and Code of Practice for Road bridges
5. IRC 112-2011 Code of Practice for Concrete Road Bridges

ANNEXURE – 5

L	T	P	C
2	0	0	3

AMR – 24

Advanced Concrete Technology
Theory Syllabus

(Common to structural engineering and structural design**)**

Course Objectives:

- To impart knowledge on concrete making materials, concrete mix design for proportioning and their testing.

Course Outcomes:

- The learner will be able to design concrete mixes of different grades and also use the special concretes.

UNIT: I

Concrete Making Materials : Cement – Bogus Compounds – Hydration Process – Types of Cement – Aggregates – Gradation Charts – Combined Aggregate – Alakali Silica Reaction – Admixtures – Chemical and Mineral Admixtures. Bureau of Indian Standards (BIS) Provisions.

UNIT: II

Fresh And Hardened Concrete: Fresh Concrete – workability tests on Concrete – Setting Times of Fresh Concrete – Segregation and bleeding.Hardened Concrete : Abrams Law, Gel space ratios, Maturity concept – Stress strain Behaviour – Creep and Shrinkage – Durability Tests on Concrete – Non Destructive Testing of Concrete. BIS Provisions

UNIT: III

Fresh And Hardened Concrete: Fresh Concrete – workability tests on Concrete – Setting Times of Fresh Concrete – Segregation and bleeding.Hardened Concrete : Abrams Law, Gel space ratios, Maturity concept – Stress strain Behaviour Creep and Shrinkage – Durability Tests on Concrete – Non Destructive Testing of Concrete. BIS Provisions.

UNIT: IV

Special Concretes: Self Compacting concrete, Polymer Concrete, Fibre Reinforced Concrete – Reactive Powder Concrete – Requirements and Guidelines – Advantages and Applications. Concrete Mix Design: Quality Control – Quality Assurance – Quality Audit - Mix Design Method – BIS Method – IS.10262 – 2019 Concrete Mix proportion guidelines. DOE Method– Light Weight Concrete, Self Compacting Concrete.

UNIT: V

Form work – materials – structural requests – form work systems – connections – specifications – design of form work – shores – removal for forms - shores – reshoring – failure of form work.

TEXT BOOKS:

1. Properties of Concrete by A. M. Neville, ELBS publications Oct 1996.
2. Concrete Technology by A. R. Santhakumar, 2nd Edition, Oxford University Press.
3. Concrete Technology by M.S. Shetty, S.Chand & Co 2009.

REFERENCE BOOKS:

1. Concrete: Micro Structure, Properties and Materials by P. K. Mehta and P. J. Monteiro,. Mc. Graw-Hill Publishing Company Ltd. New Delhi
2. Design of Concrete Mixes by N. Krishna Raju, CBS Publications, 2000.
3. Special Structural concretes by Rafat Siddique, Galgotia Publications 2000. 4. IS 10262-2009 5. Relevant BIS Codes

ANNEXURE – 6

L	T	P	C
0	0	4	2

AMR – 24

ADVANCED CONCRETE TECHNOLOGY LABORATORY

(Common to structural engineering and structural design**)**

COURSE OUTCOMES

- CO1 Conduct various laboratory tests on Cement, Aggregates
- C02 Know strain measurement
- C03 Non-destructive testing
- C04 Chemical analysis on concrete and Aggregate and Sand

LIST OF EXPERIMENTS

1. Study on Water / Cement Ratios Vs Workability of different concretes
2. Study on Water / Cement Ratios Vs Strength of different concretes
3. Study of variation of Coarse Aggregate to Fine Aggregates on Workability
4. Study of variation of Coarse Aggregate to Fine Aggregates on Strength
5. Strain measurement - Electrical resistance strain gauges
6. Non destructive testing- Impact Hammer test, UPV test
7. Qualifications tests on Self compaction concrete- L Box , J Box , U box and Slump tests.

ANNEXURE – 7

L	T	P	C
0	0	4	2

AMR – 24

ADVANCED STRUCTURAL ENGINEERING LABORATORY

(Common to structural engineering and structural design)

COURSE OUTCOMES:

- CO1 conduct various laboratory tests on Cement, Aggregates
- C02 Know strain measurement
- C03 Non-destructive testing
- C04 Chemical analysis on concrete and Aggregate and Sand

LIST OF EXPERIMENTS

1. Study on Deflection and Cracks on a Under Reinforced Over Reinforced and Balanced Sections
2. Study on Performance of RCC Beams designed for Bending and failing in Shear
3. Study on Performance of RCC Beams designed for Shear and failing in Bending
4. Study on Performance of RCC One way slabs
5. Study on Performance of RCC Two way slabs with simply supported edge conditions
6. Study on Performance of RCC Two way slabs with fixed edge conditions
7. Calculation of Young's Modulus of Elasticity of Concrete
8. Extraction and Study of Concrete Core samples from pavements

ANNEXURE -1

AMR- 24

L	T	P	C
3	0	0	3

FINITE ELEMENT METHODS IN STRUCTURAL ENGINEERING

(common to structural engineering and structural design)

Course Outcomes: A student after completion of the course will be able to

CO1: Develop finite element formulations of 1 degree of freedom problems and solve them

CO2: Understand any Finite Element software to perform stress, thermal and modal analysis

CO3: Compute the stiffness matrices of different elements and system

CO4: Interpret displacements, strains and stress resultants

UNIT I

Introduction: Review of stiffness method- Principle of Stationary potential energy-Potential energy of an elastic body- Rayleigh-Ritz method of functional approximation - variational approaches -weighted residual methods

UNIT II

Finite Element formulation of truss element: Stiffness matrix- properties of stiffness matrix Selection of approximate displacement functions- solution of a plane truss- transformation matrix and stiffness matrix for a 3-D truss- Inclined and skewed supports- Galerkin's method for 1-D truss – Computation of stress in a truss element.

UNIT III

Finite element formulation of Beam elements: Beam stiffness- assemblage of beam stiffness matrix- Examples of beam analysis for concentrated and distributed loading- Galerkin's method - 2-D Arbitrarily oriented beam element – inclined and skewed supports –rigid plane frame examples

UNIT IV

Finite element formulation for plane stress, plane strain and axi-symmetric problems- Derivation of CST and LST stiffness matrix and equations-treatment of body and surface forces- Finite Element solution for plane stress and axi-symmetric problems- comparison of CST and LST elements –convergence of solution- interpretation of stresses.

UNIT V

Iso-parametric Formulation: Iso-parametric bar element- plane bilinear Iso-parametric element quadratic plane element - shape functions, evaluation of stiffness matrix, consistent nodal load vector - Gauss quadrature- appropriate order of quadrature – element and mesh instabilities – spurious zero energy modes, stress computation- patch test.

TEXT BOOKS:

1.A first course in the Finite Element Method – Daryl L. Logan, Thomson Publications.

2.Concepts and applications of Finite Element Analysis – Robert D. Cook, Michael E Plesha, John Wiley & Sons Publications

3. Fundamental Finite Element Analysis and Applications: with Mathematica and Matlab Computations, Bhatti, M.A. Wiley Publications

REFERENCE BOOKS:

1.Introduction to Finite Elements in Engineering- Tirupati R. Chandrupatla, Ashok D. Belgunda, PHI publications.

2.Finite Element Methods (For Structural Engineers) Wail N Rifaie, Ashok K Govil, New Age International (P) Limited

ANNEXURE -2

AMR- 24

L	T	P	C
3	0	0	3

THEORY OF PLATES AND SHELLS

(common to structural engineering and structural design)

Course Outcomes:

CO1: Have a knowledge about various plate theories due to bending
CO2: Gain the knowledge of Navier's solution, Levy's solution and solve for the rectangular and square plates
CO3: Analyze circular plates with various boundary conditions.
CO4: Focus on the finite difference method of solving plate problems.
CO5: Ability to realize the potential energy principle and find the solution of rectangular plates for various loadings
CO6: Understand the behaviour of folded plates and shells.

UNIT - I

Derivation of governing differential equation for plate– in plane bending and transverse bending effects- Rectangular plates: Plates under various loading conditions like concentrated, uniformly distributed load and hydrostatic pressure. Navier and Levy's type of solutions for various boundary condition.

UNIT II

Circular plates: Symmetrically loaded, circular plates under various loading conditions, annular plates.

UNIT III

Introduction to Shells- Single and double curvature- Equations of Equilibrium of Shells: Derivation of stress resultants, Principles of membrane theory and bending theory

UNIT IV

Cylindrical Shells: Derivation of the governing DKJ equation for bending theory, details of Schorer's theory. Application to the analysis and design of short and long shells. Use of ASCE Manual coefficients for the design.

UNIT V

Beam theory of cylindrical shells: Beam and arch action. Design of diaphragms - Geometry analysis and design of elliptic Paraboloid, Conoidal and Hyperbolic Paraboloid shapes by membrane theory.

TEXT BOOKS

1. Theory of Plates and Shells 2e –S. Timoshenko and S. Woinowsky Krieger, McGraw-Hill book company, INC, New York.
2. Reinforced Concrete Shells and Folded Plates by P.C. Varghese, Prentice Hall India Publications
3. Analysis of Thin Concrete Shells by K. Chandrasekhara, New Age International (P) Ltd

REFERENCE BOOKS:

1. Theory and Analysis of Elastic Plates and Shells by J. N. Reddy, CRS Press
2. A Text Book of Shell Analysis – Bairagi, K, Khanna Publisher, New Delhi.
3. Design and Construction of Concrete Shell Roofs – Ramaswamy, G.S, Mc Graw Hill, New York

ANNEXURE – 3

AMR – 24

L	T	P	C
3	0	0	3

STABILITY OF STRUCTURES

(common to structural engineering and structural design)

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

CO1: Analyze different types of structural instabilities
CO2: Execute and work out the inelastic buckling using various methodologies.
CO3: Examine the behaviour of beam columns and frames with and without side sway using classical and stiffness methods
CO4: To be well versed in the lateral buckling, torsional buckling, Flexural torsional buckling of various beams and non-circular sections.

UNIT I

columns: Differential equation for beam columns – Beams column with concentrated loads – continuous lateral load – couples – Beam column with built in ends – continuous beams with axial load – application of Trigonometric series – Determination of allowable stresses

UNIT II

lastic buckling of bars : Elastic buckling of straight columns – Effect of shear stress on buckling – Eccentrically and laterally loaded columns –Sway & Non Sway mode - Energy methods – Buckling of a bar on elastic foundation – Buckling of bar with intermediate compressive forces and distributed axial loads – Buckling of bars with change in cross section – Effect of shear force on critical load – Built up columns – Effect of Initial curvature on bars – Buckling of frames – Sway & Non Sway mode

UNIT III

In-elastic buckling: Buckling of straight bars – Double modulus theory Tangent modulus theory. Experiments and design formulae: Experiments on columns – Critical stress diagram – Empirical formulae of design – various end conditions – Design of columns based on buckling. Mathematical Treatment of stability problems: Buckling problem orthogonality relation – Ritz method –Stiffness method and formulation of Geometric stiffness matrix- Applications to simple frames

UNIT IV

Torsional Buckling: Pure torsion of thin walled bars of open cross section – Non uniform torsion of thin walled bars of open cross section - Torsional buckling – Buckling of Torsion and Flexure

UNIT V

Lateral Buckling of simply supported Beams: Beams of rectangular cross section subjected for pure bending, Buckling of I Section subjected to pure bending

TEXT BOOKS:

1. Theory of Stability of Structures by Alexander ChaJes.
2. Theory of Elastic Stability by S. P. Timshenko & J.M. Gere-Mc Graw Hill Publications
3. Theory of Elastic Stability by Manikaselvam

REFERENCE BOOKS:

1.Fundamentals of Structural Stability by George J Smith & Dewey H. Hodges, Elsevier Publications

2.Elastic Stability of Structural Elements, N.G.R. Iyengar Macmillan Publications

ANNEXURE – 4
AMR -24
EARTH RETAINING STRUCTURES

L	T	P	C
3	0	0	3

(common to structural engineering and structural design)

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

CO1: Quantify the lateral earth pressures associated with different earth systems
CO2: Evaluate the mechanical properties of geosynthetics used for soil reinforcement
CO3: Identify the merits and demerits of different earth retaining systems.
CO4: Select the most technically appropriate type of retaining wall for the application from a thorough knowledge of available systems
CO5: Design of retaining structures using appropriate design methods, factors of safety, earth pressure diagrams and field verification methods
CO6: Aware of current guidelines regarding the design of earth retaining structures.
CO7: Design retaining structures considering both external and internal stability aspects

UNIT: I

Earth pressures – Different types and their coefficients- Classical Theories of Earth pressure – Rankine's and Coulomb's Theories for Active and Passive earth pressure- Computation of lateral Earth Pressure in Homogeneous and Layered soils- Graphical solutions for Coulomb's Theory in active and passive conditions.

UNIT: II

Retaining walls – different types - Type of Failures of Retaining Walls – Stability requirements – Drainage behind Retaining walls – Provision of Joints – Relief Shells.

UNIT: III

Sheet Pile Structures – Types of Sheet piles – Cantilever sheet piles in sands and clays – Anchored sheet piles – Free earth and Fixed earth support methods – Rowe's moment reduction method – Location of anchors and Design of Anchorage system.

UNIT: IV

Soil reinforcement – Reinforced earth - Different components – their functions – Design principles of reinforced earth retaining walls.

UNIT: V

Braced cuts and Cofferdams: Lateral Pressure in Braced cuts – Design of Various Components of a Braced cut – Stability of Braced cuts – Bottom Heave in cuts. – types of cofferdam, suitability, merits and demerits – Design of single – wall cofferdams and their stability aspects – TVA method and Cummins' methods.

TEXT BOOKS:

1. Principles of Foundation Engineering 7e by Braja Das, Cengage Learning
2. Foundation analysis and design by Bowles, J.E. – McGraw Hill

REFERENCES:

1. Soil Mechanics in Engineering Practice – Terzaghi, K and Ralph, B. Peck 2e. – John Wiley & Sons.,
2. Analysis and Design of Foundations and Retaining Structures, Samsher Prakash, Gopal Ranjan and Swami Saran, Saritha Prakashan, New Delhi
3. NPTEL course materials on Geo-synthetics and Earth Retaining Structures

L	T	P	C
0	0	4	2

ANNEXURE – 5

AMR – 24

COMPUTER AIDED DESIGN LABORATORY

(Common to structural engineering and structural design)

Course Objectives: At the end of the course, Student will be able to

CO 1: Develop Computer Programs for Analysis and Design of various Structural Elements

CO 2: Use different Structural Engineering software's to solve various civil Engineering programs

LIST OF EXPERIMENTS

Detailed Syllabus:
Analysis and Design using STADD, STADD FOUNDATION, ETABS, ANSYS

1. Wind analysis on tall structure
2. Analysis of pre stressed concrete bridge girder
3. Analysis of Cylindrical shell
4. Analysis of Bridge Pier and Abutment
5. Dynamic Analysis of Multistory structure

NOTE: A minimum of Four from the above set have to be conducted.

REFERENCE BOOK:

1.Computer aided design laboratory (Civil Engineering) by Shesha Prakash and Suresh.S

ANNEXURE – 6

L	T	P	C
0	0	4	2

AMR – 24

STRUCTURAL DESIGN LABORATORY

(Common to structural engineering and structural design**)**

COURSE OUTCOMES

- CO1 Develop Computer Programs for Analysis and Design of various Structural Elements
- CO2 Use different Structural Engineering software's to solve various civil Engineering programs

LIST OF EXPERIMENTS

Analysis and Design using STADD, STADD FOUNDATION, ETABS, ANSYS

1. Wind analysis on tall structure
2. Analysis of pre stressed concrete bridge girder
3. Analysis of Cylindrical shell
4. Analysis of Bridge Pier and Abutment
5. Dynamic Analysis of Multistory structure

NOTE: A minimum of Four from the above set have to be conducted.

REFERENCE BOOK: Computer aided design laboratory (Civil Engineering) by Shesha Prakash and Suresh.S