VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
SCHEME OF TEACHING AND EXAMINATION FOR
M.Tech. Construction Technology

I Semester **CREDIT BASED**

Subject Code	Name of the Subject	Teaching hours/week		Duration of Exam in Hours	Marks for		Total Marks	CREDITS
		Lecture	Practical / Field Work / Assignment/ Tutorials		I.A.	Exam		
14CCT11	**MECHANIZATION IN CONSTRUCTION**	4	2	3	50	100	150	4
14CCT12	**CONSTRUCTION PROJECT MANAGEMENT**	4	2	3	50	100	150	4
14CCT13	**ADVANCES IN CONSTRUCTION MATERIALS**	4	2	3	50	100	150	4
14CCT14	**STRUCTURAL MASONRY**	4	2	3	50	100	150	4
14CCT15x	**ELECTIVE 1**	4	2	3	50	100	150	4
14CCT16	**MATERIAL CHARACTERIZATION LABORATORY**	--	3	3	25	50	75	2
14CCT17	**SEMINAR**	--	3	--	25	--	25	1
	Total	**20**	**16**	**18**	**300**	**550**	**850**	**23**

Elective – 1

14CCT151	ADVANCED REINFORCED CONCRETE DESIGN
14CCT152	RS & GIS APPLICATION IN CONSTRUCTION
14CCT153	ADVANCED DESIGN OF SUB STRUCTURES
14CCT154	BUILDING SCIENCE

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM

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M.Tech Construction Technology

II Semester **CREDIT BASED**

Subject Code	Name of the Subject	Teaching hours/week		Duration of Exam in Hours	Marks for		Total Marks	CREDITS
		Lecture	Practical / Field Work / Assignment/ Tutorials		I.A.	Exam		
14CCT21	**CONSTRUCTION ECONOMICS AND FINANCE**	4	2	3	50	100	150	4
14CCT22	**PRE-ENGINEERED CONSTRUCTION TECHNOLOGY**	4	2	3	50	100	150	4
14CCT23	**CONSTRUCTION AND CONTRACT MANAGEMENT**	4	2	3	50	100	150	4
14CCT24	**CONSTRUCTION QUALITY AND SAFETY**	4	2	3	50	100	150	4
14CCT25X	**ELECTIVE 2**	4	2	3	50	100	150	4
14CCT26	**SOFTWARE APPLICATIONS LABORATORY**		3	3	25	50	75	2
14CCT27	**SEMINAR**	--	3	--	25	--	25	1
	**Project Phase-I(6 week Duration)	--	--	--	--	--	--	--
	Total	**20**	**16**	**18**	**300**	**550**	**850**	**23**

Elective – 2

14CCT251	REMEDIAL ENGINEERING
14CCT252	PAVEMENT DESIGN & CONSTRUCTION
14CCT253	SOIL EXPLORATION & GROUND IMPROVEMENT TECHNIQUES
14CCT254	DESIGN OF EARTHQUAKE RESISTANT STRUCTURES

**** Between the II Semester and III Semester, after availing a vocation of 2 weeks**

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III Semester: INTERNSHIP **CREDIT BASED**

Course Code	Subject	No. of Hrs./Week		Duration of the Exam in Hours	Marks for		Total Marks	CREDITS
		Lecture	Practical / Field Work		I.A.	Exam		
14CCT31	Seminar / Presentation on Internship (After 8 weeks from the date of commencement)	-	-	-	25	-	25	1
14CCT32	Report on Internship	-	-	-		75	75	15
14CCT33	Evaluation and Viva-voce	-	-	-	–	50	50	4
	Total	**-**	**-**	**-**	**25**	**125**	**150**	**20**

* The student shall make a midterm presentation of the activities undertaken during the first 8 weeks of internship to a panel comprising **Internship** Guide, a senior faculty from the department and Head of the Department.
# The College shall facilitate and monitor the student internship program.
The internship report of each student shall be submitted to the University.
****Between the III Semester and IV Semester after availing a vacation of 2 weeks.**

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M.Tech. Construction Technology

IV Semester **CREDIT BASED**

Subject Code	Subject	No. of Hrs./Week		Duration of Exam in Hours	Marks for		Total Marks	CREDITS
		Lecture	Field Work / Assignment / Tutorials		I.A.	Exam		
14CCT41	**ENERGY AND BUILDINGS**	4	2	3	50	100	150	4
14CCT42X	ELECTIVE-3	4	2	3	50	100	150	4
14CCT43	Evaluation of Project Phase-I	-	-	-	25	-	25	1
14CCT44	Evaluation of Project Phase-II	-	-	-	25	-	25	1
14CCT45	Evaluation of Project Work and Viva-voce	–	-	3	-	100+100	200	18
	Total	**8**	**04**	**09**	**150**	**400**	**550**	**28**
				Grand Total (I to IV Sem.) : 2400 Marks; 94 Credits				

Elective – 3

14CCT421	PRE-STRESSED CONCRETE
14CCT422	BUILDING SERVICES AND MAINTENANCE
14CCT423	DISASTER MANAGEMENT TECHNIQUES
14CCT424	CONSTRUCTION & DEMOLITION WASTE MANAGEMENT

Note:

1) Project Phase – I**:** 6 weeks duration shall be carried out between II and III Semesters. Candidates in consultation with the guides shall carryout literature survey / visit to Industries to finalize the topic of dissertation.
2) Project Phase – II**:** 16 weeks duration during III Semester. Evaluation shall be taken during the Second week of the IV Semester. Total Marks shall be 25.
3) Project Evaluation: 24 weeks duration in IV Semester. Project Work Evaluation shall be taken up at the end of the IV Semester. Project Work Evaluation and Viva-Voce Examinations shall be conducted. Total Marks shall be 250 (Phase I Evaluation: 25 Marks, Phase –II Evaluation: 25 Marks, Project Evaluation marks by

Internal Examiner (guide): 50, Project Evaluation marks by External Examiner: 50, marks for external and 100 for viva-voce).

Marks of Evaluation of Project:

- The I.A. Marks of Project Phase – I & II shall be sent to the University along with Project Work report at the end of the Semester.

4) During the final viva, students have to submit all the reports.
5) The Project Valuation and Viva-Voce will be conducted by a committee consisting of the following:

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

I SEMESTER

MECHANIZATION IN CONSTRUCTION

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

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

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

Mechanization in rebar fabrication

Mechanization in concrete production and placement

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

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

Safety and Environmental issues in mechanization

REFERENCE BOOKS:

1. Peurifoy R L, “Construction Planning, Equipment and Methods”, Mc Graw Hill
2. James F Russell, “Construction Equipment”, Prentice Hall
3. Current Literature

CONSTRUCTION PROJECT MANAGEMENT

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

Project Organization, Bar Charts, Work Breakdown Structure, Time estimates, Applications of CPM and PERT-Scheduling, Monitoring and Updating. Line of Balance Scheduling. Resource Planning-levelling and Allocation. Time-Cost Trade-off. Cost Control in Construction. Introduction to Material Management- Purchase management and inventory control. Introduction to Building Information Model (BIM).

REFERENCE BOOKS:

1. Peurifoy. R L, “Construction Planning, Equipment and Methods”- Mc Graw Hill.
2. Srinath L.S, “PERT and CPM”, East West Press Pvt Ltd New Delhi.
3. Frank Harris and Roland McCaffer, “Modern Construction Management”- 4th Ed. Blackwell Science Ltd.
4. Current Literature.

ADVANCES IN CONSTRUCTION MATERIALS

Subject Code	**: 14CCT 13**	IA Marks	: 50
No. of Lecture Hrs/ Week	: 04	Exam Hrs	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

Concrete making materials-cement, aggregates, admixtures (both mineral and chemical). Microstructure of concrete, Fresh concrete and its rheology, Mechanical, deformational behaviour of hardened concrete. Creep and Shrinkage of Concrete. Durability of Plain and Reinforced Concrete. Proportioning of Mixes- Normal Concrete, High Strength/Performance Concrete, Fibre Reinforced Concrete, Reactive Powder Concrete, Roller Compacted Concrete, Self-Compacting Concrete, Geo-polymer Concrete and Decorative Concrete,

Types of Reinforcements. Corrosion of Reinforcing Steel- Electro-chemical process, measures of protection. Polymers, fibres, adhesives and sealants- types and their uses. Structural glazing.

REFERENCE BOOKS:

1. Neville A.M. "Properties of Concrete"-4th Ed., Longman.
2. Mehta .P.K., and Paulo J.M. Monteiro, "Concrete- Microstructure, Properties and Materials"-(Indian Ed., Indian Concrete Institute), McGraw Hill.
3. **"Current Literature".**

STRUCTURAL MASONRY

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

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

REFERENCE BOOKS:

1. Hendry A W, "Structural Masonry"
2. Sven Sahlin, "Structural Masonry"
3. Curtin, "Design of Reinforced and Pre-stressed Masonry"
4. Dayaratnam P,"Brick and Reinforced Brick Structures"-Oxford and IBH pub.

ADVANCED REINFORCED CONCRETE DESIGN

Subject Code	**: CCT 151**	IA Marks	: 50
No. of Lecture Hrs/ Week	: 04	Exam Hrs	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

1. Yield line method of design of slabs.
2. Design of grid floors.
3. Design of continuous beams.
4. Design of portal frames.

5. Design of silos and bunkers.
6. Design of flat slabs.
7. Art of detailing earthquake resistant construction – expansion and construction joints

REFERENCE BOOKS:

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

RS and GIS Applications in Construction

Subject Code	**: CCT 152**	IA Marks	: 50
No. of Lecture Hrs/ Week	: 04	Exam Hrs	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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

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

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

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

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

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

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

REFERENCE BOOKS:

1. Peter A Burrough Rachael A Mc Donnel, Principles of GIS (Oxford), 2000.
2. Christopher Jones. "GIS and Computer cartography "(Longman), 2000.
3. Lillesand, "Remote Sensing and Image interpretation"-(John Wiley and Sons), 2000.

Advanced Design of Sub Structures

Subject Code	**: CCT 153**	IA Marks	: 50
No. of Lecture Hrs/ Week	: 04	Exam Hrs	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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

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

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

Drilled pier, Caissons, well foundation

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

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

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

Reference books:

1. Gopal Ranjan and ASR Rao, “Basic and Applied Soil Mechanics”, New Age Int. (P) Ltd.
2. Swamisaran, “Analysis and Design of Sub-Structures”, IBH & Oxford
3. B.M.Das, “Principles of Foundation Engineering”, PWS Kent, Boston.
4. J.E. Bowles, “Foundation Analysis and Design”, McGraw-Hills
5. Teng, “Foundation Design”, Prentice Hall, Ind
6. K.R. Arora, “Soil mechanics and foundation engineering”, Standard publishers distributors

Building Science

Subject Code	**: CCT 154**	IA Marks	: 50
No. of Lecture Hrs/ Week	: 04	Exam Hrs	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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

Thermal comfort factors, thermal indices, thermal quantities, heat exchange in buildings, periodic heat flow, mechanical and structural means of thermal control.

Propagation of sound, sound insulation, absorption, transmission reverberation roofing and walling system for sound absorption and insulation, noise and noise control in buildings.

Principles of day lighting in buildings

REFERENCE BOOKS:

1. Koenigsberger, "Manual of Tropical Housing and Building- Climatic Design", Orient Longman
2. Deodhat, S V , "Building Science and Planning", Khanna Pub.
3. B C Punmia, "Building Construction", Laxmi Pub
4. SP:41- Functional Requirements for Buildings, BIS, New Delhi

Material Characterization laboratory

Subject Code	**: 14CCT 16**	IA Marks	: 50
No. of Practical Hrs/ Week	: 03		

In-situ test methods

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

Stress-Strain relationship of concrete and masonry

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

Instrumentation for dynamic measurement

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

REFERENCE BOOKS:

1. "Relevant IS codes"
2. "Software Manuals"
3. Harry G Harris and Gajanan M Sabnis, "Structural Modeling and Experimental Techniques", CRC Press
4. Dally and Riley, "Experimental stress analysis", McGraw Hill
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

II SEMESTER

CONSTRUCTION ECONOMICS AND FINANCE

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

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, Appraisal through financial statements-ratio's analysis, Long term Financing, Practical problems and case studies.

REFERENCE BOOKS:

1. Courtland A. Collier and William B. Ledbetter,"Engineering Economics and Cost Analysis"- Harper & Row.

2. Kuchal S.C, "Financial Management"

3. Van Horne J.C, "Fundamentals of Financial Management" Prentice Hall.

Pre Engineered Construction Technology

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

General Principles of Fabrication

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.

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.

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.

Pre-Engineered Buildings

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

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 Studies in the use of Precast Concrete, Netherland Betor Verlag, 2009.
5. Hass, A.M. Precast concrete design and Applications, Applied Science Publishers, 1983.

CONSTRUCTION AND CONTRACT MANAGEMENT

Subject Code	**: 14CCT 23**	IA Marks	: 50
No. of Lecture Hrs/ Week	: 04	Exam Hrs	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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

Tendering and contractual procedures, Indian Contract Act 1872 as applied to construction, Types of contracts, International contracts, Conditions and specifications of contract, Contract administration, Claims, compensation and disputes, Dispute resolution techniques, Arbitration and Conciliation Act 1996 – case studies, Professional ethics, Duties and responsibilities of parties.

REFERENCE BOOKS:

1. Roshan Namavathi, “Professional Practice”
2. Gajaria GT, “Law Relating to Building & Civil Engg. Contracts in India”
3. Collier, Kieth, “Managing Construction Contracts”

Construction Quality and Safety

Subject Code	**: 12CCT 24**	IA Marks	: 50
No. of Lecture Hrs/ Week	: 04	Exam Hrs	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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

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, Safety rules in construction, Safety in construction operations, Safety in the use of construction equipment, Ergonomics, Accident Prevention and safety, Construction Safety Management.

REFERENCE BOOKS:

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.

Remedial Engineering

Subject Code	**: CCT 251**	IA Marks	: 50
No. of Lecture Hrs/ Week	: 04	Exam Hrs	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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

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

Materials for Repair: Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fiber reinforced concrete.

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

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

REFERENCE BOOKS

1. Sidney., M. Johnson “Deterioration Maintenance and Repair of Structures”

2. R.N. Raikar “Rehabilitation of Structures”- Edited by, Vol. 1, 2 and 3, Proc., Int. Symposium, Maharashtra Indian Chapter of ACI, Bombay

3. Denison Campbell, Allen & Harold Roper,“ Concrete Structures– Materials, Maintenance and Repair”- Longman Scientific and Technical

4. CPWD Hand book on Repair and Rehabilitation of RCC Buildings, DG(W), Central Public Works Department, New Delhi, 2002.

Pavement Design and Construction

Subject Code	**: CCT 252**	IA Marks	: 50
No. of Lecture Hrs/ Week	: 04	Exam Hrs	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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

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

ESWL and EWL factors.

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

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

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

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

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

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

REFERENCE BOOKS:

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. Huang, “Pavement Analysis”- Elsevier Publications
5. HRB/TRB/IRC/International Conference on “Structural Design of Asphalt Pavements”.
6. “Relevant IRC Publications”
7. “CMA Hand Book”
8. Sharma, S.C.”Construction Equipment and its Management”- Khanna Publishers

Soil Exploration and Ground Improvement Techniques

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

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

REFERENCE BOOKS:

1. Hvorslev MJ, “Subsurface Exploration and Sampling of Soils for Civil Engg. Purposes” Elsevier Pub. Co
2. Manfredd RH, “Engineering Principles of Ground Modification”, Mc Graw Hill
3. Head KH, “Manual of Soil Laboratory Testing”.
4. Purushotham Raj, “Ground Improvement Techniques”.
5. “Current Literature”, Laxmi Pub

Design of Earthquake Resistant Structures

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

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

REFERENCE BOOKS:

1. Minoru Wakabayashi, “Design of Earthquake Resistant Buildings”- McGraw Hill Pub.
2. Anil K Chopra, “Dynamics of Structures – Theory and Application to Earthquake Engineering”- 2nd ed., Pearson Education pub.

3. Anderson,R.A., “Fundamentals of Vibrations”- Mc Millan
4. IS – 1893 (Part I): 2002, IS – 13920: 1993, IS – 4326: 1993, IS-13828: 1993
5. Timoshenkeo, S., “Vibration and Stuctural Dynamics”-VanNostrand Co.,
6. Clough and Penzien, “Dynamics of Structures”.
7. Mukyopadhyaya, “Vibration and Structural Dynamics”- Oxford &IBH
8. James Ambrose and Dimitry Vergun, “ Design for Earthquakes”.
9. David Key, “Earthquake Design Practice for Buildings”,Thomas Telford.

Software applications laboratory

Subject Code	**: 14CCT 26**	IA Marks	: 50
No. of Practical Hrs/ Week	: 03		

Software Application

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

REFERENCE BOOKS:

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

IV SEMESTER

ENERGY AND BUILDINGS

Subject Code	**: 12CCT 41**	IA Marks	: 50
No. of Lecture Hrs/ Week	: 04	Exam Hrs	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

Introduction, Energy and Buildings – Zero carbon buildings, energy efficiency, energy monitoring, energy modeling, carbon reduction in buildings, renewable energy sources,.

Computation of embodied energy, life cycle energy assessment - case studies.

Green building concepts, rating standards – case studies.

Energy efficient materials and Technologies.

REFERENCE BOOKS:

1. Dejan Mumovic and Mat Santamouris “ A hand book of Sustainable Building Design & Engineering – An Integrated approach to energy, health and operational performance, Earthscan publishing house, 2009.
2. "Current Literature

Pre-Stressed Concrete

Subject Code	**: CCT 421**	IA Marks	: 50
No. of Lecture Hrs/ Week	: 04	Exam Hrs	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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

REFERENCE BOOKS:

1. A Park and Paulay, “Reinforced Reinforced and Pre-stressed Concrete”, John Wiley & Sons.
2. Lin TY and Burns N H, “Reinforced Concrete Design".
3. Kong KF and Evans T H “Design of Pre-stressed Concrete Structures”

Building Services and Maintenance

Subject Code	**: CCT 422**	IA Marks	: 50
No. of Lecture Hrs/ Week	: 04	Exam Hrs	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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

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

Building Maintenance: Preventive and protective maintenance, Scheduled and contingency maintenance planning, M.I.S. for building maintenance. Maintenance standards. Economic maintenance decisions.

REFERENCE BOOKS:

1. NBC,” Relevant Parts: BIS New Delhi
2. Jain V K,” Services in Building Complex and High Rise Buildings”,Khanna Pub.
3. Pchelinstev V. A., Fire Resistance of Buildings.

Disaster Management Techniques

Subject Code	**: CCT 423**	IA Marks	: 50
No. of Lecture Hrs/ Week	: 04	Exam Hrs	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

Introduction: Disaster preparedness, Goals and objectives of ISDR Programme, Risk identification, Risk sharing, Disaster and development: Development plans and disaster management, alternative to dominant approach, Disaster development linkages, Principle of risk partnership

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

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

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

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

REFERNCE BOOKS:

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

Construction and Demolition Waste Management

Subject Code	**: CCT 424**	IA Marks	: 50
No. of Lecture Hrs/ Week	: 04	Exam Hrs	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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

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

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

REFERENCE BOOKS:

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"