SYLLABUS

M.Tech- CONSTRUCTION TECHONOLOGY

MECHANIZATION IN CONSTRUCTION [As per Choice Based Credit System (CBCS) scheme] SEMESTER – I			
Subject Code	16CCT11	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:

Course objectives: This course will enable students to

- Understand the various types of equipments used for Construction.
- Understand the various methods of Construction Techniques

Modules	**Teaching Hours**	**RBT Level**
Module -1		
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	**10 Hours**	**L_1, L_2, L_4, L_5**
Module -2		
Mechanization in aggregate manufacturing: Natural aggregates and recycled aggregates	**10 Hours**	**L_1, L_2, L_3 L_4, L_5**
Module -3		
Mechanization in rebar fabrication Mechanization in concrete production and placement Mechanization through construction: formwork and scaffolding types, materials and design principles.	**10 Hours**	**L_1, L_2, L_3 L_4, L_5**
Module -4		
Mechanization through construction methods/technologies: segmental construction of bridges/flyovers, box pushing technology for tunneling, trench-less technology. Pile Driving Equipment : Pile hammers, selecting a pile hammer, loss of energy due to impact, Energy losses due to causes other than impact.	**10 Hours**	**L_1, L_2, L_3 L_4, L_5**
Module -5		
Mechanization through construction methods of Drilling, Blasting and Tunneling Equipment : Definition of terms, bits, Jackhammers, Drifters, wagon drills, chisel drills,	**10 Hours**	**L_1, L_2, L_4, L_5**

piston drills, blast hole drills, shot drills, diamond drills, tunneling equipment, selecting the drilling method equipment; selecting drilling pattern. Safety and Environmental issues in mechanization		

Course outcomes:

On completion of this course, students are able to

- To decide which type and capacity of construction equipment can be used for a particular job on site.
- To Know the methods of drilling and blasting.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. "Construction Equipment and its Planning and Applications", Mahesh Varma, Metropolitan Book Co.(P) Ltd.,New Delhi. India.
2. "Construction Machinery and Equipment in India". (A compilation of articles Published in Civil Engineering and
3. "Construction Review" Published by Civil Engineering and Construction Review,New Delhi, 1991.
4. Sharma S.C. "Construction Equipment and Management", Khanna Publishers, Delhi, 1988
5. Peurifoy R L, "Construction Planning, Equipment and Methods", Mc Graw Hill
6. James F Russell, "Construction Equipment", Prentice Hall
7. "Current Literature"

CONSTRUCTION PROJECT AND MANAGEMENT

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

SEMESTER – I

Subject Code	16CCT12	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

- Understand the various management techniques for successful completion of construction projects.
- Understand the effect of management for project organization,

Modules	Teaching Hours	RBT Level
Module -1		
Introduction: Construction Projects- Concept, Project Categories, Characteristic of projects, project life cycle phase. Project Management- Project Management Function, Role of Project Manager. Organizing For Construction - Principles of organization, type of organization structure	**10 Hours**	**L_1, L_2, L_3, L_4, L_5**
Module -2		
Project Feasibility Reports: Introduction, Significance in feasibility report- Technical analysis, Financial analysis, Economic analysis, Ecological analysis, Flow diagram for feasibility study of a project. Project planning Scope: Planning Process, Objectives, Types of Project plans, Resource Planning Process.	**10 Hours**	**L_1, L_2, L_3, L_4, L_5**
Module -3		
Bar Charts, Work Breakdown Structure, Time estimates, Applications of CPM and PERT A-O-N Network-Logic and Precedence diagrams, advantages, Drawing A-O-N network from A-O-A network and related problems	**10 Hours**	**L_1, L_2, L_3, L_4, L_5**
Module -4		
Time Cost relationship: Direct and indirect cost, step in optimization of cost, related problem. Allocation of resources: Histogram, Resource smoothening, Resource leveling and related problem. Project updating using CPM network and related numerical problems.	**10 Hours**	**L_1, L_2, L_4, L_5**
Module -5		
Scheduling, Monitoring and Updating. Line of Balance Scheduling. Resource Planning-Leveling and Allocation. Introduction to Building Information Model (BIM).	**10 Hours**	**L_1, L_2**

Course outcomes: *On completion of this course, students are able to* • Allocate the funds for each work and execute the same. • Calculate the total time required to complete the job without delay and delay in the project and also estimate the amount of additional funds may require to complete the job		
Question paper pattern: • The question paper will have ten questions. • Each full question consists of 16 marks. • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module.		
REFERENCES: 1. Chitkara, K.K. "Construction Project Management: Planning, Scheduling and Control", Tata McGraw-Hill Publishing Company, New Delhi, 1998. 2. Choudhury S , "Project Management", McGraw-Hill Publishing Company, New Delhi, 1988. 3. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders", Prentice Hall, Pittsburgh, 2000. 4. Srinath L.S, "PERT and CPM", East West Press Pvt Ltd New Delhi. 5. Frank Harris and Roland McCaffer, "Modern Construction Management"- 4th Ed Blackwell Science Ltd. 6. Current Literature		

ADVANCED TECHNIQUES IN CONCRETE CONSTRUCTION

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

SEMESTER – I

Subject Code	16CCT13	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

- Study the properties of concrete making materials, tests, mix design, special concretes and various methods for making concrete.
- To understand the quality control of concrete

Modules	Teaching Hours	RBT Level
Module -1		
Features of Recent Advances in Concrete, Types of Concrete to be dealt; Terminologies, Ingredients, Properties of Fresh & Hardened concrete, related tests, Production and use of concrete.	**10 Hours**	**L_1, L_2**
Module -2		
High Performance Concretes: Definition & Introduction, Classification, general properties, Advantages, Disadvantages, Applications, Description of types. Guidelines for Mix design and use of following concretes: Light weight concrete, High strength concrete, Ultra-high strength concrete (reactive powder concrete), High workability concrete/Self compacting concrete, Fiber reinforced concrete, Polymer-concrete composites	**10 Hours**	**L_2, L_3**
Module -3		
Special Concretes: Definition & Introduction, General properties, Advantages, Disadvantages, Applications, Concreting practices, Guidelines for Mix design and use of following concretes: High density concrete, Shrinkage compensating concrete, Mass concrete, Roller compacted concrete.	**10 Hours**	**L_2, L_3**
Module -4		
Durability of Concrete: Definitions, Deterioration processes – Physical, Chemical, Environmental & Biological; Measures for ensuring durability, Corrosion of reinforcing steel, protective measures.	**10 Hours**	**L_2, L_3, L_4**
Module -5		
Testing and Quality Control of Concrete: Classification of test methods, In-situ, Non-Destructive & Partially–Destructive tests for fresh concrete, hardened concrete and durability of concrete.	**10 Hours**	**L_1, L_2**

Problems on the in-situ testing results and compared with Laboratory results		

Course outcomes:

On completion of this course, students are able to:

- To know the various tests on fresh, hardened concrete, special concrete and the methods of manufacturing of concrete.
- To check the quality of hardened concrete by using Various NDT Tests

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Gambhir.M.L., "Concrete Technology", McGraw Hill Education, 2006.
2. Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
3. Neville, A.M., "Properties of Concrete", Prentice Hall, 1995, London.
4. Santhakumar.A.R. ; "Concrete Technology",Oxford University Press,2007.
5. Shetty M.S., "Concrete Technology", S.Chand and Company Ltd. Delhi, 2003.
6. Mehta .P.K., and Paulo J.M. Monteiro, "Concrete- Microstructure, Properties and Materials"-(Indian Ed.,Indian Concrete institute), McGraw Hill.
7. "Current Literature".

CONSTRUCTION QUALITY AND SAFETY

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

SEMESTER – I

Subject Code	16CCT14	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

- Understand the elements of quality planning and the implication.
- Become aware of objectives and advantage of quality assurance.
- Study the relationship between quality and safety management

Modules	Teaching Hours	RBT Level
Module -1		
Construction Quality, Inspection and Testing, Quality control, Quality Assurance, Quality Certification for companies and laboratories (ISO Certification, NABL certification)	**10 Hours**	**L_1, L_2, L_5**
Module -2		
Total Quality Management, Critical factors of TQM, TQM in Projects, Benchmarking, concepts of quality policy, standards, manual	**10 Hours**	**L_3, L_4, L_5**
Module -3		
Third Party Certification: Construction Safety-meaning and scope, Safety in construction- Technological aspects, organizational aspects and behavioural aspects, Safety legislation and Standards, Contract conditions on safety in Civil Engineering projects	**10 Hours**	**L_1, L_2, L_4, L_5**
Module -4		
Safety in Construction: Causes, classification, cost and measurement of an accident, safety programme for construction, protective equipment, accident report, safety measure: (a) For storage and handling of building materials. (b) Construction of elements of a building (c) In demolition of buildings Safety lacuna in Indian scenario	**10 Hours**	**L_3, L_4, L_5**
Module -5		
Types of injuries, Factors affecting safety, Strategic Planning for safety provisions. Personal & Structural safety - Safety consideration during construction, demolition and during use of equipment. Recording injuries and accident indices. Method statement, SOPs, PPE, Inspections, Investigations. Site safety programmes - JSA, JHA, Root cause analysis, meetings, safety policy, manuals, training & orientation.	**10 Hours**	**L_2, L_4**

Safety legislation regard to violation		

Course outcomes:

On completion of this course, students are able to:

- Should be exposed to means of quality control.
- Should be able to taken safety measures in construction.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. N. Logothetis, "Management for Total Quality", Prentice Hall
2. David Gold Smith, "Safety Management in construction and Industry", Mc Graw Hill
3. K N Vaid, "Construction Safety Management", NICMAR, Bombay
4. D S Rajendra Prasad, "Quality Management System in Civil Engineering", Sapna Book House, Bangalore
5. "The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996, Universal Law Publishing Co. Pvt. Ltd.
6. Robert (QMP) " Bench Marking", " The search for industry Best Practices that led to superior performance" American Society of Quality 1995
7. Break Joseph and Susan Joseph " Total Quality Management", Excel Books , New Delhi, 1995.
8. Juran Frank, J.M. and Gryna, F.M. "*Quality Planning and Analysis*", Tata McGraw Hill 2002.
9. James, J.O Brian, "Construction Inspection Handbook –Quality" 2009

ADVANCED REINFORCED CONCRETE DESIGN

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

SEMESTER – I

Subject Code	16CSE151	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

- Learn principles of Structural Design.
- Design different types of structures and to detail the structures.
- Evaluate performance of the structures.

Modules	Teaching Hours	RBT Level
Module -1		
Yield line method of design of slabs: Assumptions, Derivation and Examples for different shapes of Slab.	**8 Hours**	**L_2, L_3, L_4**
Module -2		
Design of grid floors: Concept, Importance and Design Examples.	**8 Hours**	**L_2, L_3, L_4**
Module -3		
Design of continuous beams Concept of Moment Redistribution, Design Examples.	**8 Hours**	**L_2, L_3, L_4**
Module -4		
Design of flat slabs, Importance of flat slabs, Flat slab with and without Column Head, Drops, Design Examples..	**8 Hours**	**L_1, L_2, L_4**
Module -5		
Art of detailing earthquake resistant construction – expansion and construction joints.	**8 Hours**	**L_2, L_3, L_4**

Course outcomes:

On completion of this course, students are able to:

- Achieve Knowledge of design and development of problem solving skills.
- Understand the industrial building and the components.
- Design and develop analytical skills.
- Summarize the principles of Structural Design and detailing
- Understands the concept of Pre- engineered buildings.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.

- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. P.C.Varghese, "Advanced Reinforced Concrete Design"- Prentice-Hall of India, New Delhi, 2005.
2. 2.Dr.B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, " Comprehensive RCC Design"
3. Advanced Reinforced Concrete Design - N. Krishnaraju, CBS Publishers
4. A Park and Paulay, "Reinforced and Prestressed Concrete"-John Wiley & Sons
5. Lin TY and Burns N H, "Reinforced Concrete Design". John Wiley & Sons
6. Kong KF and Evans T H "Design of Prestressed Concrete Structures"

APPLIED SOIL MECHANICS

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

SEMESTER – I

Subject Code	16CCT152	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

- To explore the scientific principles used to describe the major engineering properties of soil, and the engineering testing methods used to quantify these properties
- To explain role of water in soil behavior with change in soil stresses, permeability and quantity of seepage including flow net are estimated
- To determine shear parameters and stress changes in soil due to foundation loads
- To estimate the magnitude and time-rate of settlement due to consolidation.

Modules	Teaching Hours	RBT Level
Module -1		
Geostatic Stresses & Stress Paths: Stresses within a soil mass: Concept of stress for a particulate system, Effective stress principle, Geostatic stresses, Soil water hydraulics: Principal stresses and Mohr's circle of stress, Stress paths; At Rest earth pressure, Stress paths for different practical situations	**8 Hours**	**L_1, L_2, L_5**
Module -2		
Compressibility and Consolidation: One, two and three dimensional compression, Odometer test, parameters – coefficient of volume change, constrained modulus, compression index, swell for loading and unloading, maximum past consolidation stress, Over consolidation ratio, Primary and secondary compression, consolidation - One, two and three dimensional problems, Consolidation of partially saturated soils, Creep/Secondary Consolidation	**8 Hours**	**L_1, L_2**
Module -3		
Stress-Strain-Strength Behaviour of Soils: Shear strength of soils; Failure criteria (Four Models for interpreting the shear strength of soils- Coulomb's Failure Criterion, Taylor's Failure Criterion, Mohr–Coulomb Failure Criterion, Tresca Failure Criterion, Practical Implications of Failure Criteria), drained and un-drained shear strength of soils. Significance of pore pressure parameters; Determination of shear strength; Drained, Consolidated Un-drained and Un-drained tests; Interpretation of triaxial test results. Behaviour of sands; Critical void ratio; dilation in soils	**8 Hours**	**L_1, L_2, L_5**

Module -4		
Stability analysis of slope -effective vs. total stress analysis, Stability Analysis of Slope: Effective and total stress approach, shape of slip surface, methods of slices, graphic methods, location of critical slip circle, wedge analysis method, stability during critical conditions.Soil Anchors: Inclusions and Installation Techniques, Design of Soil Anchors, Application Criteria: Advantages and Limitations.	**8 Hours**	**L_1, L_2, L_5**
Module -5		
Critical State Soil Mechanics: Critical state parameters; Critical state for normally consolidated and over consolidated soil; Significance of Roscoe and Hvorslev state boundary surfaces; Yielding, Bounding Surfaces	**8 Hours**	**L_1, L_2**

Course outcomes:

On completion of this course, students are able to:

- Analyse the soil stresses, permeability and seepage for the existing field
- conditions
- To understand the compressibility behaviour of soil and consolidation settlement along with time rate of settlement
- To develop suitable method for analyzing the slope stability.
- To understand the behaviour of soils at critical state.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. An Introduction to the Mechanics of Soils and Foundation - through critical state soil mechanics- Atkinson J. H. - McGraw- Hill Co. (1993)
2. Soil Behavior and Critical State Soil Mechanics Wood, D.M (1991)- Cambridge university press
3. Soil Mechanics SI version- Lambe, T. W. and Whitman, R. V, John Wiley & Sons.(2011)
4. Soil Mechanics and Foundations, Muniram Budhu(2007), John Wiley & Sons, Inc.
5. Geotechnical Engineering- Donold P Coduto Phi Learning Private Limited, New Delhi
6. Soil Mechanics and Foundation Engg.- Muni Budhu (2010), 3rd Edition, John Wiely & Sons
7. Soil Mechanics- J A Knappett and R F Craig Eighth Edition(2012), Spon Press Taylor & Francis

APPLICATIONS OF RS AND GIS IN CONSTRUCTION

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

SEMESTER – I

Subject Code	16CCT153	IA Marks	20
Number of Lecture Hrs/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students to

- Study the various types of data, data analysis methods and data quality requirements
- Study the means of getting suitable data output and to use the data output for construction management using GIS tools

Modules	Teaching Hours	RBT Level
Module -1		
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.	**8 Hours**	**L_3, L_5**
Module -2		
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, and 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.	**8 Hours**	**L_3, L_4, L_5**
Module -3		
Modelling and Analysis of Aquifer Systems: Need, model calibration, single and multi-cell models, Inverse problems, estimation of regional aquifer problems; aquifer management; linear and nonlinear programming methods.	**8 Hours**	**L_2, L_3, L_5**
Module -4		
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	**8 Hours**	**L_2**

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		
Module -5		
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.	**8 Hours**	**L_2, L_5**

Course outcomes:

On completion of this course, students are able to:

- Know the different methods used to extract the storage data and use appropriate method to interpret the image
- Know the conceptual modeling

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Burrough P.A., "Principles of GIS for Land Resources Assessment", Oxford Publication, 2008.
2. Robert Laurini and Derek Thompson, "Fundamentals of Spatial Information Systems", Academic Press, 2006.
3. Anji Reddy, "Remote Sensing and Geographical Information Systems", BS Publications 2001,
4. Bradford W. Parkinson, James Spilker, "Global Positioning System: Theory and Applications", Vol. I, 1996
5. Srinivas M.G. (Edited by), "Remote Sensing Applications", Narosa Publishing House, 2001.
6. Rhind, D., "Understanding of GIS, The ARC / INFO Method", ESRI Press. 2000.
7. James, B. Campbell, Randolph H. Wynne, Introduction to Remote Sensing - The Guilford Press, 2011.
8. Lillesand T.M and Kiefer R.W. Remote Sensing and Image Interpretation - 6th Edition, John Wiley and Sons, 2008.

SUSTAINABLE MATERIALS AND GREEN BUILDING

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

SEMESTER – IV

Subject Code	16CCT154	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students to

- Understand the sustainable materials used in construction.
- Understand the amount of energy required for building.
- Understand the use of Non-renewable sources

Modules	Teaching Hours	RBT Level
Module -1		
Introduction and definition of Sustainability. Carbon cycle and role of construction material such as concrete and steel, etc. CO2 contribution from cement and other construction materials.	**8 Hours**	**L_1, L_2**
Module -2		
Construction materials and indoor air quality. No/Low cement concrete. Recycled and manufactured aggregate. Role of QC and durability. Life cycle and sustainability.	**8 Hours**	**L_1, L_2, L_4**
Module -3		
Components of embodied energy, calculation of embodied energy for construction materials. Energy concept and primary energy. Embodied energy via-a-vis operational energy in conditioned building. Life Cycle energy use.	**8 Hours**	**L_1, L_2**
Module -4		
Control of energy use in building, ECBC code, codes in neighboring tropical countries, OTTV concepts and calculations, features of LEED and TERI Griha ratings. Role of insulation and thermal properties of construction materials, influence of moisture content and modeling. Performance ratings of green buildings. Zero energy building	**8 Hours**	**L_1, L_2, L_4**
Module -5		
Non-renewable sources of energy and Environmental aspects – energy norm, coal, oil , natural gas, Nuclear energy, Global temperature, Green house effects, global warming. Acid rain - Causes, effects and control methods. Regional impacts of temperature change.	**8 Hours**	**L_1, L_2, L_4**

Course outcomes:

On completion of this course, students are able to:

- To know the idea of utilizing less carbon emission materials.
- To know the calculation of energy consumed for a building.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. "Construction Materials, Methods & Techniques"(3e) by William P Spence, Yesdee Publication 2012, Pvt. Ltd,, Chennai, India
2. "Concrete Structure properties & Materials" by Mehta P.K & Mantreio P.J.M, Prentice hall.
3. "Building Materials" by M L Gambhir, Neha Jamwal, Tata McGraw Hill Publ.
4. New Building Materials and Construction World magazine
5. C.J.Kibert(2008)"Sustainable Construction: Green Building Design and delivery", 3rd Ed., John Wiley, Hoboken, New Jersey
6. Energy Conservation Building Code (ECBC)
7. Sustainable Engineering Practice ASCE Publication 2010.
8. Hagger Sustainable Industrial Design and Waste Management, Techniz Book 2010.
9. Willan T. Mayer Energy economics and building design.
10. National Building Code 2005, Part 0-10, Bureau of Indian Standards
11. G.T. Miller Jr. (2004) "Living in the Environment: Principles,Connections, and Solutions", 14th Ed., Brooks Cole, Pacific Grove, California, Washington DC, April 1989.

CONCRETE LABORATORY

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

SEMESTER – I

Concrete Laboratory

Subject Code	16CCTL16	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 objective of this course is to make students to learn principles and design of experiments.
- To investigate the performance of various Concrete

Modules	Teaching Hours	RBT Level
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	**12 Hours**	
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 stackbonded masonry prisms and obtaining the stress-strain behavior (Modulus of Elasticity) under compression	**9 Hours**	
Measurement of Moisture content in aggregates, soil and hardened concrete surface using NDT techniques. Pull-Out Tests on concrete	**6 Hours**	
Effect of Chemical admixtures on fresh & harden properties of concrete Effect of mineral admixtures on fresh & harden properties of concrete Tests on Bitumen materials Tests on Course aggregates for road construction	**9 Hours**	
Bonding Patterns in Brick work (joints, alignments, level and Plumb maintenance)	**6 Hours**	

Course outcomes:

On completion of this course, students are able to:

- Achieve Knowledge of Design and development of experimental skills.
- Understand the principles of design of concrete experiments.

REFERENCES:

1. Metha P.K and Monteiro. P. J. M. " CONCRETE", Microstructure, Properties and Materials, Third Edition,Tata McGraw- Hill Publishing company Limited, New Delhi,2006
2. Shetty .M.S., " Concrete Technology, Theory and Practice", Revised Edition, S. Chand & company Ltd.,New Delhi,2006
3. Neville. A.M. , " Properties of Concrete", 4th Edition Longman,1995
4. Mindass and Young, " Concrete", Prentice Hall.1998
5. J K Ray, “Experimental analysis of stress and strain”, S Chand & Co.
6. J K Bungey, “Testing of concrete in structures”, Surrey University Press.
7. “Relevant IS codes”
8. “Software Manuals”

DESIGN OF SUB STRUCTURES

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

SEMESTER – II

Design of Sub Structures

Subject Code	**16CCT21**	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

- To study methods to learn on different types of foundations
- To study the best practices in the analysis and design of foundations

Modules	Teaching Hours	RBT Level
Module-1		
Bearing capacity of shallow foundations - Homogeneous – Layered soils - Soft and Hard Rocks, effect of ground water table and eccentricity of foundations Evaluation of bearing capacity from insitu tests - partial safety factor approach codal - Recommendations. Bearing capacity of hallow foundations - Homogeneous - Layered soils - Soft and Hard Rocks, effect of ground water table and eccentricity of foundations	**10 Hours**	**L_1, L_2**
Module-2		
Design of shallow foundations and Proportionating of shallow footings Introduction to special foundations - Foundation design in relation to ground movements - Foundation on recent refuse fills - Design of Foundation for seismic forces - Codal recommendations.	**10 Hours**	**L_1, L_2, L_4**
Module-3		
Design of Raft foundations- types of rafts, stability and rigidity of the soil structure system, allowable soil pressures for rafts in cohesionless and cohesive soils, Design of raft by rigid beam method and Winkler method, Solution based on elastic half space and based on elastic theory	**10 Hours**	**L_1, L_2, L_4**
Module-4		
Pile foundations Single Pile: Vertically loaded piles, Static capacity- α, β and λ Methods, Dynamic formulae; Wave Equation Analyses; Point Bearing Resistance with SPT and CPT Results; Bearing Resistance of Piles on Rock; Settlement; Pile Load Test; Uplift Resistance; Laterally Loaded Piles -Ultimate Lateral Resistance; Negative Skin Friction; Ultimate Capacity of Pile Groups in Compression, Pullout & Lateral Load; Efficiency; Settlements of Pile Groups; Interaction of	**10 Hours**	**L_1, L_2, L_4**

Axially & Laterally Loaded Pile Groups		
Module-5		
Design of Machine Foundations: Analysis and design of block foundations for reciprocating engines, Dynamic analysis and design procedure for a hammer foundation, IS code of practice design procedure for foundations of reciprocating and impact type machines. Vibration isolation and absorption techniques	**10 Hours**	**L_1, L_2, L_3, L_4**

Course outcomes:

On completion of this course, students are able to:

- To develop a mechanism to design the foundations for resisting vibrations and achieve static equilibrium conditions of structures
- To analyze and adopt design skills of vertical and batter piles for various types of loading and soil conditions
- To design the sheet piles and under reamed piles in expansive soils

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Soil Dynamics and Machine Foundation (2010), Swami Saran, Galgotia Publications Pvt. Ltd.
2. Foundation Engineering (2012), J E Bowles. McGraw Hill Book Company
3. Analysis and Design of Foundations and Retaining Structures(1979)–S Prakash, Sarita Prakashana, Meerut
4. Foundation design in practices (2010)- Kaurna Moy Ghosh. PHI
5. Foundation Engineering (1998): Bajara M Das, John Wiley & Sons,
6. Vibration Analysis and Foundation Dynamics(1998)-Kameswara Rao, N. S. V., Wheeler Publication Ltd.,
7. Soil Mechanics and Foundation Engineering – S K Garg, Khanna Publications
8. Geotechnical Engineering – C Venkataramaiah, New Age International Publishers

CONSTRUCTION ECONOMICS AND FINANCE

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

SEMESTER – II

Construction Economics and Finance

Subject Code	**16CCT22**	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

- Understand concept of financial management
- Know the time value money factor
- Know the importance of bidding and awards

Modules	Teaching Hours	RBT Level
Module-1		
Financial Management; Meaning and Scope, Economics and Scope, Supply and Demand Mechanism, analysis and forecasting. Balance sheet, profit & loss account, fund flow statement.	**10 Hours**	**L_1, L_2, L_4**
Module-2		
Production and Cost theory, analysis. Pricing; objectives, determinants, absorption, marginal costing. Financial analysis, Decisions. Capital Budgeting, budgetary control, standard costing and variance, investment appraisal Practical problems and case studies	**10 Hours**	**L_1, L_2, L_3, L_4**
Module-3		
Engineering economics, Time value of money, discounted cash flow, NPV, ROR, Bases of comparison, Incremental analysis, Benefit-Cost analysis, Replacement analysis, Breakeven analysis, Capital budgeting, Taxation and Inflation, Working capital management, Construction accounting, Income statement, Financial statements.	**10 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
Construction Finance: Accounting information and application, Financial versus economic evaluation, financial statements and project appraisal. Project yield, taxation and inflation, risk and uncertainty, Turnkey activities; finance and working capital, depreciation and amortization; cost control, performance budgeting, equipment rentals.	**10 Hours**	**L_1, L_2, L_3, L_4**
Module-5		
Bidding and awards, work pricing, cost elements of contracts, letters of credit, financing plans, multiple sources of finance. Qualifying, bidding, bidders, comparing the bids, under-writing. unforeseen revisions, costs and rates escalation, cost progress reporting. Legal aspects	**10 Hours**	**L_1, L_2, L_3**

Course outcomes:

On completion of this course, students are able to:

- To prepare the balance sheet
- To prepare the cash flow statement.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Peterson, H.C., Lewis, W.C. "Managerial Economics", Prentice Hall of India Pvt. Ltd., 2001
2. Parkin, M. & Bade R., "Modern Macroeconomics" 4th Edition, Prentice Hall, 1996
3. Werther & Davis, "Human Resources & Personnel Management", McGraw Hill, 1996
4. Edwards, John et.al., 1983 "Manpower planning, John Wiley": New York
5. Anthony, R.N. Govindrajan, V., Irwin, "Management control systems", McGraw Hill 10th Edition, 2000
6. Baumel, W.J., A.S. Blinder and W.M. Scarth, "Economics: Principles and policy", Academic Press Canada, Tornoto, 1985
7. Anthony & Reece, "Accounting Principles-AITBS", Sixth Edition,1998
8. Koontz O'Donnel : "Essentials of Management"; Tata McGraw Hill, 1982
9. Monappa A. "Personnel Management", Tata McGraw Hill,

PRE ENGINEERING CONSTRUCTION AND TECHNOLOGY

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

SEMESTER – II

Pre Engineering Construction and Technology

Subject Code	**16CCT23**	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

- Understand the type of prefabricated elements
- Understand the method of hoisting
- Understand the basic construction of the pre engineered buildings

Modules	**Teaching Hours**	**RBT Level**
Module-1		
General Principles of PreFabrication Comparison with monolithic construction – Types of prefabrication – site and plant prefabrication - Economy of prefabrication – Modular coordination – Standardization – Planning for Components of prefabricated structures – Disuniting of structures – Design of simple rectangular beams and I beams – Handling and erection stresses – Elimination of erection stresses – Beams, columns – Symmetrical frames.	**10 Hours**	**L_1, L_2, L_3**
Module-2		
Prefabricated Elements Roof and floor panels, ribbed floor panels – wall panels – footings – Joints for different structural Connections – Effective sealing of joints for water proofing – Provisions for non-structural fastenings –Expansion joints in pre-cast construction. Designing and detailing of precast unit for factory structures –Purlins, Principal rafters, roof trusses, lattice girders, gable frames – Single span single storeyed frames –Single storeyed buildings – slabs, beams and columns.	**10 Hours**	**L_1, L_2, L_3, L_4**
Module-3		
Production and Hoisting Technology Choice of production setup – Manufacturing methods – Stationary and mobile production – Planning of production setup – Storage of precast elements – Dimensional tolerances – Acceleration of concrete hardening. Equipments for hoisting and erection – Techniques for erection of different types of members like Beams, Slabs, Wall panels and Columns – Vacuum lifting pads.	**10 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
Precast sandwich Panels ,Prestressed concrete solid flat	**10 Hours**	

slabs, Hollow core slab/panels, Prestressed concrete Double "T",Bridge, Precast segmental Box Girders, Specifications and Seismic considerations.		
Module-5		
Pre-Engineered Buildings Introduction – Advantages - Pre Engineered Buildings Vs Conventional Steel Buildings - Design of Pre Engineered Buildings (PEB) – Applications	**10 Hours**	**L_1, L_2, L_3**

Course outcomes:

On completion of this course, students are able to:

- To design the pre-engineered structures and execute the same for a given structure
- To know the different types of stresses acting on the structures while lifting the prefabricated structures and type of equipment required to support such stresses

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. L. Mokk, "Prefabricated Concrete for Industrial and Public Structures," Publishing House of the Hungarian Academy of Sciences, Budapest, 2007.
2. T. Koncz, "Manual of Precast Concrete Construction", Vol. I, II, III & IV, Berlin, 1971.
3. B. Lewicki, "Building with Large Prefabricates", Elsevier Publishing Company, Amsterdam, London, New York, 1998.
4. Structural Design Manual, Precast Concrete Connection Details, Society for the
5. Studies in the use of Precast Concrete, Netherland Betor Verlag, 2009.
6. Hass, A.M. Precast concrete design and Applications, Applied Science Publishers,1983.

CONSTRUCTION CONTRACTS AND SPECIFICATIONS

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

SEMESTER – II

Construction Contracts and Specifications

Subject Code	**16CCT24**	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

- analyze, evaluate and design construction contract documents

Modules	Teaching Hours	RBT Level
Module-1		
Agreement, Contract, essential conditions, Indian Contract Act 1872, types of contract, terminology of contract. Construction Specifications: standard specifications, general specification, development, interpretation.	**10 Hours**	**L_1, L_2, L_3**
Module-2		
Tender and tender documents: types of bidding, tender notice, tendering procedure. Construction claims: extra item, excess quantity, deficit quantity, price escalation.	**10 Hours**	**L_1, L_2, L_3**
Module-3		
Dispute resolution mechanism: litigation, arbitration, conciliation, mediation, dispute resolution board. Contractual Problems: possible contractual problems, creation of claims, development of disputes. Contract document: drafting of clauses, development, and interpretation, CPWD conditions of contract, FIDIC conditions of contract	**10 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
BOT contract: types of contract, PPP framework, types of risk, concession agreement, drafting of clauses, development, and interpretation.	**10 Hours**	**L_1,L_3,L_4**
Module-5		
Laws affecting Engineers: Labour Law, Sales Tax, VAT, Service Tax, Excise Duty. Relational Contract: partnering, alliancing, key elements, processes.	**10 Hours**	**L_1, L_3,L_4**

Course outcomes:

On completion of this course, students are able to:

- Develop the tender documents for the project
- Attain the knowledge on arbitration
- Present the contract documents as per CPWD

Question paper pattern:

- The question paper will have ten questions.

- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Collier, Kieth, **"Managing Construction Contracts"**
2.S. Ranaga Rao Contract Management and Dispute Resolutions Engineering staff College of India January 2008.
3. C. J. Schexnayder and R. E. Mayo, Construction Management Fundamentals, McGraw Hill, New Delhi. 2003
4. General Conditions of Contract, Central Public Works Department, New Delhi, 2010
5.D.S. Berrie and B.c. Paulson, Professional construction management including C.M.,Design construct and general contracting, McGraw Hill InternationaL, Third Edition 1992..
6.V. K. Raina, Construction & Contract Management Practices,SPD, New Delhi

ADVANCED DESIGN OF STEEL STRUCTURES

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

SEMESTER – II

Advanced Design of Steel Structures

Subject Code	**16CCT251**	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students

- To learn principles of Design of industrial building
- To design different components of industrial structures and to detail the structures.

Modules	**Teaching Hours**	**RBT Level**
Module-1		
Laterally Unrestrained Beams: Lateral Buckling of Beams, Factors affecting lateral stability, IS 800 code provisions, Design Approach. Lateral buckling strength of beams – Design Examples.	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-2		
Design of tension members and Design of compression members, built up compression members.	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-3		
Connections bearing type joints - unstiffened and stiffened seat connections, moment resisting connection of brackets - bolted and welded.	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
Steel Beams with Web Openings: Shape of the web openings, practical guide lines, and Force distribution and failure patterns, Design of castellated beams.	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-5		
Forms of light gauge sections, Effective width computation of unstiffened, stiffened compression elements of cold formed light gauge sections. Concept of local buckling of thin elements. Limiting width to thickness ratio.	**8 Hours**	**L_1, L_2, L_3, L_4**

Course outcomes:

On completion of this course, students are able to:

- Achieve Knowledge of design and development of problem solving skills.
- Design and develop analytical skills.
- Summarize the principles of Structural Design and detailing.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.

- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Bureau of Indian Standards, IS800-2007, IS875-1987, IS-801-1975. Steel Tables, SP 6 (1) – 1984
2. N Subramanian- "Design of Steel Structure" oxford University Press
3. B.C. Punmia, A.K. Jain "Design of Steel Structures", Laxmi Publications, New Delhi.
4. Ramchandra and Virendra Gehlot "Design of Steel Structures " Vol 1 and Vol.2, Scientific Publishers, Jodhpur
5. Duggal "Limit State Design of Steel Structures" TMH

PAVEMENT DESIGN AND CONSTRUCTION

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

SEMESTER – II

Pavement Design and Construction

Subject Code	**16CCT252**	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students

- understand types of pavement
- understand stress-strain characteristics of pavements and control of deflection

Modules	Teaching Hours	RBT Level
Module-1		
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	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-2		
Flexible Pavements: Specifications of materials, construction method and field control checks for various types of flexible pavement layers – WBM-BM- SDBCBC **Flexible Pavement Design Methods For Highways** : CBR method-Principle – Testing as per IRC, AASHTO and Asphalt Institute and Shell Method. Problems on above	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-3		
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	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
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	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-5		
Design: Types of joints in cement concrete pavements and	**8 Hours**	**L_1, L_2, L_3,**

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		**L_4**

Course outcomes:

On completion of this course, students are able to:

- Analyse and predict the behaviour of the flexible and rigid pavements
- Predict the behaviour of the joints in rigid pavements

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Yoder, E.J., and Witczak, "Principles of Pavement Design"- 2nd ed. John Wiley and Sons, 1975.
2. Yang, "Design of Functional Pavements"- McGraw Hill Book Co.
3. Khanna and Justo, "Test Book of Highway Engineering"- Nemchand brothers, Roorke-2004.
4. Sharma, S.C."Construction Equipment and its Management"- Khanna Publishers
5. Huang, "Pavement Analysis"- Elsevier Publications
6. HRB/TRB/IRC/International Conference on "Structural Design of Asphalt Pavements".
7. "Relevant IRC Publications"
8. CMA Hand Book"

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

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

SEMESTER – II

Subject Code	**16CCT253**	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students

- Focus mainly on identifying the dynamic loading induced on the structures
- understand and evaluate the seismic response of structures

Modules	**Teaching Hours**	**RBT Level**
Module-1		
BASIC DESIGN PARAMETERS: Theory of plate tectonics, Seismic Waves Dynamic properties of structures and its evaluation, strength and deformation characteristics of structures under earthquake loading, Requirements of efficient earthquake resistant structural system damping devices and base isolation systems,	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-2		
Response history of strong motion characteristics, response spectrum- elastic and inelastic, D-V-A response spectrum, Computation of seismic forces in multistoried building as per IS 1893	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-3		
Structural modeling: Design requirements, Response control concepts, seismic evaluation and retrofitting methods. Effect of structural irregularities on seismic performance of RC building, applied and advanced problems	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
Effect of infill masonry walls on frames, modeling concepts of infill masonry walls, Behaviour of masonry structures, failure patterns, strength of masonry in shear and flexure, slenderness concept of masonry walls as per codal provisions	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-5		
Structural design of foundation: Introduction – loads acting on foundations during earthquake – fundamental failure mechanisms of foundations – essential criteria for design of foundations in liquefiable soils – structural design of foundations subjected to earthquake loading	**8 Hours**	**L_1, L_2, L_3, L_4**

Course outcomes:

On completion of this course, students are able to:

- Design of structure under earthquake loading by considering the influence of various design parameters that includes the liquefaction of soils due to earthquake.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Dynamics of structures- Theory and application to earthquake engineering (2007).Anil K Chopra, Prentice hall India .
2. Earthquake design of Structures (2007) Duggal, Oxford
3. IS 1893-2002, part 1, IS 13920-1993, IS 4326-1993, IS 13828-1993
4. Earthquake resistant design of Structures, Pankaj Agarwal, manish Shrikande, Prentice Hall, New Delhi,.
5. Sesimic design of concrete and Masonry Building, T Paulay and MJN Priestley, John Wiley & Sons, NY

BUILDING COST AND QUALITY MANAGEMENT

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

SEMESTER – II

Subject Code	**16CCT254**	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students

- Prepare the BOQ of a given project
- Understand the qualities of materials used in the construction work

Modules	Teaching Hours	RBT Level
Module-1		
Estimation of quantities for R.C.C. multistoreyed complex viz. earthwork, concrete in foundation, D.P.C., R.C.C. work, flooring and roofing, plastering and pointing etc., wood work, white washing.	**8 Hours**	**L_1, L_2, L_3**
Module-2		
Analysis of rates for multistoreyed building works – Brick work in foundations and Superstructure, cement concrete, R.C. C., Plastering, Flooring, Timber work etc. Checking of construction quality – various tests for bricks, cement, concrete, aggregates, and steel as per IS codes	**8 Hours**	**L_1, L_2, L_4**
Module-3		
Preparation of bills for payment, measurement book, mode of payment, running account bill. Ledger and Cash book details, Arbitration.	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
Estimation of building services viz. water supply works, electrification, sanitary fitting etc, and their cost analysis	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-5		
Elements of Valuation: methods, techniques and examples Completion report of the project; Checking of Plan, Details of various works, and issue of completion report of the project.	**8 Hours**	**L_1, L_2, L_3, L_4**

Course outcomes:

On completion of this course, students are able to:

- To prepare the quantities of work for a multistoried building
- To certify the valuation report on existing structures
- To prepare the detailed bills for the on-going project

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each

module.

- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Estimating and Costing by B.N. Dutta
2. Estimating and Costing by G.S. Birdie
3. Estimating and Costing by Chakaraborty
4. Professional Practice – Roshan N Namavati, Lakahni Book Depot, Mumbai

SOFTWARE APPLICATION LABORATORY

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

SEMESTER – II

Subject Code	16CCTL26	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 objective of this course is to make students to learn principles and design of structures.

Modules	Teaching Hours	RBT Level
Software Application Use of construction management softwares (MS-PROJECTS, PRIMAVERA), preparing of estimation of a structure using excel Analysis of skeletal and continuum structures using standard FEM packages, BIM	**42 Hours**	

Course outcomes:

On completion of this course, students are able to:

- Achieve Knowledge of Design and development of soft skills.
- Understand the principles of design of structures using the standard packages.

Question paper pattern:

- Individual experiment should be set

REFERENCES:

1. "Software Manuals"
2. Harry G Harris and Gajanan M Sabnis, "Structural Modeling and Experimental Techniques", CRC Press

RESTORATION AND REHABILITATION OF STRUCTURES

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

SEMESTER – IV

Subject Code	**16CCT41**	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

- Learning the structural properties for causing failures
- Identification of failure phenomenon
- New approach in the design aspects
- Understanding the concept of serviceability and durability

Modules	Teaching Hours	RBT Level
Module-1		
Performance of construction materials, components in services and testing of existing structures both destructive and non-destructive; Causes of deterioration; preventive measures and maintenance. Problems on deterioration	**10 Hours**	**L_1, L_2, L_3, L_4**
Module-2		
Principles of assessment of weathering and durability; Characteristics of materials; Diagnosis of construction failures; Dealing with cracks; Methods of repair in concrete, Steel and timber structural components;	**10 Hours**	**L_1, L_2, L_3, L_4**
Module-3		
Corrosion damage of reinforced concrete and its repair and prevention measures; Surface deterioration, Efflorescence , causes, prevention and protection; Surface coatings and painting; Water proofing;	**10 Hours**	**L_1, L_2, L_3**
Module-4		
Grouting and shotcrete Strengthening of existing structures; Special repairs, maintenance Inspection and planning, Budgeting and management	**10 Hours**	**L_1, L_2, L_3, L_4**
Module-5		
Case studies of repair structures based on strength, deflection, cracking, chemical, weathering, fire, leakage, marine and demolition methods. Problems based on above case studies	**10 Hours**	**L_1, L_2, L_3, L_4**

Course outcomes:

On completion of this course, students are able to:

- To predict the failure modes in Structural engineering before construction of structures
- To design the structures to overcome the failure in construction activities
- To understand the deterioration of concrete structures

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Deterioration, Maintenance and repair of structures– S M Johnson
2. Concrete structures materials, Maintenance and repair – Dension campbell, allen and Harold Roper, Longman Scientific and Technical
3. Repair of Concrete Structures- R T Allen and S C Edwards, Balckie and Sons
4. Learing of failure from Deficiencies in design, construction and Service, Raiker R N, R & D Centre (SDCPL)

DISASTER MANAGEMENT TECHNIQUES

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

SEMESTER – IV

Subject Code	**16CCT421**	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students

- The graduates are expected to adopt various numerical method and mathematical tools for analysis of research data
- Learning about the natural disaster
- Learning the risk reduction methods of disasters
- Application of GIS

Modules	**Teaching Hours**	**RBT Level**
Module-1		
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	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-2		
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	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-3		
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	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
Seismicity: Seismic waves-Earthquakes and faults-measures of earthquake, magnitude and intensity-ground damage-Tsunamis and earthquakes. The design and management of Disaster Information Resource Network, Asian Disaster Preparedness Centre, Regional data base, Contacts and Sources	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-5		

Damage due to ground failures, Landslides, rockslides, liquefaction, fire, floods, tsunamis, release of hazardous material like poisonous gas, nuclear radiation	**8 Hours**	**L_1, L_2, L_3**

Course outcomes:

On completion of this course, students are able to:

- Analyse the existing data of the natural calamities and prediction of the disaster
- Develop an appropriate methods to identify and rectify the disaster

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Pardeep Sahni, Madhavi Malalgoda and Ariyabandu, "Disaster risk reduction in south Asia", PHI
2. Amita sinvhal, "Understanding earthquake disasters", TMH, 2010
3. Pardeep sahni, Alka Dhameja and Uma Medury, "Disaster Mitigation: Experiences and reflections", PHI
4. Disaster Mitigation Experiences & Reflectios by Pardeep Sahni, Alka Dhameja,and Uma Medury.
5. Disaster Management Report by Department of Agriculture and Cooperation,Govt. of India.

CONSTRUCTION DEMOLITION AND WASTE MANAGEMENT

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

SEMESTER – IV

Subject Code	**16CCT422**	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students

- focus on the principles of sustainable construction and demolition waste management and resource efficiency
- examining the environmental impact of building materials; formulating and designing pre–construction and site waste management plans

Modules	**Teaching Hours**	**RBT Level**
Module-1		
Environmental Impact of Building Materials Embodied energy of materials; impact on the local environment; toxicity of the material; life cycle assessment. Nature and Source Direct and indirect waste; site types and origins; composition; quantity; current recycling/reuse potential of building materials.	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-2		
Construction and Demolition Waste Management Plans International good practice; planning requirements; DoEHLG guidance document; company policy; demolition plans; site implementation; supplier agreements; sub–contractor management; role of waste management contractor; training; auditing; skip management; current markets; current disposal options; health and safety; reporting to local authorities. Treatment of Construction and Demolition Waste, waste permits; waste licenses; waste transfer facilities; landfills; treatment technologies; hazardous waste facilities; reporting to EPA	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-3		
Designing for Waste Prevention and Minimisation Waste prevention and minimization; client, contractor and designer attitudes; proper maintenance of existing buildings; reuse of existing building structure; design flexibility; design for reuse and recycling; dimensional co–ordination and standardization; modular design; material selection and control.	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
Waste Forecasting Tools Application of WRAP's designing out waste tool for buildings and civil engineering; WRAP net waste tool; BRE SMARTWaste; WRAP Site Waste Management Plan Tracker	**8 Hours**	**L_1, L_2, L_3**

Module-5		
Future developments Potential future markets; 'smart' materials; use of eco–materials.	**8 Hours**	**L_1, L_2, L_3, L_4**

Course outcomes:

On completion of this course, students are able to:

- Formulate, design, evaluate and review pre–construction and construction phase resource efficient waste management plans
- Evaluate, assess and recommend potential reuse/recycling/disposal options considering existing and potential future markets/uses.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Springer,"Recycling and Resource Recovery Engineering", Springer-Verlag Berlin Heidelberg (1996)
2. Greg Winkler, "Recycling Construction and Demolition waste: A LEED-Based Toolkit (Green Source) (Google ebook), Mc Graw Hill Professional
3. V M Tam, Chi Ming Tam, "Reuse of Construction and Demolition Waste in Housing Development", Nova Science Publishers, 2008
4. "Current Literature"

DESIGN OF PRESTRESSED CONCRETE STRUCTURES

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

SEMESTER – IV

Subject Code	**16CCT423**	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students

- Learning concepts of prestress in civil Engineering projects
- Learning the concepts of prestressing in mass housing projects, railway sleepers, flyovers etc.,

Modules	**Teaching Hours**	**RBT Level**
Module-1		
Design of high strength concrete mixes. Loss of prestress in single span and continuous beams. Use of IS 1343-1980, Analysis Limit State Design of beams for Tension Type II and III problems, Cracking moment, untensioned reinforcement, Partial prestressing, Stress Corrosion. Transfer of prestress by bond, Transverse tensile stresses, End zone reinforcement. Behaviour of Bonded and unbounded prestress concrete beams	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-2		
Deflection of Prestressed concrete members, short and long term, control of deflections. Crack width considerations. Flexural strength of prestressed concrete sections: Types of flexural failures, Limit state concept.	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-3		
Shear resistance of prestressed concrete members: Principal stresses and ultimate shear Resistance, Design of shear reinforcement, prestressed concrete, members in Torsion, Design of reinforcement in torsion shear and bending	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
Stress distribution in end block, Analysis and Anchorage Zone reinforcement. Composite Construction of prestressed precast and cast in situ concrete. Statically Indeterminate structures: Continuous beams, primary and secondary moments, Continuity, concordant cable profile, Analysis and Design of continuous beams	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-5		
Prestressed concrete pipes and poles. Design of Prestressed concrete tanks.	**8 Hours**	**L_1, L_2, L_3, L_4**

Course outcomes:

On completion of this course, students are able to:

- To take the appropriate decision in respect of choice of Prestressed section over

R.C.C .

- Design the structures with various methods of prestressing

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Nigel R Hewon Prestressed Concrete Bridge, Design and construction Thomas Telford London 2003.
2. Plan Cast Precast and Prestressed concrete(A Design Guide) Devid A.Sheppard & William R. Phillps Mcgraw Hill Publication Co. 1989.
3. N. Krishnaraju Prestressed Concrete Tata McGraw Hill (Third Edition) 1981**.**
4. Lin T.Y,Burns N.H. Design of Prestressed Concrete Structures. John Wiley & sons (Third Edition).1982. ,

ENERGY AND BUILDINGS

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

SEMESTER – IV

Subject Code	**16CCT424**	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students

- To understand the importance of energy conservation
- To understand importance of non-renewable resources
- Design energy efficient buildings

Modules	Teaching Hours	RBT Level
Module-1		
Conservation & energy efficiency concepts-overview of significance of energy use and energy processes in buildings	**8 Hours**	**L_1, L_2, L_3,**
Module-2		
Solar energy fundamentals & practices in building design-solar astronomical relations and radiation physics and measurements, design decision for optimal orientation of building, shadow analysis.	**8 Hours**	**L_1, L_2, L_3,**
Module-3		
Heating and ventilation design- Human thermal comfort, climatological factors, material specifications and heat transfer principles, Thermal performance evaluation, Heat loss from buildings, design of artificial ventilation system, design of insulators	**8 Hours**	**L_1, L_2, L_3,**
Module-4		
Design audits & economic optimization- Concept of cost/benefit of energy conservation & carbon footprint estimation. Energy efficient lighting system design: Basic terminologies and standards, daylighting and artificial lighting design, auditing	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-5		
Advances in computational energy conservation-implementation of computer energy simulation programs into building designs	**8 Hours**	**L_1, L_2, L_3, L_4**

Course outcomes:

On completion of this course, students are able to:

- Understand the importance of energy resources
- Design energy efficient buildings.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Energy Efficient Buildings In India, Mili Majumdar The Energy Research Institute.
2. Energy-Efficient Building Systems Lal Jayamaha, McGraw Hill Publication.
3. Solar Energy and thermal processes J A Duffie & W A Beckman, John Wiley
4. Energy Conservation Building Code, 2007.
5. Handbook of functional requirement of buildings, SP: 41:1987

SYLLABUS

M.Tech- CONSTRUCTION TECHONOLOGY

MECHANIZATION IN CONSTRUCTION [As per Choice Based Credit System (CBCS) scheme] SEMESTER – I			
Subject Code	16CCT11	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:

Course objectives: This course will enable students to

- Understand the various types of equipments used for Construction.
- Understand the various methods of Construction Techniques

Modules	**Teaching Hours**	**RBT Level**
Module -1		
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	**10 Hours**	**L_1, L_2, L_4, L_5**
Module -2		
Mechanization in aggregate manufacturing: Natural aggregates and recycled aggregates	**10 Hours**	**L_1, L_2, L_3 L_4, L_5**
Module -3		
Mechanization in rebar fabrication Mechanization in concrete production and placement Mechanization through construction: formwork and scaffolding types, materials and design principles.	**10 Hours**	**L_1, L_2, L_3 L_4, L_5**
Module -4		
Mechanization through construction methods/technologies: segmental construction of bridges/flyovers, box pushing technology for tunneling, trench-less technology. Pile Driving Equipment : Pile hammers, selecting a pile hammer, loss of energy due to impact, Energy losses due to causes other than impact.	**10 Hours**	**L_1, L_2, L_3 L_4, L_5**
Module -5		
Mechanization through construction methods of Drilling, Blasting and Tunneling Equipment : Definition of terms, bits, Jackhammers, Drifters, wagon drills, chisel drills,	**10 Hours**	**L_1, L_2, L_4, L_5**

piston drills, blast hole drills, shot drills, diamond drills, tunneling equipment, selecting the drilling method equipment; selecting drilling pattern. Safety and Environmental issues in mechanization		

Course outcomes:

On completion of this course, students are able to

- To decide which type and capacity of construction equipment can be used for a particular job on site.
- To Know the methods of drilling and blasting.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. "Construction Equipment and its Planning and Applications", Mahesh Varma, Metropolitan Book Co.(P) Ltd.,New Delhi. India.
2. "Construction Machinery and Equipment in India". (A compilation of articles Published in Civil Engineering and
3. "Construction Review" Published by Civil Engineering and Construction Review,New Delhi, 1991.
4. Sharma S.C. "Construction Equipment and Management", Khanna Publishers, Delhi, 1988
5. Peurifoy R L, "Construction Planning, Equipment and Methods", Mc Graw Hill
6. James F Russell, "Construction Equipment", Prentice Hall
7. "Current Literature"

CONSTRUCTION PROJECT AND MANAGEMENT

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

SEMESTER – I

Subject Code	16CCT12	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

- Understand the various management techniques for successful completion of construction projects.
- Understand the effect of management for project organization,

Modules	Teaching Hours	RBT Level
Module -1		
Introduction: Construction Projects- Concept, Project Categories, Characteristic of projects, project life cycle phase. Project Management- Project Management Function, Role of Project Manager. Organizing For Construction - Principles of organization, type of organization structure	**10 Hours**	**L_1, L_2, L_3, L_4, L_5**
Module -2		
Project Feasibility Reports: Introduction, Significance in feasibility report- Technical analysis, Financial analysis, Economic analysis, Ecological analysis, Flow diagram for feasibility study of a project. Project planning Scope: Planning Process, Objectives, Types of Project plans, Resource Planning Process.	**10 Hours**	**L_1, L_2, L_3, L_4, L_5**
Module -3		
Bar Charts, Work Breakdown Structure, Time estimates, Applications of CPM and PERT A-O-N Network-Logic and Precedence diagrams, advantages, Drawing A-O-N network from A-O-A network and related problems	**10 Hours**	**L_1, L_2, L_3, L_4, L_5**
Module -4		
Time Cost relationship: Direct and indirect cost, step in optimization of cost, related problem. Allocation of resources: Histogram, Resource smoothening, Resource leveling and related problem. Project updating using CPM network and related numerical problems.	**10 Hours**	**L_1, L_2, L_4, L_5**
Module -5		
Scheduling, Monitoring and Updating. Line of Balance Scheduling. Resource Planning-Leveling and Allocation. Introduction to Building Information Model (BIM).	**10 Hours**	**L_1, L_2**

Course outcomes: *On completion of this course, students are able to* • Allocate the funds for each work and execute the same. • Calculate the total time required to complete the job without delay and delay in the project and also estimate the amount of additional funds may require to complete the job		
Question paper pattern: • The question paper will have ten questions. • Each full question consists of 16 marks. • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module.		
REFERENCES: 1. Chitkara, K.K. "Construction Project Management: Planning, Scheduling and Control", Tata McGraw-Hill Publishing Company, New Delhi, 1998. 2. Choudhury S , "Project Management", McGraw-Hill Publishing Company, New Delhi, 1988. 3. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders", Prentice Hall, Pittsburgh, 2000. 4. Srinath L.S, "PERT and CPM", East West Press Pvt Ltd New Delhi. 5. Frank Harris and Roland McCaffer, "Modern Construction Management"- 4th Ed Blackwell Science Ltd. 6. Current Literature		

ADVANCED TECHNIQUES IN CONCRETE CONSTRUCTION

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

SEMESTER – I

Subject Code	16CCT13	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

- Study the properties of concrete making materials, tests, mix design, special concretes and various methods for making concrete.
- To understand the quality control of concrete

Modules	Teaching Hours	RBT Level
Module -1		
Features of Recent Advances in Concrete, Types of Concrete to be dealt; Terminologies, Ingredients, Properties of Fresh & Hardened concrete, related tests, Production and use of concrete.	**10 Hours**	**L_1, L_2**
Module -2		
High Performance Concretes: Definition & Introduction, Classification, general properties, Advantages, Disadvantages, Applications, Description of types. Guidelines for Mix design and use of following concretes: Light weight concrete, High strength concrete, Ultra-high strength concrete (reactive powder concrete), High workability concrete/Self compacting concrete, Fiber reinforced concrete, Polymer-concrete composites	**10 Hours**	**L_2, L_3**
Module -3		
Special Concretes: Definition & Introduction, General properties, Advantages, Disadvantages, Applications, Concreting practices, Guidelines for Mix design and use of following concretes: High density concrete, Shrinkage compensating concrete, Mass concrete, Roller compacted concrete.	**10 Hours**	**L_2, L_3**
Module -4		
Durability of Concrete: Definitions, Deterioration processes – Physical, Chemical, Environmental & Biological; Measures for ensuring durability, Corrosion of reinforcing steel, protective measures.	**10 Hours**	**L_2, L_3, L_4**
Module -5		
Testing and Quality Control of Concrete: Classification of test methods, In-situ, Non-Destructive & Partially–Destructive tests for fresh concrete, hardened concrete and durability of concrete.	**10 Hours**	**L_1, L_2**

Problems on the in-situ testing results and compared with Laboratory results		

Course outcomes:

On completion of this course, students are able to:

- To know the various tests on fresh, hardened concrete, special concrete and the methods of manufacturing of concrete.
- To check the quality of hardened concrete by using Various NDT Tests

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Gambhir.M.L., "Concrete Technology", McGraw Hill Education, 2006.
2. Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
3. Neville, A.M., "Properties of Concrete", Prentice Hall, 1995, London.
4. Santhakumar.A.R. ; "Concrete Technology",Oxford University Press,2007.
5. Shetty M.S., "Concrete Technology", S.Chand and Company Ltd. Delhi, 2003.
6. Mehta .P.K., and Paulo J.M. Monteiro, "Concrete- Microstructure, Properties and Materials"-(Indian Ed.,Indian Concrete institute), McGraw Hill.
7. "Current Literature".

CONSTRUCTION QUALITY AND SAFETY

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

SEMESTER – I

Subject Code	16CCT14	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

- Understand the elements of quality planning and the implication.
- Become aware of objectives and advantage of quality assurance.
- Study the relationship between quality and safety management

Modules	Teaching Hours	RBT Level
Module -1		
Construction Quality, Inspection and Testing, Quality control, Quality Assurance, Quality Certification for companies and laboratories (ISO Certification, NABL certification)	**10 Hours**	**L_1, L_2, L_5**
Module -2		
Total Quality Management, Critical factors of TQM, TQM in Projects, Benchmarking, concepts of quality policy, standards, manual	**10 Hours**	**L_3, L_4, L_5**
Module -3		
Third Party Certification: Construction Safety-meaning and scope, Safety in construction- Technological aspects, organizational aspects and behavioural aspects, Safety legislation and Standards, Contract conditions on safety in Civil Engineering projects	**10 Hours**	**L_1, L_2, L_4, L_5**
Module -4		
Safety in Construction: Causes, classification, cost and measurement of an accident, safety programme for construction, protective equipment, accident report, safety measure: (a) For storage and handling of building materials. (b) Construction of elements of a building (c) In demolition of buildings Safety lacuna in Indian scenario	**10 Hours**	**L_3, L_4, L_5**
Module -5		
Types of injuries, Factors affecting safety, Strategic Planning for safety provisions. Personal & Structural safety - Safety consideration during construction, demolition and during use of equipment. Recording injuries and accident indices. Method statement, SOPs, PPE, Inspections, Investigations. Site safety programmes - JSA, JHA, Root cause analysis, meetings, safety policy, manuals, training & orientation.	**10 Hours**	**L_2, L_4**

Safety legislation regard to violation		

Course outcomes:

On completion of this course, students are able to:

- Should be exposed to means of quality control.
- Should be able to taken safety measures in construction.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. N. Logothetis, "Management for Total Quality", Prentice Hall
2. David Gold Smith, "Safety Management in construction and Industry", Mc Graw Hill
3. K N Vaid, "Construction Safety Management", NICMAR, Bombay
4. D S Rajendra Prasad, "Quality Management System in Civil Engineering", Sapna Book House, Bangalore
5. "The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996, Universal Law Publishing Co. Pvt. Ltd.
6. Robert (QMP) " Bench Marking", " The search for industry Best Practices that led to superior performance" American Society of Quality 1995
7. Break Joseph and Susan Joseph " Total Quality Management", Excel Books , New Delhi, 1995.
8. Juran Frank, J.M. and Gryna, F.M. "*Quality Planning and Analysis*", Tata McGraw Hill 2002.
9. James, J.O Brian, "Construction Inspection Handbook –Quality" 2009

ADVANCED REINFORCED CONCRETE DESIGN

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

SEMESTER – I

Subject Code	16CSE151	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

- Learn principles of Structural Design.
- Design different types of structures and to detail the structures.
- Evaluate performance of the structures.

Modules	Teaching Hours	RBT Level
Module -1		
Yield line method of design of slabs: Assumptions, Derivation and Examples for different shapes of Slab.	**8 Hours**	**L_2, L_3, L_4**
Module -2		
Design of grid floors: Concept, Importance and Design Examples.	**8 Hours**	**L_2, L_3, L_4**
Module -3		
Design of continuous beams Concept of Moment Redistribution, Design Examples.	**8 Hours**	**L_2, L_3, L_4**
Module -4		
Design of flat slabs, Importance of flat slabs, Flat slab with and without Column Head, Drops, Design Examples..	**8 Hours**	**L_1, L_2, L_4**
Module -5		
Art of detailing earthquake resistant construction – expansion and construction joints.	**8 Hours**	**L_2, L_3, L_4**

Course outcomes:

On completion of this course, students are able to:

- Achieve Knowledge of design and development of problem solving skills.
- Understand the industrial building and the components.
- Design and develop analytical skills.
- Summarize the principles of Structural Design and detailing
- Understands the concept of Pre- engineered buildings.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.

- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. P.C.Varghese, "Advanced Reinforced Concrete Design"- Prentice-Hall of India, New Delhi, 2005.
2. 2.Dr.B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, " Comprehensive RCC Design"
3. Advanced Reinforced Concrete Design - N. Krishnaraju, CBS Publishers
4. A Park and Paulay, "Reinforced and Prestressed Concrete"-John Wiley & Sons
5. Lin TY and Burns N H, "Reinforced Concrete Design". John Wiley & Sons
6. Kong KF and Evans T H "Design of Prestressed Concrete Structures"

APPLIED SOIL MECHANICS

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

SEMESTER – I

Subject Code	16CCT152	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

- To explore the scientific principles used to describe the major engineering properties of soil, and the engineering testing methods used to quantify these properties
- To explain role of water in soil behavior with change in soil stresses, permeability and quantity of seepage including flow net are estimated
- To determine shear parameters and stress changes in soil due to foundation loads
- To estimate the magnitude and time-rate of settlement due to consolidation.

Modules	Teaching Hours	RBT Level
Module -1		
Geostatic Stresses & Stress Paths: Stresses within a soil mass: Concept of stress for a particulate system, Effective stress principle, Geostatic stresses, Soil water hydraulics: Principal stresses and Mohr's circle of stress, Stress paths; At Rest earth pressure, Stress paths for different practical situations	**8 Hours**	**L_1, L_2, L_5**
Module -2		
Compressibility and Consolidation: One, two and three dimensional compression, Odometer test, parameters – coefficient of volume change, constrained modulus, compression index, swell for loading and unloading, maximum past consolidation stress, Over consolidation ratio, Primary and secondary compression, consolidation - One, two and three dimensional problems, Consolidation of partially saturated soils, Creep/Secondary Consolidation	**8 Hours**	**L_1, L_2**
Module -3		
Stress-Strain-Strength Behaviour of Soils: Shear strength of soils; Failure criteria (Four Models for interpreting the shear strength of soils- Coulomb's Failure Criterion, Taylor's Failure Criterion, Mohr–Coulomb Failure Criterion, Tresca Failure Criterion, Practical Implications of Failure Criteria), drained and un-drained shear strength of soils. Significance of pore pressure parameters; Determination of shear strength; Drained, Consolidated Un-drained and Un-drained tests; Interpretation of triaxial test results. Behaviour of sands; Critical void ratio; dilation in soils	**8 Hours**	**L_1, L_2, L_5**

Module -4		
Stability analysis of slope -effective vs. total stress analysis, Stability Analysis of Slope: Effective and total stress approach, shape of slip surface, methods of slices, graphic methods, location of critical slip circle, wedge analysis method, stability during critical conditions.Soil Anchors: Inclusions and Installation Techniques, Design of Soil Anchors, Application Criteria: Advantages and Limitations.	**8 Hours**	**L_1, L_2, L_5**
Module -5		
Critical State Soil Mechanics: Critical state parameters; Critical state for normally consolidated and over consolidated soil; Significance of Roscoe and Hvorslev state boundary surfaces; Yielding, Bounding Surfaces	**8 Hours**	**L_1, L_2**

Course outcomes:

On completion of this course, students are able to:

- Analyse the soil stresses, permeability and seepage for the existing field
- conditions
- To understand the compressibility behaviour of soil and consolidation settlement along with time rate of settlement
- To develop suitable method for analyzing the slope stability.
- To understand the behaviour of soils at critical state.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. An Introduction to the Mechanics of Soils and Foundation - through critical state soil mechanics- Atkinson J. H. - McGraw- Hill Co. (1993)
2. Soil Behavior and Critical State Soil Mechanics Wood, D.M (1991)- Cambridge university press
3. Soil Mechanics SI version- Lambe, T. W. and Whitman, R. V, John Wiley & Sons.(2011)
4. Soil Mechanics and Foundations, Muniram Budhu(2007), John Wiley & Sons, Inc.
5. Geotechnical Engineering- Donold P Coduto Phi Learning Private Limited, New Delhi
6. Soil Mechanics and Foundation Engg.- Muni Budhu (2010), 3rd Edition, John Wiely & Sons
7. Soil Mechanics- J A Knappett and R F Craig Eighth Edition(2012), Spon Press Taylor & Francis

APPLICATIONS OF RS AND GIS IN CONSTRUCTION

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

SEMESTER – I

Subject Code	16CCT153	IA Marks	20
Number of Lecture Hrs/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students to

- Study the various types of data, data analysis methods and data quality requirements
- Study the means of getting suitable data output and to use the data output for construction management using GIS tools

Modules	Teaching Hours	RBT Level
Module -1		
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.	**8 Hours**	**L_3, L_5**
Module -2		
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, and 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.	**8 Hours**	**L_3, L_4, L_5**
Module -3		
Modelling and Analysis of Aquifer Systems: Need, model calibration, single and multi-cell models, Inverse problems, estimation of regional aquifer problems; aquifer management; linear and nonlinear programming methods.	**8 Hours**	**L_2, L_3, L_5**
Module -4		
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	**8 Hours**	**L_2**

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		
Module -5		
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.	**8 Hours**	**L_2, L_5**

Course outcomes:

On completion of this course, students are able to:

- Know the different methods used to extract the storage data and use appropriate method to interpret the image
- Know the conceptual modeling

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Burrough P.A., "Principles of GIS for Land Resources Assessment", Oxford Publication, 2008.
2. Robert Laurini and Derek Thompson, "Fundamentals of Spatial Information Systems", Academic Press, 2006.
3. Anji Reddy, "Remote Sensing and Geographical Information Systems", BS Publications 2001,
4. Bradford W. Parkinson, James Spilker, "Global Positioning System: Theory and Applications", Vol. I, 1996
5. Srinivas M.G. (Edited by), "Remote Sensing Applications", Narosa Publishing House, 2001.
6. Rhind, D., "Understanding of GIS, The ARC / INFO Method", ESRI Press. 2000.
7. James, B. Campbell, Randolph H. Wynne, Introduction to Remote Sensing - The Guilford Press, 2011.
8. Lillesand T.M and Kiefer R.W. Remote Sensing and Image Interpretation - 6th Edition, John Wiley and Sons, 2008.

SUSTAINABLE MATERIALS AND GREEN BUILDING

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

SEMESTER – IV

Subject Code	16CCT154	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students to

- Understand the sustainable materials used in construction.
- Understand the amount of energy required for building.
- Understand the use of Non-renewable sources

Modules	Teaching Hours	RBT Level
Module -1		
Introduction and definition of Sustainability. Carbon cycle and role of construction material such as concrete and steel, etc. CO2 contribution from cement and other construction materials.	**8 Hours**	**L_1, L_2**
Module -2		
Construction materials and indoor air quality. No/Low cement concrete. Recycled and manufactured aggregate. Role of QC and durability. Life cycle and sustainability.	**8 Hours**	**L_1, L_2, L_4**
Module -3		
Components of embodied energy, calculation of embodied energy for construction materials. Energy concept and primary energy. Embodied energy via-a-vis operational energy in conditioned building. Life Cycle energy use.	**8 Hours**	**L_1, L_2**
Module -4		
Control of energy use in building, ECBC code, codes in neighboring tropical countries, OTTV concepts and calculations, features of LEED and TERI Griha ratings. Role of insulation and thermal properties of construction materials, influence of moisture content and modeling. Performance ratings of green buildings. Zero energy building	**8 Hours**	**L_1, L_2, L_4**
Module -5		
Non-renewable sources of energy and Environmental aspects – energy norm, coal, oil , natural gas, Nuclear energy, Global temperature, Green house effects, global warming. Acid rain - Causes, effects and control methods. Regional impacts of temperature change.	**8 Hours**	**L_1, L_2, L_4**

Course outcomes:

On completion of this course, students are able to:

- To know the idea of utilizing less carbon emission materials.
- To know the calculation of energy consumed for a building.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. "Construction Materials, Methods & Techniques"(3e) by William P Spence, Yesdee Publication 2012, Pvt. Ltd,, Chennai, India
2. "Concrete Structure properties & Materials" by Mehta P.K & Mantreio P.J.M, Prentice hall.
3. "Building Materials" by M L Gambhir, Neha Jamwal, Tata McGraw Hill Publ.
4. New Building Materials and Construction World magazine
5. C.J.Kibert(2008)"Sustainable Construction: Green Building Design and delivery", 3rd Ed., John Wiley, Hoboken, New Jersey
6. Energy Conservation Building Code (ECBC)
7. Sustainable Engineering Practice ASCE Publication 2010.
8. Hagger Sustainable Industrial Design and Waste Management, Techniz Book 2010.
9. Willan T. Mayer Energy economics and building design.
10. National Building Code 2005, Part 0-10, Bureau of Indian Standards
11. G.T. Miller Jr. (2004) "Living in the Environment: Principles,Connections, and Solutions", 14th Ed., Brooks Cole, Pacific Grove, California, Washington DC, April 1989.

CONCRETE LABORATORY

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

SEMESTER – I

Concrete Laboratory

Subject Code	16CCTL16	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 objective of this course is to make students to learn principles and design of experiments.
- To investigate the performance of various Concrete

Modules	Teaching Hours	RBT Level
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	**12 Hours**	
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 stackbonded masonry prisms and obtaining the stress-strain behavior (Modulus of Elasticity) under compression	**9 Hours**	
Measurement of Moisture content in aggregates, soil and hardened concrete surface using NDT techniques. Pull-Out Tests on concrete	**6 Hours**	
Effect of Chemical admixtures on fresh & harden properties of concrete Effect of mineral admixtures on fresh & harden properties of concrete Tests on Bitumen materials Tests on Course aggregates for road construction	**9 Hours**	
Bonding Patterns in Brick work (joints, alignments, level and Plumb maintenance)	**6 Hours**	

Course outcomes:

On completion of this course, students are able to:

- Achieve Knowledge of Design and development of experimental skills.
- Understand the principles of design of concrete experiments.

REFERENCES:

1. Metha P.K and Monteiro. P. J. M. " CONCRETE", Microstructure, Properties and Materials, Third Edition,Tata McGraw- Hill Publishing company Limited, New Delhi,2006
2. Shetty .M.S., " Concrete Technology, Theory and Practice", Revised Edition, S. Chand & company Ltd.,New Delhi,2006
3. Neville. A.M. , " Properties of Concrete", 4th Edition Longman,1995
4. Mindass and Young, " Concrete", Prentice Hall.1998
5. J K Ray, “Experimental analysis of stress and strain”, S Chand & Co.
6. J K Bungey, “Testing of concrete in structures”, Surrey University Press.
7. “Relevant IS codes”
8. “Software Manuals”

DESIGN OF SUB STRUCTURES

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

SEMESTER – II

Design of Sub Structures

Subject Code	**16CCT21**	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

- To study methods to learn on different types of foundations
- To study the best practices in the analysis and design of foundations

Modules	Teaching Hours	RBT Level
Module-1		
Bearing capacity of shallow foundations - Homogeneous – Layered soils - Soft and Hard Rocks, effect of ground water table and eccentricity of foundations Evaluation of bearing capacity from insitu tests - partial safety factor approach codal - Recommendations. Bearing capacity of hallow foundations - Homogeneous - Layered soils - Soft and Hard Rocks, effect of ground water table and eccentricity of foundations	**10 Hours**	**L_1, L_2**
Module-2		
Design of shallow foundations and Proportionating of shallow footings Introduction to special foundations - Foundation design in relation to ground movements - Foundation on recent refuse fills - Design of Foundation for seismic forces - Codal recommendations.	**10 Hours**	**L_1, L_2, L_4**
Module-3		
Design of Raft foundations- types of rafts, stability and rigidity of the soil structure system, allowable soil pressures for rafts in cohesionless and cohesive soils, Design of raft by rigid beam method and Winkler method, Solution based on elastic half space and based on elastic theory	**10 Hours**	**L_1, L_2, L_4**
Module-4		
Pile foundations Single Pile: Vertically loaded piles, Static capacity- α, β and λ Methods, Dynamic formulae; Wave Equation Analyses; Point Bearing Resistance with SPT and CPT Results; Bearing Resistance of Piles on Rock; Settlement; Pile Load Test; Uplift Resistance; Laterally Loaded Piles -Ultimate Lateral Resistance; Negative Skin Friction; Ultimate Capacity of Pile Groups in Compression, Pullout & Lateral Load; Efficiency; Settlements of Pile Groups; Interaction of	**10 Hours**	**L_1, L_2, L_4**

Axially & Laterally Loaded Pile Groups		
Module-5		
Design of Machine Foundations: Analysis and design of block foundations for reciprocating engines, Dynamic analysis and design procedure for a hammer foundation, IS code of practice design procedure for foundations of reciprocating and impact type machines. Vibration isolation and absorption techniques	**10 Hours**	**L_1, L_2, L_3, L_4**

Course outcomes:

On completion of this course, students are able to:

- To develop a mechanism to design the foundations for resisting vibrations and achieve static equilibrium conditions of structures
- To analyze and adopt design skills of vertical and batter piles for various types of loading and soil conditions
- To design the sheet piles and under reamed piles in expansive soils

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Soil Dynamics and Machine Foundation (2010), Swami Saran, Galgotia Publications Pvt. Ltd.
2. Foundation Engineering (2012), J E Bowles. McGraw Hill Book Company
3. Analysis and Design of Foundations and Retaining Structures(1979)–S Prakash, Sarita Prakashana, Meerut
4. Foundation design in practices (2010)- Kaurna Moy Ghosh. PHI
5. Foundation Engineering (1998): Bajara M Das, John Wiley & Sons,
6. Vibration Analysis and Foundation Dynamics(1998)-Kameswara Rao, N. S. V., Wheeler Publication Ltd.,
7. Soil Mechanics and Foundation Engineering – S K Garg, Khanna Publications
8. Geotechnical Engineering – C Venkataramaiah, New Age International Publishers

CONSTRUCTION ECONOMICS AND FINANCE

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

SEMESTER – II

Construction Economics and Finance

Subject Code	**16CCT22**	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

- Understand concept of financial management
- Know the time value money factor
- Know the importance of bidding and awards

Modules	Teaching Hours	RBT Level
Module-1		
Financial Management; Meaning and Scope, Economics and Scope, Supply and Demand Mechanism, analysis and forecasting. Balance sheet, profit & loss account, fund flow statement.	**10 Hours**	**L_1, L_2, L_4**
Module-2		
Production and Cost theory, analysis. Pricing; objectives, determinants, absorption, marginal costing. Financial analysis, Decisions. Capital Budgeting, budgetary control, standard costing and variance, investment appraisal Practical problems and case studies	**10 Hours**	**L_1, L_2, L_3, L_4**
Module-3		
Engineering economics, Time value of money, discounted cash flow, NPV, ROR, Bases of comparison, Incremental analysis, Benefit-Cost analysis, Replacement analysis, Breakeven analysis, Capital budgeting, Taxation and Inflation, Working capital management, Construction accounting, Income statement, Financial statements.	**10 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
Construction Finance: Accounting information and application, Financial versus economic evaluation, financial statements and project appraisal. Project yield, taxation and inflation, risk and uncertainty, Turnkey activities; finance and working capital, depreciation and amortization; cost control, performance budgeting, equipment rentals.	**10 Hours**	**L_1, L_2, L_3, L_4**
Module-5		
Bidding and awards, work pricing, cost elements of contracts, letters of credit, financing plans, multiple sources of finance. Qualifying, bidding, bidders, comparing the bids, under-writing. unforeseen revisions, costs and rates escalation, cost progress reporting. Legal aspects	**10 Hours**	**L_1, L_2, L_3**

Course outcomes:

On completion of this course, students are able to:

- To prepare the balance sheet
- To prepare the cash flow statement.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Peterson, H.C., Lewis, W.C. "Managerial Economics", Prentice Hall of India Pvt. Ltd., 2001
2. Parkin, M. & Bade R., "Modern Macroeconomics" 4th Edition, Prentice Hall, 1996
3. Werther & Davis, "Human Resources & Personnel Management", McGraw Hill, 1996
4. Edwards, John et.al., 1983 "Manpower planning, John Wiley": New York
5. Anthony, R.N. Govindrajan, V., Irwin, "Management control systems", McGraw Hill 10th Edition, 2000
6. Baumel, W.J., A.S. Blinder and W.M. Scarth, "Economics: Principles and policy", Academic Press Canada, Tornoto, 1985
7. Anthony & Reece, "Accounting Principles-AITBS", Sixth Edition,1998
8. Koontz O'Donnel : "Essentials of Management"; Tata McGraw Hill, 1982
9. Monappa A. "Personnel Management", Tata McGraw Hill,

PRE ENGINEERING CONSTRUCTION AND TECHNOLOGY

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

SEMESTER – II

Pre Engineering Construction and Technology

Subject Code	**16CCT23**	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

- Understand the type of prefabricated elements
- Understand the method of hoisting
- Understand the basic construction of the pre engineered buildings

Modules	**Teaching Hours**	**RBT Level**
Module-1		
General Principles of PreFabrication Comparison with monolithic construction – Types of prefabrication – site and plant prefabrication - Economy of prefabrication – Modular coordination – Standardization – Planning for Components of prefabricated structures – Disuniting of structures – Design of simple rectangular beams and I beams – Handling and erection stresses – Elimination of erection stresses – Beams, columns – Symmetrical frames.	**10 Hours**	**L_1, L_2, L_3**
Module-2		
Prefabricated Elements Roof and floor panels, ribbed floor panels – wall panels – footings – Joints for different structural Connections – Effective sealing of joints for water proofing – Provisions for non-structural fastenings –Expansion joints in pre-cast construction. Designing and detailing of precast unit for factory structures –Purlins, Principal rafters, roof trusses, lattice girders, gable frames – Single span single storeyed frames –Single storeyed buildings – slabs, beams and columns.	**10 Hours**	**L_1, L_2, L_3, L_4**
Module-3		
Production and Hoisting Technology Choice of production setup – Manufacturing methods – Stationary and mobile production – Planning of production setup – Storage of precast elements – Dimensional tolerances – Acceleration of concrete hardening. Equipments for hoisting and erection – Techniques for erection of different types of members like Beams, Slabs, Wall panels and Columns – Vacuum lifting pads.	**10 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
Precast sandwich Panels ,Prestressed concrete solid flat	**10 Hours**	

slabs, Hollow core slab/panels, Prestressed concrete Double "T",Bridge, Precast segmental Box Girders, Specifications and Seismic considerations.		
Module-5		
Pre-Engineered Buildings Introduction – Advantages - Pre Engineered Buildings Vs Conventional Steel Buildings - Design of Pre Engineered Buildings (PEB) – Applications	**10 Hours**	**L_1, L_2, L_3**

Course outcomes:

On completion of this course, students are able to:

- To design the pre-engineered structures and execute the same for a given structure
- To know the different types of stresses acting on the structures while lifting the prefabricated structures and type of equipment required to support such stresses

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. L. Mokk, "Prefabricated Concrete for Industrial and Public Structures," Publishing House of the Hungarian Academy of Sciences, Budapest, 2007.
2. T. Koncz, "Manual of Precast Concrete Construction", Vol. I, II, III & IV, Berlin, 1971.
3. B. Lewicki, "Building with Large Prefabricates", Elsevier Publishing Company, Amsterdam, London, New York, 1998.
4. Structural Design Manual, Precast Concrete Connection Details, Society for the
5. Studies in the use of Precast Concrete, Netherland Betor Verlag, 2009.
6. Hass, A.M. Precast concrete design and Applications, Applied Science Publishers,1983.

CONSTRUCTION CONTRACTS AND SPECIFICATIONS

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

SEMESTER – II

Construction Contracts and Specifications

Subject Code	**16CCT24**	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

- analyze, evaluate and design construction contract documents

Modules	Teaching Hours	RBT Level
Module-1		
Agreement, Contract, essential conditions, Indian Contract Act 1872, types of contract, terminology of contract. Construction Specifications: standard specifications, general specification, development, interpretation.	**10 Hours**	**L_1, L_2, L_3**
Module-2		
Tender and tender documents: types of bidding, tender notice, tendering procedure. Construction claims: extra item, excess quantity, deficit quantity, price escalation.	**10 Hours**	**L_1, L_2, L_3**
Module-3		
Dispute resolution mechanism: litigation, arbitration, conciliation, mediation, dispute resolution board. Contractual Problems: possible contractual problems, creation of claims, development of disputes. Contract document: drafting of clauses, development, and interpretation, CPWD conditions of contract, FIDIC conditions of contract	**10 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
BOT contract: types of contract, PPP framework, types of risk, concession agreement, drafting of clauses, development, and interpretation.	**10 Hours**	**L_1,L_3,L_4**
Module-5		
Laws affecting Engineers: Labour Law, Sales Tax, VAT, Service Tax, Excise Duty. Relational Contract: partnering, alliancing, key elements, processes.	**10 Hours**	**L_1, L_3,L_4**

Course outcomes:

On completion of this course, students are able to:

- Develop the tender documents for the project
- Attain the knowledge on arbitration
- Present the contract documents as per CPWD

Question paper pattern:

- The question paper will have ten questions.

- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Collier, Kieth, **"Managing Construction Contracts"**
2.S. Ranaga Rao Contract Management and Dispute Resolutions Engineering staff College of India January 2008.
3. C. J. Schexnayder and R. E. Mayo, Construction Management Fundamentals, McGraw Hill, New Delhi. 2003
4. General Conditions of Contract, Central Public Works Department, New Delhi, 2010
5.D.S. Berrie and B.c. Paulson, Professional construction management including C.M.,Design construct and general contracting, McGraw Hill InternationaL, Third Edition 1992..
6.V. K. Raina, Construction & Contract Management Practices,SPD, New Delhi

ADVANCED DESIGN OF STEEL STRUCTURES

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

SEMESTER – II

Advanced Design of Steel Structures

Subject Code	**16CCT251**	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students

- To learn principles of Design of industrial building
- To design different components of industrial structures and to detail the structures.

Modules	**Teaching Hours**	**RBT Level**
Module-1		
Laterally Unrestrained Beams: Lateral Buckling of Beams, Factors affecting lateral stability, IS 800 code provisions, Design Approach. Lateral buckling strength of beams – Design Examples.	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-2		
Design of tension members and Design of compression members, built up compression members.	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-3		
Connections bearing type joints - unstiffened and stiffened seat connections, moment resisting connection of brackets - bolted and welded.	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
Steel Beams with Web Openings: Shape of the web openings, practical guide lines, and Force distribution and failure patterns, Design of castellated beams.	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-5		
Forms of light gauge sections, Effective width computation of unstiffened, stiffened compression elements of cold formed light gauge sections. Concept of local buckling of thin elements. Limiting width to thickness ratio.	**8 Hours**	**L_1, L_2, L_3, L_4**

Course outcomes:

On completion of this course, students are able to:

- Achieve Knowledge of design and development of problem solving skills.
- Design and develop analytical skills.
- Summarize the principles of Structural Design and detailing.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.

- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Bureau of Indian Standards, IS800-2007, IS875-1987, IS-801-1975. Steel Tables, SP 6 (1) – 1984
2. N Subramanian- "Design of Steel Structure" oxford University Press
3. B.C. Punmia, A.K. Jain "Design of Steel Structures", Laxmi Publications, New Delhi.
4. Ramchandra and Virendra Gehlot "Design of Steel Structures " Vol 1 and Vol.2, Scientific Publishers, Jodhpur
5. Duggal "Limit State Design of Steel Structures" TMH

PAVEMENT DESIGN AND CONSTRUCTION

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

SEMESTER – II

Pavement Design and Construction

Subject Code	**16CCT252**	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students

- understand types of pavement
- understand stress-strain characteristics of pavements and control of deflection

Modules	Teaching Hours	RBT Level
Module-1		
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	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-2		
Flexible Pavements: Specifications of materials, construction method and field control checks for various types of flexible pavement layers – WBM-BM- SDBCBC **Flexible Pavement Design Methods For Highways** : CBR method-Principle – Testing as per IRC, AASHTO and Asphalt Institute and Shell Method. Problems on above	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-3		
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	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
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	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-5		
Design: Types of joints in cement concrete pavements and	**8 Hours**	**L_1, L_2, L_3,**

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		**L_4**

Course outcomes:

On completion of this course, students are able to:

- Analyse and predict the behaviour of the flexible and rigid pavements
- Predict the behaviour of the joints in rigid pavements

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Yoder, E.J., and Witczak, "Principles of Pavement Design"- 2nd ed. John Wiley and Sons, 1975.
2. Yang, "Design of Functional Pavements"- McGraw Hill Book Co.
3. Khanna and Justo, "Test Book of Highway Engineering"- Nemchand brothers, Roorke-2004.
4. Sharma, S.C."Construction Equipment and its Management"- Khanna Publishers
5. Huang, "Pavement Analysis"- Elsevier Publications
6. HRB/TRB/IRC/International Conference on "Structural Design of Asphalt Pavements".
7. "Relevant IRC Publications"
8. CMA Hand Book"

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

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

SEMESTER – II

Subject Code	**16CCT253**	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students

- Focus mainly on identifying the dynamic loading induced on the structures
- understand and evaluate the seismic response of structures

Modules	**Teaching Hours**	**RBT Level**
Module-1		
BASIC DESIGN PARAMETERS: Theory of plate tectonics, Seismic Waves Dynamic properties of structures and its evaluation, strength and deformation characteristics of structures under earthquake loading, Requirements of efficient earthquake resistant structural system damping devices and base isolation systems,	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-2		
Response history of strong motion characteristics, response spectrum- elastic and inelastic, D-V-A response spectrum, Computation of seismic forces in multistoried building as per IS 1893	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-3		
Structural modeling: Design requirements, Response control concepts, seismic evaluation and retrofitting methods. Effect of structural irregularities on seismic performance of RC building, applied and advanced problems	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
Effect of infill masonry walls on frames, modeling concepts of infill masonry walls, Behaviour of masonry structures, failure patterns, strength of masonry in shear and flexure, slenderness concept of masonry walls as per codal provisions	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-5		
Structural design of foundation: Introduction – loads acting on foundations during earthquake – fundamental failure mechanisms of foundations – essential criteria for design of foundations in liquefiable soils – structural design of foundations subjected to earthquake loading	**8 Hours**	**L_1, L_2, L_3, L_4**

Course outcomes:

On completion of this course, students are able to:

- Design of structure under earthquake loading by considering the influence of various design parameters that includes the liquefaction of soils due to earthquake.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Dynamics of structures- Theory and application to earthquake engineering (2007).Anil K Chopra, Prentice hall India .
2. Earthquake design of Structures (2007) Duggal, Oxford
3. IS 1893-2002, part 1, IS 13920-1993, IS 4326-1993, IS 13828-1993
4. Earthquake resistant design of Structures, Pankaj Agarwal, manish Shrikande, Prentice Hall, New Delhi,.
5. Sesimic design of concrete and Masonry Building, T Paulay and MJN Priestley, John Wiley & Sons, NY

BUILDING COST AND QUALITY MANAGEMENT

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

SEMESTER – II

Subject Code	**16CCT254**	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students

- Prepare the BOQ of a given project
- Understand the qualities of materials used in the construction work

Modules	Teaching Hours	RBT Level
Module-1		
Estimation of quantities for R.C.C. multistoreyed complex viz. earthwork, concrete in foundation, D.P.C., R.C.C. work, flooring and roofing, plastering and pointing etc., wood work, white washing.	**8 Hours**	**L_1, L_2, L_3**
Module-2		
Analysis of rates for multistoreyed building works – Brick work in foundations and Superstructure, cement concrete, R.C. C., Plastering, Flooring, Timber work etc. Checking of construction quality – various tests for bricks, cement, concrete, aggregates, and steel as per IS codes	**8 Hours**	**L_1, L_2, L_4**
Module-3		
Preparation of bills for payment, measurement book, mode of payment, running account bill. Ledger and Cash book details, Arbitration.	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
Estimation of building services viz. water supply works, electrification, sanitary fitting etc, and their cost analysis	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-5		
Elements of Valuation: methods, techniques and examples Completion report of the project; Checking of Plan, Details of various works, and issue of completion report of the project.	**8 Hours**	**L_1, L_2, L_3, L_4**

Course outcomes:

On completion of this course, students are able to:

- To prepare the quantities of work for a multistoried building
- To certify the valuation report on existing structures
- To prepare the detailed bills for the on-going project

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each

module.

- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Estimating and Costing by B.N. Dutta
2. Estimating and Costing by G.S. Birdie
3. Estimating and Costing by Chakaraborty
4. Professional Practice – Roshan N Namavati, Lakahni Book Depot, Mumbai

SOFTWARE APPLICATION LABORATORY

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

SEMESTER – II

Subject Code	16CCTL26	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 objective of this course is to make students to learn principles and design of structures.

Modules	Teaching Hours	RBT Level
Software Application Use of construction management softwares (MS-PROJECTS, PRIMAVERA), preparing of estimation of a structure using excel Analysis of skeletal and continuum structures using standard FEM packages, BIM	**42 Hours**	

Course outcomes:

On completion of this course, students are able to:

- Achieve Knowledge of Design and development of soft skills.
- Understand the principles of design of structures using the standard packages.

Question paper pattern:

- Individual experiment should be set

REFERENCES:

1. "Software Manuals"
2. Harry G Harris and Gajanan M Sabnis, "Structural Modeling and Experimental Techniques", CRC Press

RESTORATION AND REHABILITATION OF STRUCTURES

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

SEMESTER – IV

Subject Code	**16CCT41**	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

- Learning the structural properties for causing failures
- Identification of failure phenomenon
- New approach in the design aspects
- Understanding the concept of serviceability and durability

Modules	Teaching Hours	RBT Level
Module-1		
Performance of construction materials, components in services and testing of existing structures both destructive and non-destructive; Causes of deterioration; preventive measures and maintenance. Problems on deterioration	**10 Hours**	**L_1, L_2, L_3, L_4**
Module-2		
Principles of assessment of weathering and durability; Characteristics of materials; Diagnosis of construction failures; Dealing with cracks; Methods of repair in concrete, Steel and timber structural components;	**10 Hours**	**L_1, L_2, L_3, L_4**
Module-3		
Corrosion damage of reinforced concrete and its repair and prevention measures; Surface deterioration, Efflorescence , causes, prevention and protection; Surface coatings and painting; Water proofing;	**10 Hours**	**L_1, L_2, L_3**
Module-4		
Grouting and shotcrete Strengthening of existing structures; Special repairs, maintenance Inspection and planning, Budgeting and management	**10 Hours**	**L_1, L_2, L_3, L_4**
Module-5		
Case studies of repair structures based on strength, deflection, cracking, chemical, weathering, fire, leakage, marine and demolition methods. Problems based on above case studies	**10 Hours**	**L_1, L_2, L_3, L_4**

Course outcomes:

On completion of this course, students are able to:

- To predict the failure modes in Structural engineering before construction of structures
- To design the structures to overcome the failure in construction activities
- To understand the deterioration of concrete structures

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Deterioration, Maintenance and repair of structures– S M Johnson
2. Concrete structures materials, Maintenance and repair – Dension campbell, allen and Harold Roper, Longman Scientific and Technical
3. Repair of Concrete Structures- R T Allen and S C Edwards, Balckie and Sons
4. Learing of failure from Deficiencies in design, construction and Service, Raiker R N, R & D Centre (SDCPL)

DISASTER MANAGEMENT TECHNIQUES

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

SEMESTER – IV

Subject Code	**16CCT421**	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students

- The graduates are expected to adopt various numerical method and mathematical tools for analysis of research data
- Learning about the natural disaster
- Learning the risk reduction methods of disasters
- Application of GIS

Modules	**Teaching Hours**	**RBT Level**
Module-1		
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	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-2		
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	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-3		
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	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
Seismicity: Seismic waves-Earthquakes and faults-measures of earthquake, magnitude and intensity-ground damage-Tsunamis and earthquakes. The design and management of Disaster Information Resource Network, Asian Disaster Preparedness Centre, Regional data base, Contacts and Sources	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-5		

Damage due to ground failures, Landslides, rockslides, liquefaction, fire, floods, tsunamis, release of hazardous material like poisonous gas, nuclear radiation	**8 Hours**	**L_1, L_2, L_3**

Course outcomes:

On completion of this course, students are able to:

- Analyse the existing data of the natural calamities and prediction of the disaster
- Develop an appropriate methods to identify and rectify the disaster

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Pardeep Sahni, Madhavi Malalgoda and Ariyabandu, "Disaster risk reduction in south Asia", PHI
2. Amita sinvhal, "Understanding earthquake disasters", TMH, 2010
3. Pardeep sahni, Alka Dhameja and Uma Medury, "Disaster Mitigation: Experiences and reflections", PHI
4. Disaster Mitigation Experiences & Reflectios by Pardeep Sahni, Alka Dhameja,and Uma Medury.
5. Disaster Management Report by Department of Agriculture and Cooperation,Govt. of India.

CONSTRUCTION DEMOLITION AND WASTE MANAGEMENT

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

SEMESTER – IV

Subject Code	**16CCT422**	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students

- focus on the principles of sustainable construction and demolition waste management and resource efficiency
- examining the environmental impact of building materials; formulating and designing pre–construction and site waste management plans

Modules	**Teaching Hours**	**RBT Level**
Module-1		
Environmental Impact of Building Materials Embodied energy of materials; impact on the local environment; toxicity of the material; life cycle assessment. Nature and Source Direct and indirect waste; site types and origins; composition; quantity; current recycling/reuse potential of building materials.	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-2		
Construction and Demolition Waste Management Plans International good practice; planning requirements; DoEHLG guidance document; company policy; demolition plans; site implementation; supplier agreements; sub–contractor management; role of waste management contractor; training; auditing; skip management; current markets; current disposal options; health and safety; reporting to local authorities. Treatment of Construction and Demolition Waste, waste permits; waste licenses; waste transfer facilities; landfills; treatment technologies; hazardous waste facilities; reporting to EPA	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-3		
Designing for Waste Prevention and Minimisation Waste prevention and minimization; client, contractor and designer attitudes; proper maintenance of existing buildings; reuse of existing building structure; design flexibility; design for reuse and recycling; dimensional co–ordination and standardization; modular design; material selection and control.	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
Waste Forecasting Tools Application of WRAP's designing out waste tool for buildings and civil engineering; WRAP net waste tool; BRE SMARTWaste; WRAP Site Waste Management Plan Tracker	**8 Hours**	**L_1, L_2, L_3**

Module-5		
Future developments Potential future markets; 'smart' materials; use of eco–materials.	**8 Hours**	**L_1, L_2, L_3, L_4**

Course outcomes:

On completion of this course, students are able to:

- Formulate, design, evaluate and review pre–construction and construction phase resource efficient waste management plans
- Evaluate, assess and recommend potential reuse/recycling/disposal options considering existing and potential future markets/uses.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Springer,"Recycling and Resource Recovery Engineering", Springer-Verlag Berlin Heidelberg (1996)
2. Greg Winkler, "Recycling Construction and Demolition waste: A LEED-Based Toolkit (Green Source) (Google ebook), Mc Graw Hill Professional
3. V M Tam, Chi Ming Tam, "Reuse of Construction and Demolition Waste in Housing Development", Nova Science Publishers, 2008
4. "Current Literature"

DESIGN OF PRESTRESSED CONCRETE STRUCTURES

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

SEMESTER – IV

Subject Code	**16CCT423**	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students

- Learning concepts of prestress in civil Engineering projects
- Learning the concepts of prestressing in mass housing projects, railway sleepers, flyovers etc.,

Modules	**Teaching Hours**	**RBT Level**
Module-1		
Design of high strength concrete mixes. Loss of prestress in single span and continuous beams. Use of IS 1343-1980, Analysis Limit State Design of beams for Tension Type II and III problems, Cracking moment, untensioned reinforcement, Partial prestressing, Stress Corrosion. Transfer of prestress by bond, Transverse tensile stresses, End zone reinforcement. Behaviour of Bonded and unbounded prestress concrete beams	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-2		
Deflection of Prestressed concrete members, short and long term, control of deflections. Crack width considerations. Flexural strength of prestressed concrete sections: Types of flexural failures, Limit state concept.	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-3		
Shear resistance of prestressed concrete members: Principal stresses and ultimate shear Resistance, Design of shear reinforcement, prestressed concrete, members in Torsion, Design of reinforcement in torsion shear and bending	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-4		
Stress distribution in end block, Analysis and Anchorage Zone reinforcement. Composite Construction of prestressed precast and cast in situ concrete. Statically Indeterminate structures: Continuous beams, primary and secondary moments, Continuity, concordant cable profile, Analysis and Design of continuous beams	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-5		
Prestressed concrete pipes and poles. Design of Prestressed concrete tanks.	**8 Hours**	**L_1, L_2, L_3, L_4**

Course outcomes:

On completion of this course, students are able to:

- To take the appropriate decision in respect of choice of Prestressed section over

R.C.C .

- Design the structures with various methods of prestressing

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Nigel R Hewon Prestressed Concrete Bridge, Design and construction Thomas Telford London 2003.
2. Plan Cast Precast and Prestressed concrete(A Design Guide) Devid A.Sheppard & William R. Phillps Mcgraw Hill Publication Co. 1989.
3. N. Krishnaraju Prestressed Concrete Tata McGraw Hill (Third Edition) 1981**.**
4. Lin T.Y,Burns N.H. Design of Prestressed Concrete Structures. John Wiley & sons (Third Edition).1982. ,

ENERGY AND BUILDINGS

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

SEMESTER – IV

Subject Code	**16CCT424**	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives:

This course will enable students

- To understand the importance of energy conservation
- To understand importance of non-renewable resources
- Design energy efficient buildings

Modules	Teaching Hours	RBT Level
Module-1		
Conservation & energy efficiency concepts-overview of significance of energy use and energy processes in buildings	**8 Hours**	**L_1, L_2, L_3,**
Module-2		
Solar energy fundamentals & practices in building design-solar astronomical relations and radiation physics and measurements, design decision for optimal orientation of building, shadow analysis.	**8 Hours**	**L_1, L_2, L_3,**
Module-3		
Heating and ventilation design- Human thermal comfort, climatological factors, material specifications and heat transfer principles, Thermal performance evaluation, Heat loss from buildings, design of artificial ventilation system, design of insulators	**8 Hours**	**L_1, L_2, L_3,**
Module-4		
Design audits & economic optimization- Concept of cost/benefit of energy conservation & carbon footprint estimation. Energy efficient lighting system design: Basic terminologies and standards, daylighting and artificial lighting design, auditing	**8 Hours**	**L_1, L_2, L_3, L_4**
Module-5		
Advances in computational energy conservation-implementation of computer energy simulation programs into building designs	**8 Hours**	**L_1, L_2, L_3, L_4**

Course outcomes:

On completion of this course, students are able to:

- Understand the importance of energy resources
- Design energy efficient buildings.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCES:

1. Energy Efficient Buildings In India, Mili Majumdar The Energy Research Institute.
2. Energy-Efficient Building Systems Lal Jayamaha, McGraw Hill Publication.
3. Solar Energy and thermal processes J A Duffie & W A Beckman, John Wiley
4. Energy Conservation Building Code, 2007.
5. Handbook of functional requirement of buildings, SP: 41:1987