Course Title: STRUCTURAL ANALYSIS

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – IV

Subject Code	15CT42	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	50	Exam. Hours	03

CREDITS – 04

Course objectives: This course will enable students;

1. Apply knowledge of mathematics and engineering in calculating slope and deflections
2. Identify, formulate and solve engineering problems
3. Analyse structural systems and interpret data
4. Engage in lifelong learning with the advances in Structural Engineering

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1: Introduction and Analysis of Plane Trusses		
Introduction- Conditions of Equilibrium, Degrees of freedom, Determinate and indeterminate structures Analysis of plane trusses – Method of Joints and Method of Sections	**5 Hours**	**L2,L4,L5**
Determination of Deflection of determinate beams by using geometric methods- moment area and conjugate beam approach	**5 Hours**	**L2,L4,L5**
Module -2: Energy Principles and Energy Theorems		
Strain energy and complementary strain energy, strain energy due to axial load bending and shear, law of conservation of energy, principles of virtual work, Castigliano's first theorem, Belti's law, Clarke – Max well theorem of reciprocal deflection. Deflection of beams and trusses using strain energy and unit local methods	**10 Hours**	**L2, L4, L5**

Module-3: Arches and Cable Structures		
Analysis of three hinged parabolic arch with supports at same levels – determination of thrust, shear and bending moment. Analysis of cables under point load and u.d.l length of cables (supports at same level).	**10 Hours**	**L2,L4,L5**
Module -4: Deflection of Beams		
Analysis of statically indeterminate beam- Propped cantilever using consistent deformation method Analysis of continuous beams using Clapeyron's three moment equation	**10 Hours**	**L2, L4, L5**
Module -5: Deflection of Beams		
Analysis of continuous beams and simple orthogonal portal frames (without sway) by slope deflection method	**5 Hours**	**L2, L4, L5**
Analysis of continuous beams and simple orthogonal portal frames (without sway) by moment distribution method.	**5 Hours**	**L2, L4, L5**

Course outcomes:

After studying this course, students will be able;

1. Evaluate the forces in determinate trusses by method of joints and sections.
2. Evaluate the deflection of cantilever, simply supported and overhanging beams by different methods
3. Understand the energy principles and energy theorems and its applications to determine the deflections of trusses and bent frames.
4. Determine the stress resultants in arches and cables.

Program Objectives (as per NBA)

1. *Engineering Knowledge.*
2. *Problem Analysis.*
3. *Interpretation of data.*

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- ***The students shall answer Five full questions selecting one full question from each module.***
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Pundit Gupta – Structural Analysis Vol. 1 and II.
2. C.S. Reddy – Basic Structural Analysis, TMH.

Reference Books:

1. Indeterminate Structural Analysis – J. Sterling Kinney
2. Elemental Structural Analysis – Noris C H, Wilbur J.B
3. Intermediate Structural Analysis – C.K.Wang

Course Title: SURVEYING - II

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – IV

Subject Code	15CT43	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives:

The objectives of this course is to make students to learn:

1. Understand the basic principles of Surveying
2. Learn Linear and Angular measurements to arrive at solutions to basic surveying problems.
3. Employ conventional surveying methods for curve setting
4. Acquire the surveying data to compute areas and volumes and draw contours.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
THEODOLITE SURVEY Theodolite and types, Fundamental axes and parts of a transit theodolite, uses of theodolite, Temporary adjustments of a transit theodolite, Measurement of horizontal angles – Method of repetitions and reiterations, Measurements of vertical angles, Prolonging a straight line by a theodolite in adjustment and theodolite not in adjustment	**6 Hours**	**L1, L2**
PERMANENT ADJUSTMENT OF DUMPY LEVEL AND TRANSIT THEODOLITE: Interrelationship between fundamental axes for instrument to be in adjustment and step by step procedure of obtaining permanent adjustments	**4 Hours**	**L1, L2**

Module -2		
TRIGONOMETRIC LEVELLING Determination of elevation of objects when the base is accessible and inaccessible by single plane and double plane method, Distance and difference in elevation between two inaccessible objects by double plane method. Salient features of Total Station, Advantages of Total Station over conventional instruments, Application of Total Station.	**10 Hours**	**L1, L2**
Module -3		
TACHEOMETRY Basic principle, Types of tacheometric survey, Tacheometric equation for horizontal line of sight and inclined line of sight in fixed hair method, Anallactic lens in external focusing telescopes, Reducing the constants in internal focusing telescope, Moving hair method and tangential method, Subtance bar, Beaman stadia arc.	**5 Hours**	**L1,L2**
CURVE SETTING (Simple curves) Curves – Necessity – Types, Simple curves, Elements, Designation of curves, Setting out simple curves by linear methods, Setting out curves by Rankines deflection angle method.	**5 Hours**	**L1,L2**
Module -4		
CURVE SETTING (Compound and Reverse curves) Compound curves, Elements, Design of compound curves, Setting out of compound curves, Reverse curve between two parallel straights (Equal radius and unequal radius).	**5 Hours**	**L1,L2**

CURVE SETTING (Transition and Vertical curves) Transition curves, Characteristics, Length of Transition curve, Setting out cubic Parabola and Bernoulli's Lemniscates, Vertical curves – Types – Simple numerical problems.	**5 Hours**	**L1,L2**
Module -5		
AREAS AND VOLUMES Calculation of area from cross staff surveying, Calculation of area of a closed traverse by coordinates method. Planimeter – principle of working and use of planimeter to measure areas, digital planimter, Computations of volumes by trapezoidal and prismoidal rule, Capacity contours	**10 Hours**	**L1,L2**

Course outcomes:
After successful completion of the course, the student will be able to:

1. Possess a sound knowledge of fundamental principles of surveying
2. Measurement of vertical and horizontal plane, linear and angular dimensions to arrive at solutions to basic surveying problems
3. Apply the knowledge of conventional surveying methods for curve setting
4. Analyse the data to compute areas and volumes and draw contours.

Program Objectives (as per NBA)

1. *Engineering Knowledge.*
2. *Problem Analysis.*
3. *Interpretation of data.*

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- The students shall answer Five full questions selecting one full question from each module.
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. '**Surveying'** Vol 2 and Vol 3 - B. C. Punmia, Laxmi Publications
2. **'Plane Surveying'** A. M. Chandra – New age international (P) Ltd
3. **'Higher Surveying'** A.M. Chandra New age international (P) Ltd

Reference Books:

1. **Fundamentals of Surveying** - Milton O. Schimidt – Wong, Thomson Learning.
2. **Fundamentals of Surveying** - S.K. Roy – Prentice Hall of India
3. **Surveying**, Arther Bannister et al., Pearson Education, India

Course Title: Concrete Technology

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – IV

Subject Code	15CV/CT44	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	50	Exam. Hours	03

CREDITS – 04

Course objectives: This course will enable students;

1. Recognize the importance of material characteristics and their contributions to strength development in Concrete
2. Proportion ingredients of Concrete to arrive at most desirable mechanical properties of Concrete.
3. Ascertain and measure engineering properties of concrete in fresh and hardened state which meet the requirement of real time structures.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module-1: Concrete Ingredients		
Cement – Cement manufacturing process, steps to reduce carbon footprint, chemical composition and their importance, hydration of cement, types of cement. Testing of cement. Fine aggregate: Functions, requirement, Alternatives to River sand, M-sand introduction and manufacturing. Coarse aggregate: Importance of size, shape and texture. Grading and blending of aggregate. Testing on aggregate, requirement. Recycled aggregates Water – qualities of water. Chemical admixtures – plasticizers, accelerators, retarders and air entraining agents. Mineral admixtures – Pozzolanic and cementitious materials, Fly ash, GGBS, silica fumes, Metakaolin and rice husk ash.	**10 Hours**	**L1,L2,L3**

Module -2: Fresh Concrete		
Workability-factors affecting workability. Measurement of workability–slump, Compaction factor and Vee-Bee Consistometer tests, flow tests. Segregation and bleeding. Process of manufacturing of concrete- Batching, Mixing, Transporting, Placing and Compaction. Curing – Methods of curing – Water curing, membrane curing, steam curing, accelerated curing, self-curing. Good and Bad practices of making and using fresh concrete and Effect of heat of hydration during mass concreting at project sites.	**10 Hours**	**L1,L2,L3**
Module -3: Hardened Concrete		
Factors influencing strength, W/C ratio, gel/space ratio, Maturity concept, Testing of hardened concrete, Creep –factors affecting creep. Shrinkage of concrete – plastic shrinking and drying shrinkage, Factors affecting shrinkage. Definition and significance of durability. Internal and external factors influencing durability, Mechanisms- Sulphate attack – chloride attack, carbonation, freezing and thawing. Corrosion, Durability requirements as per IS-456, Insitu testing of concrete- Penetration and pull out test, rebound hammer test, ultrasonic pulse velocity, core extraction – Principal, applications and limitations.	**10 Hours**	**L1,L2,L3**
Module -4: Concrete Mix Proportioning		
Concept of Mix Design with and without admixtures, variables in proportioning and Exposure conditions, Selection criteria of ingredients used for mix design, Procedure of mix	**10 Hours**	**L1, L2, L3, L4**

proportioning. Numerical Examples of Mix Proportioning using IS-10262		
Module -5:		
RMC- manufacture and requirement as per QCI-RMCPCS, properties, advantages and disadvantages. Self-Compacting concrete- concept, materials, tests, properties, application and typical mix Fiber reinforced concrete - Fibers types, properties, application of FRC. Light weight concrete-material properties and types. Typical light weight concrete mix and applications	**10 Hours**	**L1, L2, L3, L4**

Course outcomes:

After studying this course, students will be able;

CO1: Relate material characteristics and their influence on microstructure of concrete. (L2,L3)(PO1)

CO 2: Distinguish concrete behaviour based on its fresh and hardened properties. [L2, L4] (PO1, PO2)

CO 3: Illustrate proportioning of different types of concrete mixes for required fresh and hardened properties using professional codes. [L3] (PO1, PO2, PO3)

Program Objectives (as per NBA)

1. *Engineering Knowledge.*
2. *Problem Analysis.*
3. *Interpretation of data.*

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- ***The students shall answer Five full questions selecting one full question from each module.***
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Neville A.M. “Properties of Concrete”-4th Ed., Longman.
2. M.S. Shetty, Concrete Technology - Theory and Practice Published by S. Chand and Company, New Delhi.
3. Kumar Mehta. P and Paulo J.M. Monteiro “Concrete-Microstructure, Property and Materials”, 4th Edition, McGraw Hill Education, 2014
4. A.R. Santha Kumar, “Concrete Technology”, Oxford University Press, New Delhi (New Edition)

Reference Books:

1. M L Gambir, “Concrete Technology”, McGraw Hill Education, 2014.
2. N. V. Nayak, A. K. Jain Handbook on Advanced Concrete Technology, ISBN: 978-81- 8487-186-9
3. Job Thomas, “Concrete Technology”, CENGAGE Learning, 2015
4. IS 4926 (2003): Code of Practice Ready-Mixed Concrete [CED 2: Cement and Concrete]
5. Criteria for RMC Production Control, Basic Level Certification for Production Control of Ready Mixed Concrete-BMTPC\
6. Specification and Guidelines for Self-Compacting Concrete, EFNARC, Association House

Course Title: BUILDING CONSTRUCTION [As per Choice Based Credit System (CBCS) scheme] SEMESTER – IV			
Subject Code	15CT45	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 04			

Course objectives:
This course will enable students to;
1. In investigation of soil condition, Deciding suitable foundation for different structures
2. In supervision of different types of masonry and suitable lintel, chejja and canopy
3. In selection of materials, design and supervision of suitable type of floor, roof and stairs.
4. To gain knowledge about doors, windows, plastering, painting, damp proofing, scaffolding, shoring, underpinning and to take suitable engineering measures.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
FOUNDATION: Preliminary Investigation of Soil, **Bearing Capacity of Soil** – Introduction, Safe Bearing Capacity of Soil, Allowable Bearing Capacity of Soil, Determination of Bearing Capacity by Plate Load Test and by method of dropping weight	**4 Hours**	**L1, L2,L4**
Classification of Foundations: Introduction to different types of foundation, Masonry footings, Isolated footings, Combined and Strap RCC footings, Raft footing, Grillage foundation, Pile foundations (Friction and Load bearing piles), Foundation in black cotton soils.	**6 Hours**	**L1, L2**

Module -2		
BRICK MASONRY: Definition of terms used in masonry, Bonds in brickwork, English Bond, Flemish Bond, Reinforced brickwork, Hollow Block construction, Damp Proof construction, Masonry arches classification, Stability of an arch, Joints in Masonry, Load Bearing and partition walls.	**5 Hours**	**L1,L2,L3**
STONE MASONRY: Rubble Masonry**,** Coursed Rubble Masonry**,** Uncoursed rubble masonry**,** Random rubble masonry**,** Ashlar Masonry**.** Shoring, Underpinning, Scaffolding	**5 Hours**	**L1,L2,L3**
Module -3		
LINTELS, CHEJJA, CANOPY BALCONY: Lintels - Types and classifications**,** Functions & Method of construction. Chejja -Types and classifications**,** Functions & Method of construction. Canopy -Types and classifications**,** Functions & Method of construction.	**2 Hours**	**L2, L3**
ROOFS: Flat Roof (R.C.C), Sloped roof (R.C.C. and Tile roof), Lean to roof**,** Wooden truss (King post and queen post trusses)**,** Steel trusses- for various spans up to 15m using structural steel sections including Tubular and Hollow sections with Details such as purlins, roof coverings and joints. Weather proof course for RCC Roof. Roof Coverings.	**4 Hours**	**L2, L3**
STAIRS: Types (Classification) and Technical terms in stairs, Requirements of a good stair. Geometric Design of RCC Dog Legged and open well stairs (Plan and sectional elevation of stairs)	**4 Hours**	**L2, L3,L4**

Module -4		
PLASTERING: Purpose of plastering, Materials of plastering, Lime mortar, Cement Mortar Methods of plastering, Lath plastering **FLOORING:** Types of flooring (Materials and method of laying), Granolithic, Mosaic, Ceramic, Marble, Polished granite, Industrial flooring **DOORS AND WINDOWS:** Door Types: Paneled doors, Glazed doors, Flush doors, Collapsible and rolling shutters, Louvered doors, Revolving, sliding and swing doors Windows Types: Paneled, Glazed, Bat window, Dormer window, Louvered and corner window, Ventilators	**10Hours**	**L2, L3**
Module -5:		
PAINTING: Purpose, Types, Application of paints to new and old surfaces, Distemper, Plastic emulsion, Enamel, Powder coated painting to walls and iron and steel surfaces, Polishing of wood surface **INTRODUCTION TO COST EFFECTIVE CONSTRUCTION:** Necessity, Advantages, Materials and composites, Stabilized and bocks, Precast roofing elements, L-Panel, Channel section, Micro concrete tiles, Pre cast doors and windows (Pre cast frames and shutters), Pre fabrication techniques **FORM WORK:** Form work details, RCC columns, Beams, Floors, Slip forming	**10Hours**	**L1,L2,L3**
Course outcomes: After a successful completion of the course, the student will be able to: 1. Select suitable materials and adopt suitable construction techniques for buildings 2. Adopt suitable cost effective construction techniques to enhance durability of buildings.		
Program Objectives (as per NBA) ***1.*** *Engineering Knowledge.* ***2.*** *Problem Analysis.* ***3.*** *Interpretation of data.*		

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- The students shall answer Five full questions selecting one full question from each module.
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Building Construction by S.C. Rangwala
2. Building Construction by Sushil Kumar
3. Building Construction by Punmia B.C.

Reference Books:

1. Construction Technology Vol. 1 to Vol. 4 by Chutley
2. Construction Technology Vol. 1 and Vol. 2 by Mckay.

Course Title: FINANCIAL AND COST ACCOUNTING

[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – IV

Subject Code	15CT46	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	04

CREDITS – 04

Course objectives:
This course will enable students;
1. To understand the basic concepts of finance and cost accounting
2. To comprehend the methods used to assess the financial accounting and cost of different projects
3. To evaluate the financial position to investment in a project by various methods

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
Financial Accounting: Basic Concept – Definitions of Book Keeping and Accounting – Objectives and Functions of Accounting – Types of Accounts – Rules of Debit and Credit, Journal – Ledger – Trial Balance. Preparation of Final Accounts – Adjusting Entry – Trading, Profit and Loss Account and Balance Sheet.	**10 Hours**	**L2,L3,L4**
Module -2		
Budget - Meaning and definitions – Preparation of Functional Budgets – Cash Budget - Sales Budget – Purchases and Production Budget – Flexible Budget. **Capital Budgeting** – Nature, Importance and Objectives – Process involved in Capital Budgeting – Kinds of Capital Budgeting Decision	**10 Hours**	**L1,L2**

Module -3		
Methods of Evaluating Investment Proposals – Payback method – Payback profitability method – Discounted Cash Flow method – Net present – Value method	**10 Hours**	**L2, L3, L5**
Module -4		
Costing concepts – Meaning and Definition – Objectives – Difference between Cost of Financial Accounting Cost Classification Statement of Cost and Estimation – Methods of Costing – Job Costing and Process Costing	**10 Hours**	**L1,L2**
Module -5:		
Project Accounts – Preparation of Contract Accounts for each project – Methods of Recording and Reporting Site Accounts to Project Office and from Project Office to Head Office.	**10 Hours**	**L1,L2**

Course outcomes:

After a successful completion of the course, the student will be able to:

1. Apply the knowledge of concepts of finance and cost accounting in construction.
2. Analyze the financial accounting and cost of construction projects.
3. Assess the financial position to investment in a project

Program Objectives (as per NBA)

1. *Engineering Knowledge.*
2. *Problem Analysis.*
3. *Interpretation of data.*

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- The students shall answer Five full questions selecting one full question from each module.
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Reference Books:

1. Bhattacharya S.K. and Dearden John, “Accounting for Management”, Vani Educational Books, Mumbai (Latest Edition).
2. Saravanvel P. “Management Accounting” Principles and Practices.
3. B.S. Raman “Accountancy”.
4. Prof. K.S. Nagapathi, “Management Accounting” R. Chand and Co., New Delhi.
5. Kuchal S.C. “Corporate Finance”, Tata McGraw Hill, New Delhi.

Course Title: SURVEYING PRATICE-II

[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – IV

Subject Code	15CTL47	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	42	Exam Hours	03

CREDITS – 02

Course objectives: This course will enable students to

The objectives of this course is to make students to learn:

1. *Apply the basic principles of engineering surveying and measurements*
2. *Follow effectively field procedures required for a professional surveyor*
3. *Use techniques, skills and conventional surveying instruments necessary for engineering practice.*

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
1. Measurement of horizontal angles with method of repetition and reiteration using theodolite.	03	**L3, L4**
2. Measurement of vertical angles using theodolite.	03	**L3,L4**
3. To determine the elevation of an object using single plane method when base is accessible and inaccessible.	03	**L3, L4**
4. To determine the distance and difference in elevation between two inaccessible points using double plane method.	03	**L3**
5. To determine the tacheometric constants using horizontal and inclined line of sight.	03	**L3, L4**
6. To set out simple curves using linear methods – perpendicular offsets from long chord and offsets from chords produced.	03	**L3, L4**
7. To set out simple curves using Rankine's deflection angles method.	03	**L3, L4**
8. To set out compound curve with angular methods with suing theodolite only.	03	**L3, L4**

9. To set out the center line of a simple rectangular room suing offset from base line	03	**L3, L4**
10. To set out center lines of columns of a building using two base lines at right angles	03	**L3, L4**
11. Calculation of area from cross staff surveying	03	**L3, L4**
12. Calculation of area of a closed traverse by coordinates method	03	**L3, L4**
13. Demonstration**:** Exposure to use of Total Station. Traversing, Longitudinal sections, Block levelling	03	**L1, L2**
14. Demonstration**:** Usage of relevant softwares for preparation of the contour drawings.	03	**L1, L2**

Course outcomes:

After a successful completion of the course, the student will be able to:

1. Apply the basic principles of engineering surveying and for linear and angular measurements.
2. Comprehend effectively field procedures required for a professional surveyor.
3. Use techniques, skills and conventional surveying instruments necessary for engineering practice.[L3,L4][PO5]

Program Objectives (as per NBA)

1. *Engineering Knowledge.*
2. *Problem Analysis.*
3. *Interpretation of data.*

Question paper pattern:

- All are individual experiments.
- Instructions as printed on the cover page of answer script for split up of marks to be strictly followed.
- All exercises are to be included for practical examination.

Text Books:

1. B.C. Punmia, **"Surveying Vol.1"**, Laxmi Publications pvt. Ltd., New Delhi – 2009.
2. Kanetkar T P and S V Kulkarni , **Surveying and Levelling Part I**, Pune Vidyarthi Griha Prakashan, 1988

Course Title: CONSTRUCTION MATERIALS TESTING LAB- II

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – IV

Subject Code	15CTL48	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	42	Exam Hours	03

CREDITS – 02

Course objectives:

The objectives of this course is to make students to learn:

1. Ability to apply knowledge of mathematics and engineering in calculating the mechanical properties of structural materials.
2. Ability to function on multi-disciplinary teams in the area of materials testing.
3. Ability to use the techniques and skills necessary for selecting suitable structural materials.
4. Understanding of professional and ethical responsibility in the areas of material testing.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
1. CEMENT: Normal consistency, Soundness by Autoclave method, Compression strength test.	**03 Hours**	L_2, L_3, L_5
2.AGGREGATES: **Coarse Aggregate-**Crushing, abrasion, impact and Specific gravity and water absorption. **Fine Aggregate-** Specific gravity and water absorption.	**06 Hours**	L_1, L_2, L_3, L_5
3. Mix Proportioning of Concrete using IS-10262	**06 Hours**	L_1, L_2, L_3, L_5
4. FRESH CONCRETE: Workability – slump, Compaction factor and Vee Bee tests.	**06 Hours**	L_1, L_2, L_3, L_5
5. Self-Compacting Concrete: Typical Mix by EFNARC, Workability- Slump Flow Test, V Funnel Test, L-Box test	**06 Hours**	L_1, L_2, L_3, L_5
6.HARDENED CONCRETE: Compression Strength and Split tensile tests.	**06 Hours**	L_1, L_2, L_3, L_5
7. BITUMINOUS MATERIALS AND MIXES: Specific Gravity, Penetration, Ductility, Softening point, Flash and fire point, Viscosity. Marshall Stability tests	**06 Hours**	L_1, L_2, L_4, L_5
8.SUBGRADE SOIL: CBR Test	**03 Hours**	L_2, L_3, L_4, L_5

Course outcomes:

After successful completion of the course, the students will be able to:

1. Reproduce the basic knowledge of mathematics and engineering in finding the strength in compression and split tensile strength of hardened concrete
2. Identify and compare suitable structural materials used in construction.
3. Evaluate the impact of engineering solutions on the society and also will be aware of contemporary issues regarding failure of structures due to unsuitable materials.

Program Objectives (as per NBA)

1. *Engineering Knowledge.*
2. *Evaluation of mechanical properties of structural materials.*
3. *Interpretation of test results.*

Question paper pattern:

- Group experiments - Compression Strength, Split tensile tests.
- Individual Experiments - Remaining tests.
- Two questions are to be set - One from group experiments and the other as individual experiment.
- Instructions as printed on the cover page of answer script for split up of marks to be strictly followed.
- All exercises are to be included for practical examination.

Reference Books:

1. Relevant IS Codes, EFNARC code and IRC Codes
2. Highway Material Testing Laboratory Manual – New Chand and Bros.
3. M.S. Shetty, Concrete Technology - Theory and Practice Published by S. Chand and Company, New Delhi.
4. M.L. Gambhir – Concrete Manual – Dhanpat Rai and sons New – Delhi.