I YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MATRIX METHODS IN STRUCTURAL ANALYSIS

Course Code: GR24D5001 **L/T/P/C: 3/0/0/3**
I Year I Semester

Prerequisites: Engineering Mechanics, Strength of Materials, Structural Analysis

Course Outcomes:

1. Evaluate the static and kinematic indeterminacy and generate stiffness and flexibility matrices.
2. Analyse the skeleton structures using stiffness method under different coordinate system.
3. Use flexibility matrix method to analyse different structures.
4. Use stiffness matrix method to analyse different structures.
5. Analyse various types of structural members using special analysis procedures and shear walls in multi storied constructions.

UNIT I

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 - for truss element, beam element and tensional element. Transformation of coordinates - element stiffness matrix - and load vector - local and global coordinates

UNIT II

Stiffness Matrix Assembly of Structures and its Applications to Simple Problems: Direct Stiffness method, Matrix in Global Coordinates, Boundary Conditions, Solution of Stiffness Matrix Equations.

UNIT III

Analysis of Beams, Plane Trusses, Plane Rigid Jointed frames using flexibility method

UNIT IV

Analysis of plane truss - continuous beam - plane frame by stiffness matrix methods.

UNIT V

Special analysis procedures - Static condensation and sub structuring - initial and thermal stresses. Shear walls- Necessity - structural behaviour of large frames with and without shear walls - approximate methods of analysis of shear walls.

Text Books:

1. William Weaver J.R and James M.Geve, Matrix Analysis of Frames structures, CBS publications, Delhi 2004.
2. Ashok.K.Jain, Advanced Structural Analysis, New Chand & Brothers, Third edition,2015.
3. C.S.Reddy, Structural Analysis, 3rd edition, 2010.

Reference Books:

1. Kanchi, Matrix Structural Analysis, New Age International Pvt Limited, January 2016.
2. Ghali and Neville, Structural Analysis, 7th edition, September, 2017.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED SOLID MECHANICS

Course Code: GR24D5002 **L/T/P/C: 3/0/0/3**
I Year I Semester

Course Prerequisites: Mathematics and Strength of Materials

Course Outcomes:

1. Identify the theory, concepts, principles, and governing equations of Elasticity principles.
2. Examine equations of equilibrium and draw relations among stress, strain and displacement and utilize the equilibrium equations, compatibility equations and various boundary conditions to analyze elastic problems.
3. Simplify the understating of three-dimensional problems of elasticity in Cartesian coordinates system and able to determine principal stresses and planes of 3D problems.
4. Apply the principles of elasticity to solve torsional problems in prismatic bars and tubes.
5. Assess the concepts of stresses and strains for plastic deformation to comprehend the yield criteria of materials.

UNIT I

Introduction to Elasticity: Notation for forces and stresses - Components of stresses - Components of strain – Hooke's law, Strain and Stress Fields, Stress and strain at a Point, Stress Components on an Arbitrary Plane, Hydrostatic and Deviatoric Components, Saint- Venant's principle.

UNIT II

Equations of Elasticity in Two-dimensional problems in rectangular and polar coordinates: Equations of Equilibrium, Stress- Strain relations, Strain –Displacement and Compatibility Relations, Boundary conditions, Plane stress and plane strain analysis - stress function -Two dimensional problems in rectangular coordinates - solution by polynomials.

UNIT III

Analysis of stress and strain in three dimensions in rectangular and polar coordinates - principal stresses - stress ellipsoid-determination of principal stresses - max shear stresses- equations of equilibrium in terms of displacements.

UNIT IV

Torsion of Prismatic Bars: Saint Venant's Method, Prandtl's Membrane Analogy, Torsion of Rectangular Bar, use of soap films in solving torsion problems, Bending of Prismatic Bars: Stress function - bending of cantilever – circular cross section.

UNIT V

Concepts of plasticity, Plastic Deformation, Strain Hardening, Idealized Stress- Strain curve, Yield Criterions, Plastic Stress-Strain Relations.

Text Books:

1. Theory of Elasticity, S.P. Timoshenko and J.N. Goodier, Tata McGraw Hill, 3rd edition, 2017.
2. Advanced Mechanics of Solids, Srinath L.S., Tata McGraw Hill, 2nd edition, 2010.
3. Theory of Elasticity and Plasticity, H. Jane Helena, PHI Learning, 2017

Reference Books:

1. Theory of Elasticity, Sadhu Singh, Khanna Publishers, 2007.
2. Computational Elasticity, Ameen M., Narosa, 2005.
3. Solid Mechanics, Kazimi S. M. A., Tata McGraw Hill,2nd edition,2017.
4. Elasticity, Sadd M.H., Elsevier,3rd edition, 2014.
5. Engineering Solid Mechanics, Ragab A.R., Bayoumi S.E., CRC Press, first edition,1998.
6. Theory of Plasticity, J. Chakrabarty, Butterworth-Heinemann publications,3rd edition, 2006.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

Pre-Engineered Buildings

(Professional Elective I)

Course Code: GR24D5003 **L/T/P/C: 3/0/0/3**

I Year I Semester

Pre-requisites: Design of Steel Structures & Structural Analysis

Course Outcomes:

1. Differentiate the functions of Primary system, Secondary system.
2. Classify Bracing system of PEB components.
3. Classify different design loads on pre-engineered buildings.
4. Classify the structural stability of PEB's.
5. Analyse and Design Methodology of PEB's

UNIT I

Introduction to Pre-Engineered Buildings: Introduction – History - Advantages of PEB - Applications of PEB – Materials used for manufacturing of PEB. Difference between Conventional Steel Buildings and Pre-Engineered buildings.

UNIT II

Pre-Engineered Building Components: Primary System: Main frames, Gable End Frame - Secondary frame system: Sizes and Properties of Purlins & Girts – Bracing System: Rod, angle, Portal, Pipe bracing – Sheeting and Cladding: Roof Sheeting and Wall sheeting – Accessories: Turbo Ventilators, Ridge vents, Sky Lights, Louvers, Insulation, Staircases, Design of PEB frame under the influence of Dead, Live, Collateral, Wind, Seismic and Other applicable Loads. Serviceability Limits as per code., Design Parameters of PEB Frames - Depth of the section, Depth to Flange width ratios, Thickness of Flange to thickness of Web ratio. d/t_w, b_f/t_f ratios of sections as per IS code. Section Sizes as per Manufacturing Limitations, Analysis and Design of Rigid Frames.

UNIT III

PEB Frame Connection Design Methodology: Rigid Frame Moment Connection, Shear Connection, High strength bolts & grades, Lever arm, bolt Patten its effect on connection design, thickness of connection plate, Selection of governing forces for connection design.

UNIT IV

Mezzanine Floor Systems: Design of Mezzanine Beams, Columns and joists – Mezzanine decking, Different types of Mezzanine Floor systems – Grating, Chequered plate and Rigid floor System, Types of base plate Pinned, Fixed, strength bolts, different types of bolts & grades, Lever arm, bolt. Patten its effect on connection design, thickness of connection plate, base plate size, Selection of governing forces for base connection design & Anchor bolt.

UNIT V

Analysis and Design of Pre-Engineered Buildings: 2D and 3D modelling of portal frames, optimization techniques, comparison of software output with manual calculations design of cold

formed sections I e purlins and girts, design of roof sheeting, trapezoidal, standing seam sheeting, welding technology, manufacturing process, erection procedures.

Text Books:

1. Pre- Engineered Metal Buildings Systems, Labsori, McGraw-Hill Education; 3rd edition, September 2014
2. Hass, A.M., Precast Concrete, Design and Applications, Taylor & Francis, UK. Reprint 2023.
3. Pre-Engineered Steel Building, K.S. Vivek and P. Vyshnavi, LAP Lambert Academic Publishing, 1st edition, 2017.

Reference Books:

4. Metal building systems: Design and Specifications, Alexender Newman, McGraw-Hill education, 3rd edition, 2014.
5. Phillips, W.R. and Sheppard, D.A. Plant cast, Precast and Prestressed Concrete, McGraw Hill, New York,3rd edition 1989.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED CONCRETE TECHNOLOGY

(Professional Elective I)

Course Code: GR24D5004 **L/T/P/C: 3/0/0/3**
I Year I Semester

Prerequisite: Concrete Technology

Course Outcomes:

1. Describe the types of cement, admixture and decide the suitable cement and admixture for specific purpose.
2. Illustrate the properties of concrete ingredients i.e. cement, fine aggregate and coarse aggregate by conducting different tests such as work ability etc.,
3. Describe the mix proportion of ordinary, standard and high strength concrete by using different methods and how the strength of concrete can be modified by changing the proportions.
4. Identify the suitable concrete for different structures considering the prevailing weathering conditions and Design economic concrete mix proportion for different exposure conditions and intended purposes with special concrete.
5. Illustrate the forms for a specific work and decide the time of removal of forms for the different elements in different situations.

UNIT I

Concrete Making Materials: Early development and evolution of concrete- Cement- Bogues compounds – Hydration Process – Alkali silica reaction - Admixtures – Chemical and Mineral admixtures. The chemistry of Portland cement manufacture-Hydration of calcium silicate phases-Hydrated aluminates, ferrite and sulphate phases.

UNIT II

Fresh and Hardened Concrete: Fresh Concrete - workability tests on Concrete - Segregation and bleeding. Hardened Concrete: Abram's law- Gel space ratios, Maturity Concept–Stress Behavior–Creep and Shrinkage–Durability tests on concrete- Nondestructive testing of concrete. Microstructure and properties of hardened concrete-Microstructure of concrete- Strength

UNIT III

High Strength Concrete (HSC) –Use of Nano materials – Manufacturing and Properties- Design of HSC Using BIS Method- Ultra High Strength Concrete. High Performance Concrete - Requirements and properties of High-Performance Concrete.

UNIT IV

Special Concretes: Self Compacting concrete (SCC) – Mix design of SCC by Nansu and BIS methods – Polymer concrete – Fiber reinforced concrete– Reactive Powder concrete – Geopolymer Concrete - Requirements and Guidelines – Advantages and Applications. Light weight concrete, Bacterial concrete.

Concrete mix design: Mix Design method - BIS method, ACI method, DOE method.

UNIT V

Form work for Concrete – materials – structural requirements – form work systems – connections – specifications – slip forms, permanent form work, latest form work– design of form work – shores – removal of forms – reshoring – failure of form work-case studies.

Text Books:

1. A.M.Neville, Properties of Concrete, Pearson publications, 5th edition,2011.
2. P Kumar Mehta, Paulo J M Monteiro, "Concrete: Microstructure, Properties, and Materials", 4th edition McGraw Hill Education; 2017
3. M.S.Shetty, Concrete Technology, S.Chand & Co publications,2006.

Reference Books:

1. A.R. Santhakumar, Concrete Technology, Oxford Press,2006.
2. Rafat Siddique, Special Structure concretes, Galgotia Publications, 3rd edition,2000.
3. N.KrishnaRaju, Design of Concrete Mixes, CBS Publications,5th edition,2017.
4. P.K.Mehta, Concrete: Micro Structure, properties and materials, ICI, Chennai,4th edition, 2014.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
THEORY OF STRUCTURAL STABILITY
(Professional Elective I)

Course Code: GR24D5005 **L/T/P/C: 3/0/0/3**
I Year I Semester

Prerequisites: Strength of Materials, Structural Analysis

Course Outcomes:

1. Comprehend the basics in the theory of structural stability of discrete and continuous Systems.
2. Analyze for stability of columns with axial, flexural, torsional and combined buckling and also investigate for stability of columns with lateral bracing.
3. Evaluate for stability of member buckling and global buckling in frames.
4. Analyze the lateral torsion buckling in beams and for the axial flexural buckling, shear flexural buckling, buckling under combined loads in plates.
5. Explain the concepts of inelastic buckling and dynamic stability.

UNIT I

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

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.

Text Books:

1. WIGGERS S L, Structural Stability And Vibration by , SPRINGER, 2018
2. A.I. Rusakov, Fundamentals of Structural Mechanics Dynamics and Stability, Taylor & Francis, 2020
3. Theory of elastic stability, Timoshenko and Gere, Dover publications,2nd edition,2009.

Reference Books:

1. Principles of Structural Stability Theory, Alexander Chajes,Prentice Hall, New Jersey, 4th edition 2016.
2. Strength of Metal Structures, Bleich F. Bucking, Tata McGraw Hill, New York, Reprint 2022.
3. Structural Stability of columns and plates, Iyengar, N. G. R., Ellis Horwood Ltd publisher, 1988.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ANALYTICAL AND NUMERICAL METHODS FOR STRUCTURAL ENGINEERING
(Professional Elective II)

Course Code: GR24D5006 **L/T/P/C: 3/0/0/3**
I Year I Semester

Prerequisites: Fundamentals of Matrices, Mathematics

Course Outcomes
1. Apply numerical methods to find the roots of a Nonlinear Algebraic and Transcendental equations and perform error analysis.
2. Solve linear algebraic system by direct and iteration methods and apply the knowledge of Eigen values and Eigen vectors to some contents in engineering.
3. Apply the knowledge of interpolation and extrapolation of uniform and non-uniform data to certain contents of Civil Engineering.
4. Apply the knowledge of numerical differentiation and integration to some contents of Civil Engineering.
5. Formulate simple problems into programming models.

UNIT I

Fundamentals of Numerical Methods: Error Analysis; Floating-Point Approximation of a Number; Loss of Significance and Error Propagation; Stability in Numerical Computation.

Solution of Nonlinear Algebraic and Transcendental Equations:

Bisection Method; Fixed-Point Iteration Method; Secant Method; Newton Method; Rate of Convergences; Solution of a System of Nonlinear Equations; Unconstrained Optimization.

UNIT II

Elements of Matrix Algebra: Solution of Systems of Linear Equations-Direct method – Cramer's rule, Gauss – Elimination Method-Gauss Jordan elimination – Triangulation (LU Decomposition) method – Iterative methods -Jacobi – Iteration method – Gauss – Siedel iteration, Eigen Value Problems- Jacobi method for symmetric matrices- Power method

UNIT III

Curve Fitting: Linear Interpolation - Higher Order Interpolation - Lagrange Interpolation Interpolating polynomials using finites differences- Hermite Interpolation -piece-wise and spline Interpolation. Fitting a straight-line, Second-degree curve, Exponential curve, power curve by method of least squares.

UNIT IV

Numerical Differentiation & Integration: Solution of Ordinary and Partial Differential Equations - Numerical Integration – Double integration using Trapezoidal and Simpson's method. Euler's method – Backward Euler method – Midpoint method – single step method-Taylor's series method- R-K Methods. Boundary value problems. Finite Difference Schemes.

UNIT V

Computer Algorithms: Algorithms – developing an algorithm for simple mathematical problems. Introduction to Fuzzy Logic and Neural Networks - applications in Civil and Structural Engineering. Application to simply supported beams and columns – calculation of slope and deflection – Application to find Eigen values and mode shape of columns.

Text Books:

1. Numerical Methods for Scientific and Engineering Computations, M.K. Jain and S.R.K.Iyengar, New Age International Pvt. Ltd., 2022.
2. Numerical Methods in Engineering & Science with Programs in C, C++ & MATLAB, B S Grewal, Khanna Book Publishers, New Delhi, 2013
3. Fuzzy Logic and Neural Networks Basic Concepts & Application, Chennakesava R Alavala, New Age International Pvt. Ltd., 2007.

Reference Books:

1. Introductory Methods of Numerical Analysis, Sastry S. S, Prentice Hall of India, 5th edition 2012.
2. Theory and Problems of Numerical Analysis, Scheid F, McGraw Hill Book Company, (Shaum Series), Reprint 2019.
3. Computer Based Numerical Analysis, Dr. M. Shanta Kumar, Khanna Book Publishers, New Delhi,1999.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
STRUCTURAL HEALTH MONITORING
(Professional Elective II)

Course Code: GR24D5007 **L/T/P/C: 3/0/0/3**
I Year I Semester

Prerequisites: Structural Vibrations, Advanced Solid Mechanics, Engineering physics, concrete technology.

Course Outcomes:
1. Assess the health of the structure.
2. Diagnose the distress due to various causes & Faults.
3. Identify the distress and document.
4. Assess the health of structure using static & dynamic field methods.
5. Suggest Repairs, Rehabilitation & Retrofitting of the structure.

UNIT I
Structural Health: Factors affecting Health of Structures, Causes of Distress, Regular Maintenance. Structural Health Monitoring: Concepts, Various Measures.

UNIT II
Structural Audit: Assessment of Health of Structure, Collapse and Investigation, Structural Health Monitoring techniques: RF/PSTN/GSM/Satellite Communications, Networking of sensor, Data compression technique, Case Studies.

UNIT III
Static Field Testing: Types of Static Tests, Simulation and Loading Methods, Static Response Measurement.

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

UNIT V
Introduction to Repairs and Rehabilitations of Structures: Piezo–electric materials and other smart materials Electro–Mechanical Impedance (EMI) technique, adaptations of EMI technique.

Text Books:

1. Krishna Raju N., "Design of Bridges", Oxford and IBH Publishing Co., Ltd.,5th edition 2019.
2. Ponnu Swamy, "Bridge Engineering", McGraw-Hill Publication,3rd edition,2017.
3. Vazirani, Ratvani & Aswani, "Design of Concrete Bridges", Khanna Publishers, 5th Edition, 2006.

Reference Books:

1. M A. Jagadeesh and T R. Jayaram, "Design of Bridge Structures," Prentice-Hall of India, New Delhi, 2nd edition, 2009.

2. Johnson victor D, “Essentials of Bridge Engineering”, Oxford, IBH publishing Co., Ltd, 7th Edition, 2019.
3. Wai-Fah Chen LianDuan, "Bridge Engineering Handbook", CRC Press, USA, 2nd edition, 2014.
4. R.M. Barker and J.A. Puckett, “Design of Highway Bridges”, John Wiley& Sons, New York, 4th edition,2021.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DESIGN OF HIGHRISE BUILDINGS
(Professional elective II)

Course Code: GR24D5008 **L/T/P/C: 3/0/0/3**
I Year I Semester
Pre-requisites: Design of Reinforced Concrete Structures, Design of Steel Structures and Concrete Technology

Course Outcomes
1. Identify the different types of loading and approaches of design philosophies.
2. Acquire knowledge of behavior of various structural systems like Braced, In-filled frames and shear walls.
3. Analyse and design high-rise buildings with simplified 2D and 3D analysis.
4. Develop the analysis of high-rise buildings in various structural failures considerations.
5. Understand the Buckling and P-Delta analysis with different aspects of design.

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 3D 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.

Text Books
1. Taranath B.S., “Structural Analysis and Design of Tall Buildings”, McGraw Hill, 1988.
2. 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.

3. Bryan Stafford Smith and Alexcoull, “Tall Building Structures - Analysis and Design”, John Wiley and Sons, Inc., 2005.

Reference Books

1. Beedle.L.S., “Advances in Tall Buildings”, CBS Publishers and Distributors, Delhi, 1986.
2. Lin T.Y and Stotes Burry D, “Structural Concepts and systems for Architects and Engineers”, John Wiley, 1988.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRUCTURAL DESIGN LAB

Course Code: GR24D5009 **L/T/P/C: 0/0/4/2**

I Year I Semester

Prerequisites: Design of Reinforced Concrete Structures, Structural Analysis, Foundation Engineering

Course Outcomes:

1. Identify the software usages and produce structural drawing for structural members.
2. Analyse and design the plane frame and truss subjected to different type of loading.
3. Design and detailing of RC structural members like beam, column, slab, and Footing
4. Analysis and design of RCC framed structures statically for different loading conditions.
5. Analysis and design of RCC framed structures dynamically for different loading conditions

List of Experiments

1. Develop a template for design of one-way slab.
2. Develop a template for design of two-way Slab.
3. Develop a template for design of columns.
4. Develop a template for design of combined footing.
5. Analysis and design of continuous beam.
6. Analysis and design of plane frame.
7. Analysis of multi-storeyed space frame.
8. Static analysis of multi-storeyed structure.
9. Dynamic analysis of multi-storeyed structure.
10. Analysis and design of Steel truss.

Software: Relevant Software

References:

1. IS 456: 2000-Plain and Reinforced Concrete- Code of Practice.
2. IS 1893:2002-Criteria for Earthquake Resistant Design of Structures.
3. IS 875 part 3: 1987- Code of Practice for Wind loads.
4. IS 875 part 4:1987- Code of Practice for design loads (other than Earthquake) for building structures.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ADVANCED CONCRETE TECHNOLOGY LAB

Course Code: GR24D5010 **L/T/P/C: 0/0/4/2**
I Year I Semester

Prerequisites: Concrete Technology Theory and Practical.

Course Outcomes:

1. Design high grade concrete and identify, carry out laboratory tests related to the use of concrete on site.
2. Develop correlation between cube and cylinder of high strength concrete and analyze the stress-strain curve.
3. Interpret the mechanical properties of high strength concrete and examine the effect of cyclic loading on steel
4. Assess the quality of existing concrete members by Non-Destructive testing methods and study the behaviour of beams under flexure.
5. Analyze the behaviour of Self Compacting Concrete and understanding reinforcement details and corrosion levels in existing RC structures.

List of Experiments/Assignments:

1. Conduct basic tests on cement and aggregates.
2. Design the mix proportions for high strength concrete.
3. Study the correlation between cubes of dimensions 100mm and 150mm sizes.
4. Study the correlation between cube and cylinder of high strength concrete.
5. Determine the split tensile strength of high strength concrete
6. Determine the modulus of rupture of high strength concrete.
7. Determine the compressive strength of existing concrete members by Non-Destructive testing method using Rebound Hammer.
8. Assess the quality of existing concrete members by Non-Destructive testing method using Ultrasonic Pulse Velocity.
9. Study the flow properties of self-compacting concrete (as per EFNARC guidelines).
10. Evaluation of air content in concrete.
11. Optimization of dosage of super plasticizer in cement (Marsh Cone test).
12. Demonstration on how to locate reinforcement details in any existing RC structures.
13. Demonstration on assessing the level of corrosion in the existing RC structures.

Reference Books:

1. Properties of Concrete, Neville A. M., 5th Edition, Prentice Hall, 2012.
2. Concrete Technology, Shetty M. S., S. Chand and Co.,5th edition, 2006