## I Semester

<table>
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<tr>
<th>Subject Code</th>
<th>Name of the Subject</th>
<th>Teaching hours/week</th>
<th>Duration of Exam in Hours</th>
<th>Marks for</th>
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<th>CREDITS</th>
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<td>Exam</td>
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<td>14CCT12</td>
<td>CONSTRUCTION PROJECT MANAGEMENT</td>
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<tr>
<td>14CCT13</td>
<td>ADVANCES IN CONSTRUCTION MATERIALS</td>
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<td>14CCT16</td>
<td>MATERIAL CHARACTERIZATION LABORATORY</td>
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<td>14CCT17</td>
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<td><strong>18</strong></td>
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**Elective – 1**

- 14CCT151 ADVANCED REINFORCED CONCRETE DESIGN
- 14CCT152 RS & GIS APPLICATION IN CONSTRUCTION
- 14CCT153 ADVANCED DESIGN OF SUB STRUCTURES
- 14CCT154 BUILDING SCIENCE
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Name of the Subject</th>
<th>Teaching hours/week</th>
<th>Duration of Exam in Hours</th>
<th>Marks for Total Marks</th>
<th>CREDITS</th>
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<tr>
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<td>CONSTRUCTION ECONOMICS AND FINANCE</td>
<td>4 2 3 50 100 150</td>
<td>150 4</td>
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<td>CONSTRUCTION QUALITY AND SAFETY</td>
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<td>SOFTWARE APPLICATIONS LABORATORY</td>
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<td>14CCT27</td>
<td>SEMINAR</td>
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<td><strong>Project Phase-I (6 week Duration)</strong></td>
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<tr>
<td>14CCT252</td>
<td>PAVEMENT DESIGN &amp; CONSTRUCTION</td>
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<tr>
<td>14CCT253</td>
<td>SOIL EXPLORATION &amp; GROUND IMPROVEMENT TECHNIQUES</td>
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<td>14CCT254</td>
<td>DESIGN OF EARTHQUAKE RESISTANT STRUCTURES</td>
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<tr>
<td>** Between the II Semester and III Semester, after availing a vocation of 2 weeks**</td>
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III Semester: INTERNSHIP

<table>
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<th>Course Code</th>
<th>Subject</th>
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<th>Duration of the Exam in Hours</th>
<th>Marks for Total Marks</th>
<th>CREDITS</th>
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<tr>
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<td>Lecture</td>
<td>Practical / Field Work</td>
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<td>Exam</td>
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<td>14CCT31</td>
<td>Seminar / Presentation on Internship (After 8 weeks from the date of commencement)</td>
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<td>Report on Internship</td>
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<td>14CCT33</td>
<td>Evaluation and Viva-voce</td>
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* The student shall make a midterm presentation of the activities undertaken during the first 8 weeks of internship to a panel comprising Internship Guide, a senior faculty from the department and Head of the Department.

# The College shall facilitate and monitor the student internship program.

The internship report of each student shall be submitted to the University.

**Between the III Semester and IV Semester after availing a vacation of 2 weeks.
## Scheme of Teaching and Examination for M.Tech. Construction Technology

### IV Semester

<table>
<thead>
<tr>
<th>Subject Code</th>
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<td>Exam</td>
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<td>14CCT41</td>
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<td>Evaluation of Project Work and Viva-voce</td>
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**Total** 8 04 09 150 400 550 28

**Grand Total (I to IV Sem.)**: 2400 Marks; 94 Credits

### Elective – 3

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<td>14CCT423 EEG</td>
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<td>14CCT424</td>
<td>14CCT424 EEG</td>
<td>CONSTRUCTION &amp; DEMOLITION WASTE MANAGEMENT</td>
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**Note:**

1. Project Phase – I: 6 weeks duration shall be carried out between II and III Semesters. Candidates in consultation with the guides shall carryout literature survey / visit to Industries to finalize the topic of dissertation.

2. Project Phase – II: 16 weeks duration during III Semester. Evaluation shall be taken during the Second week of the IV Semester. Total Marks shall be 25.


Marks of Evaluation of Project:

- The I.A. Marks of Project Phase – I & II shall be sent to the University along with Project Work report at the end of the Semester.
4) During the final viva, students have to submit all the reports.
5) The Project Valuation and Viva-Voce will be conducted by a committee consisting of the following:

   a) Head of the Department (Chairman)
   b) Guide
   c) Two Examiners appointed by the university. (Out of two external examiners at least one should be present).
I SEMESTER

MECHANIZATION IN CONSTRUCTION

Subject Code : 14 CCT 11      IA Marks : 50
No. of Lecture Hrs/ Week : 04  Exam Hrs : 03
Total no. of Lecture Hrs. : 52  Exam Marks : 100

Introduction to mechanization: Definition, advantages and limitations of mechanization, Indian scenario and Global scenario

Mechanization through construction equipment: Equipment cost, Machine Power, Production cycle - Dozers, scrapers, Excavators, Finishing equipment, Trucks and Hauling equipment, Hoisting equipment, Draglines and Clamshells - Mechanization in aggregate manufacturing: Natural aggregates and recycled aggregates

Mechanization in rebar fabrication

Mechanization in concrete production and placement

Mechanization through construction: formwork and scaffolding-types, materials and design principles.

Mechanization through construction methods/technologies: segmental construction of bridges/flyovers, box pushing technology for tunneling, trench-less technology.

Safety and Environmental issues in mechanization

REFERENCE BOOKS:
3. Current Literature

CONSTRUCTION PROJECT MANAGEMENT

Subject Code : 14CCT 12      IA Marks : 50
No. of Lecture Hrs/ Week : 04  Exam Hrs : 03
Total no. of Lecture Hrs. : 52  Exam Marks : 100


REFERENCE BOOKS:
ADVANCES IN CONSTRUCTION MATERIALS

Concrete making materials—cement, aggregates, admixtures (both mineral and chemical). Microstructure of concrete, Fresh concrete and its rheology, Mechanical, deformational behaviour of hardened concrete. Creep and Shrinkage of Concrete. Durability of Plain and Reinforced Concrete. Proportioning of Mixes—Normal Concrete, High Strength/Performance Concrete, Fibre Reinforced Concrete, Reactive Powder Concrete, Roller Compacted Concrete, Self-Compacting Concrete, Geo-polymer Concrete and Decorative Concrete, Types of Reinforcements. Corrosion of Reinforcing Steel—Electro-chemical process, measures of protection. Polymers, fibres, adhesives and sealants—types and their uses. Structural glazing.

REFERENCE BOOKS:

3. “Current Literature”.

STRUCTURAL MASONRY

Introduction to Masonry structures, Materials for Masonry, Strength and elastic properties of masonry, Parameters influencing Masonry properties, Behaviour of masonry under shear, flexure, and axial loads (static and dynamic), Design of masonry structures, Masonry arches and Shells, Introduction to Reinforced Masonry

REFERENCE BOOKS:

2. Sven Sahlin, “Structural Masonry”
3. Curtin, “Design of Reinforced and Pre-stressed Masonry”

ADVANCED REINFORCED CONCRETE DESIGN

1. Yield line method of design of slabs.
2. Design of grid floors.
3. Design of continuous beams.
4. Design of portal frames.
5. Design of silos and bunkers.
6. Design of flat slabs.
7. Art of detailing earthquake resistant construction – expansion and construction joints

REFERENCES BOOKS:

1. A Park and Paulay, “Reinforced Reinforced and Prestressed Concrete”-John Wiley & Sons
2. Lin TY and Burns N H. “Reinforced Concrete Design”. John Wiley & Sons
3. Kong KF and Evans T H “Design of Prestressed Concrete Structures”
5. Dr.B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, “Comprehensive RCC Design”

RS and GIS Applications in Construction

<table>
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<th>IA Marks</th>
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<td>Exam Marks</td>
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</table>

Geographic information concepts and spatial models – Introduction, spatial information, temporal information, conceptual models of spatial information, representation of geographic information.

GIS Functionality – Introduction, data acquisition, preliminary data processing, data storage and retrieval, spatial search and analysis, graphics and interaction.

Computer Fundamentals of GIS and Data storage Fundamentals of computers vector/ raster storage character files and binary files, file organization, linked lists, chains, trees. Coordinate systems and map projection: Rectangular, polar and spherical coordinates, types of map projections, choosing a map projection.

GIS Data models and structures – Cartographic map model, Geo-relation model, vector/ raster methods, non-spatial data base structure viz., hierarchal network, relational structures. Digitizing Editing and Structuring map data – Entering the spatial (Digitizing), the non-spatial, associated attributes, linking spatial and non-spatial data, and use of digitizers and scanners of different types.

Data quality and sources of error – Sources of errors in GIS data, obvious sources, natural variations and the processing errors and accuracy. Principles of Spatial data access and search, regular and object oriented decomposition, introduction to spatial data analysis and overlay analysis, raster analysis, network analysis in GIS.

GIS and remote sensing data integration techniques in spatial decision support system land suitability and multi-criteria evaluation, rule based systems, network analysis, special interaction modeling, Virtual GIS.

Data base positioning systems, desirable characteristics of data base management systems, components of a data base management system, understanding the data conceptual modeling. Global positioning system, hyper spectral remote sensing, DIP techniques, hardware and software requirements for GIS, overview of GIS software.

REFERENCES BOOKS:

Advanced Design of Sub Structures

<table>
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<tr>
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<td>Exam Marks : 100</td>
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</table>

Introduction: Introduction to sub structure, definition, purpose, requirements, types. Foundation: Types, selection criteria, requirements, load computation, design steps.

Shallow foundation: Types, depth of footings, loads, principles of design, proportioning of strip, spread, rectangular, trapezoidal, combined footings (no structural design), numerical problems on proportioning, raft foundation-design method, modulus of subgrade reaction.

Pile foundation: Introduction, necessity, various classifications, load carrying capacity, static method for driven piles in sand and clay, negative skin friction, dynamic formulae, pile group, group efficiency, numerical problems on above, under reamed piles, pile load test, concept of batter piles.

Drilled pier, Caissons, well foundation
Introduction, construction of drilled pier, merits & demerits of drilled piers, caissons-open type, pneumatic and floating caissons concept, advantages, disadvantages, stability of floating caissons. Well foundation types, shapes, forces acting, components, sinking of wells, tilts and shifts.

Marine substructures: Introduction, types, concepts of breakwater, wharves, pier, seawall, docks, quay walls, design loads, combined loads, and design method of break waters.

Foundation of transmission line towers: Introduction, necessary, forces, design criteria, choice of foundation, design procedure.

Reference books:
5. Teng, “Foundation Design”, Prentice Hall, Ind

Building Science

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</table>

Climatic factors, Classification of tropical climates, site climate, micro climate of human settlements, ventilation requirements for health, mechanisms and estimation of natural ventilation, airflow patterns in building

Thermal comfort factors, thermal indices, thermal quantities, heat exchange in buildings, periodic heat flow, mechanical and structural means of thermal control.
Propagation of sound, sound insulation, absorption, transmission reverberation roofing and walling system for sound absorption and insulation, noise and noise control in buildings.

Principles of day lighting in buildings

REFERENCE BOOKS:
4. SP:41- Functional Requirements for Buildings, BIS, New Delhi

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**Material Characterization laboratory**

<table>
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<th>IA Marks</th>
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<tr>
<td>14CCT 16</td>
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</table>

| No. of Practical Hrs/ Week | 03 |

In-situ test methods

In situ testing of concrete structures, test methods available, planning of in situ tests, Surface hardness methods- Rebound Hammer equipment, its operation and procedure for testing, factors influencing rebound no., calibration, and interpretation of results, applications and limitations, Ultrasonic methods- UPV testing equipment, its use, different transducer arrangements, tests calibration and interpretation of results, Exposure to IS and other relevant codes

Stress-Strain relationship of concrete and masonry

Mix design, casting and testing High Performance/Strength concrete cylinders and obtaining the stress-strain behavior (Modulus of Elasticity) under compressive loading, casting and testing of stack-bonded masonry prisms and obtaining the stress-strain behavior (Modulus of Elasticity) under compression

Instrumentation for dynamic measurement

Use of vibration measuring instruments (accelerometers), data acquisition systems, Experiments on SDOF systems- free vibration tests to obtain natural frequency and damping

REFERENCE BOOKS:
1. “Relevant IS codes”
2. “Software Manuals”

**II SEMESTER**
CONSTRUCTION ECONOMICS AND FINANCE

Subject Code: 14CCT 21
IA Marks: 50
No. of Lecture Hrs/ Week: 04
Exam Hrs: 03
Total no. of Lecture Hrs.: 52
Exam Marks: 100


REFERENCE BOOKS:

Pre Engineered Construction Technology

Subject Code: 14 CCT 22
IA Marks: 50
No. of Lecture Hrs/ Week: 04
Exam Hrs: 03
Total no. of Lecture Hrs.: 52
Exam Marks: 100

General Principles of Fabrication

Prefabricated Elements

Production and Hoisting Technology

Pre-Engineered Buildings
Introduction – Advantages - Pre Engineered Buildings Vs Conventional Steel Buildings - Design of Pre Engineered Buildings (PEB) – Applications

References

CONSTRUCTION AND CONTRACT MANAGEMENT

<table>
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<th>IA Marks</th>
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</tbody>
</table>

Project cost estimation, rate analysis-labour, materials and equipment production, Overhead charges, Bidding models and strategies, Qualification of bidders.


REFERENCE BOOKS:
1. Roshan Namavathi, “Professional Practice”
3. Collier, Kieth, “Managing Construction Contracts”

Construction Quality and Safety

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>IA Marks</th>
<th>No. of Lecture Hrs/ Week</th>
<th>Exam Hrs</th>
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<td>50</td>
<td>04</td>
<td>03</td>
<td>52</td>
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</table>

Construction Quality, Inspection and Testing, Quality control, Quality Assurance, Quality Certification for companies and laboratories (ISO Certification, NABL certification), Total Quality Management, Critical factors of TQM, TQM in Projects, Benchmarking, concepts of quality policy, standards, manual, Third Party Certification


REFERENCE BOOKS:
Remedial Engineering

Subject Code : CCT 251 
No. of Lecture Hrs/ Week : 04 
Total no. of Lecture Hrs. : 52

IA Marks : 50
Exam Hrs : 03
Exam Marks : 100

General : Introduction, Cause of deterioration of concrete structures, Diagnostic methods & analysis, preliminary investigations, experimental investigations using NDT

Influence on Serviceability And Durability: Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, cathodic protection.


Techniques for Repair: Rust eliminators and polymers coating for rebar during repair, foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shot Crete, Epoxy injection, Mortar repair for cracks, shoring and underpinning.

Examples of Repair: To Structures Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering wear, fire, leakage, marine exposure, engineered demolition techniques for dilapidated structures - case studies

REFERENCE BOOKS
2. R.N. Raikar “Rehabilitation of Structures”- Edited by, Vol. 1, 2 and 3, Proc., Int. Symposium, Maharashtra Indian Chapter of ACI, Bombay
4. CPWD Hand book on Repair and Rehabilitation of RCC Buildings, DG(W), Central Public Works Department, New Delhi, 2002.

Pavement Design and Construction
Introduction: Highway and airport pavements, Types and component parts of pavements, their differences - Factors affecting design and performance of pavements.

Stresses and Deflections In Flexible Pavements: Stresses and deflections in homogeneous masses, wheel load stresses, various factors in traffic wheel loads, ESWL and EWL factors.

Flexible Pavement Design Methods For Highways: CBR method-Principle – Testing as per IRC, AASHTO and Asphalt Institute and Shell Method. Problems on above

Stresses in Rigid Pavements: Factors affecting design and performance of pavements. Types of stresses and causes, factors influencing the stresses; general considerations in rigid pavement analysis, EWL, wheel load stresses, warping stresses, frictional stresses, combined stresses. Problems on above Rigid Pavement Design: Types of joints in cement concrete pavements and their functions, joint spacing; design of CC pavement for roads and runways, design of joint details for longitudinal joints, contraction joints and expansion joints. IRC method of design by stress ratio method. Design of continuously reinforced concrete pavements, Problems on above

Equipment in Highway Construction: Various types of equipment for excavation, grading and compaction - their working principle, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction

Subgrade: Earthwork grading and construction of embankments and cuts for roads. Preparation of subgrade, quality control tests

Flexible Pavements: Specifications of materials, construction method and field control checks for various types of flexible pavement layers – WBM-BM- SDBCBC

Cement Concrete Pavements: Specifications and method of cement concrete pavement construction; Quality control tests; Construction of various types of joints.

REFERENCE BOOKS:
4. Huang, “Pavement Analysis”- Elsevier Publications
5. HRB/TRB/IRC/International Conference on “Structural Design of Asphalt Pavements”.
6. “Relevant IRC Publications”
7. “CMA Hand Book”
Soil Exploration and Ground Improvement Techniques

Subject Code : CCT 253
No. of Lecture Hrs/ Week : 04
Total no. of Lecture Hrs. : 52
IA Marks : 50
Exam Hrs : 03
Exam Marks : 100

Principles of exploration: Geophysical and sounding methods, Modern methods of boring and sampling; Preservation and transportation of samples; Sampling records, Soil profiles, Various types of field tests; Instrumentation; Investigation below sea/river bed; offshore investigation; investigation; interpretation of exploration data and report preparation; economics of field testing & lab testing. Engineering properties of soft & weak and compressible deposits; principles of treatment; Methods of soil improvement-lime stabilization and injection; thermal, electrical and chemical methods; Dynamic consolidation; vibroflotation; compaction by blasting; pre-consolidation with vertical drains; Granular piles; soil nailing; Anchors; Grouting; Electro-osmosis; Soil freezing; Vacuum consolidation; Case histories Soil confinement

REFERENCE BOOKS:
4. Purushotham Raj, “Ground Improvement Techniques”.
5. “Current Literature”, Laxmi Pub

Design of Earthquake Resistant Structures

Subject Code : CCT 254
No. of Lecture Hrs/ Week : 04
Total no. of Lecture Hrs. : 52
IA Marks : 50
Exam Hrs : 03
Exam Marks : 100

Introduction to engineering seismology, characteristics of earthquake and its quantification, seismological instrumentation in buildings, introduction to structural dynamics of buildings, Seismic response of buildings and sites – Dynamic properties of buildings and sites, building code requirements for earthquake effects, forms of seismic response, structural response, structural failures, non-structural damage, behaviour of ordinary construction, site failures, building foundation failures. Desirable features of earthquake resistant buildings, damping, ductility and energy absorption in buildings, details of providing ductility in structures, lessons from structural damage during past earthquakes. Earthquake analysis of linear systems- Response history analysis and response spectrum analysis. Earthquake analysis of multistoried RC structure, discussion of IS code provisions of Earthquake resistant design of buildings. Design of basic structural elements (Reinforced concrete) such as beams, columns and slabs subjected to dynamic loads by limit state method. Concepts for Earthquake resistant masonry – IS codal provisions

REFERENCE BOOKS:
5. Timoshenko, S., “Vibration and Structural Dynamics”-VanNostrand Co.,
6. Clough and Penzen, “Dynamics of Structures”.

Software applications laboratory

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Software Application

Use of construction management softwares (MS-PROJECTS, PRIMAVERA) Analysis of skeletal and continuum structures using standard FEM packages, BIM.

REFERENCE BOOKS:
1. “Software Manuals”

IV SEMESTER

ENERGY AND BUILDINGS

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Computation of embodied energy, life cycle energy assessment - case studies.
Green building concepts, rating standards – case studies.
Energy efficient materials and Technologies.

REFERENCE BOOKS:
2. “Current Literature
**Pre-Stressed Concrete**

Subject Code : CCT 421
No. of Lecture Hrs/ Week : 04
Total no. of Lecture Hrs. : 52

IA Marks : 50
Exam Hrs : 03
Exam Marks : 100

High strength materials, Pre-stressing systems, losses in pre-stress, Analysis of P.C. Members for flexure, shear, torsion., Design of reinforcement for shear, flexure and torsion. Anchorage zone stresses in Pre-tensioned and Post – tensioned members. Concept of transmission, length, bond stresses, Design of anchorage zone reinforcement, Introduction to Post-tensionin of flat slabs.

**REFERENCE BOOKS:**
2. Lin TY and Burns N H, “Reinforced Concrete Design”.
3. Kong KF and Evans T H “Design of Pre-stressed Concrete Structures”

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**Building Services and Maintenance**

Subject Code : CCT 422
No. of Lecture Hrs/ Week : 04
Total no. of Lecture Hrs. : 52

IA Marks : 50
Exam Hrs : 03
Exam Marks : 100

Standard fire, fire resistance, classification of buildings, means of escape, alarms, etc., provisions of NBC.

Engineering services in a building as a system, Lifts, escalators, cold and hot water systems, waste water systems and electrical systems.


**REFERENCE BOOKS:**
1. NBC,” Relevant Parts: BIS New Delhi

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**Disaster Management Techniques**

Subject Code : CCT 423
No. of Lecture Hrs/ Week : 04
Total no. of Lecture Hrs. : 52

IA Marks : 50
Exam Hrs : 03
Exam Marks : 100
Introduction: Disaster preparedness, Goals and objectives of ISDR Programme, Risk identification, Risk sharing, Disaster and development: Development plans and disaster management, alternative to dominant approach, Disaster development linkages, Principle of risk partnership

Application of Technology in disaster risk reduction: Application of various technologies: Data bases RDBMS-Management information systems-Decision support system and other systems-Geographic information systems-Intranets and extranets-video teleconferencing-Trigger mechanism-Remote sensing—an insight—contribution of remote sensing and GIS

Awareness of Risk reduction: Trigger mechanism—constitution of trigger mechanism—risk reduction by education—disaster information network—risk reduction by public awareness

Development of Planning on disaster: Implication of development planning—financial arrangements—areas of improvement—disaster preparedness-community based disaster management—emergency response

Seismicity: Seismic waves-Earthquakes and faults—measures of earthquake, magnitude and intensity—ground damage—Tsunamis and earthquakes.

REFERENCE BOOKS:
1. Pardeep Sahni, Madhavi Malalgoda and Ariyabandu, “Disaster risk reduction in south Asia”, PHI
3. Pardeep sahni, Alka Dhomeja and Uma Medury, “Disaster Mitigation: Experiences and reflections”, PHI

Construction and Demolition Waste Management

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Resource Economics, Disposable materials, Governmental role in waste management, Potential for reuse and recycle

Recycling methods: Retrieval of virgin aggregates by various methods, enhancing the properties of retrieved aggregates by various techniques

Construction Demolition wastes: Classification, steps in handling C & D wastes, Applications of C & D wastes, Reuse as fine aggregate, coarse aggregate, Properties of Construction demolition wastes, Properties of concrete products, specifications, standards, national policy etc.

REFERENCE BOOKS:
4. “Current Literature”