SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 1

Subject:**Pre-Stressed Concrete**

Subject Code	16CIM11	IA Marks	20
Number of Lecture Hours/week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hour	03

Credit -04

Course objectives: This course will enable students to

- Understand basic concepts of prestressing systems and methods;
- Understand the different types of losses in prestressing and its assessment
- Understand analysis and design of pre-stressed concrete elements (members)

Modules

Module 1

Introduction: Basic concept of pre-stressing – Advantages of pre-stressed concrete over reinforced concrete – materials for pre-stressed concrete and their characteristics. Uniform prestress distribution in prestressed concrete- non-uniform pre-stress distribution–moments of resistance.

Module 2

Systems and methods of pre-stressing- pre-tensioning systems – post tensioning systems – Thermo elastic pre-stressing – chemical pre-stressing. Behavior of pre-stressed concrete beams in flexure: load – deflection curves for pre-stressed concrete beams – Interpreting bending tests – Micro-cracks and visible cracks – Failure.

Module 3

Losses in Pre-stress: purpose of assessing losses – counteracting elastic loss-loss of pre-stress In case of non-Uniform pre-stress–creep, shrinkage, relaxation and anchorage losses – friction loss in pre-stress –graphical solution of friction losses– overcoming friction losses.

Module 4

Elastic design of sections for flexure: design of a simply supported beam with symmetrical sections of post tensioned and pre-tensioned type- tension members.

Module 5

Bearing and anchorage zone: statically indeterminate structure-continuous beams- primary moment – secondary moment- resultant moment.

References

1. N Krishna Raju, Prestressed Concrete, Tata Mc Graw Hill Publishing Co. Ltd, New Dehi.
2. S K Mallick, A P Gupta, Prestressed concrete, Oxford and IBI Series.
3. R. H. Evans, Bennet E W, Prestressed concrete theory and design, Chapman and Hall London.
4. T. Y. Lin, Design of Prestressed Concrete Structures, Asia Publishing House.

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 1

Subject:**Construction Equipments**

Subject Code	16CIM12	IA Marks	20
Number of Lecture Hours/week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hour	03

Credit -04

Course objectives: This course will enable students to
1. Understand the various types Quality Management and its importance
2. Understand the importance of safety in construction industry

Modules

Module 1

Plants and Equipment for production of materials: Crushers, mixers, bituminous mixing plants, concrete mixing plants, advantages, choice, production rate calculation

Module 2

Construction Equipment: Operations, applications and performance of dozers, excavators, graders, compactors, pavers, haulers, crawler, wheel tractors, power shovels, Cranes, hauling equipments, drilling, blasting equipments

Module 3

Equipment for: Dredging, tunneling, dewatering; Equipment for Flooring-dewatering and floors finishing. Sprayers, kerb casting equipment, screening equipment

Module 4

Selection of Construction Equipment: Task considerations, cost considerations, engineering considerations, equipment acquisition options

Module 5

Maintenance of Equipment: Repairs, log maintenance, safety during operation, economical life of equipment

References

1. Peurifoy, R.L., Ledbette. W.B., Construction Planning, Equipment and Methods, McGraw Hill Co.,
2. Antil J.M., Civil Engineering Construction, McGraw Hill Book Co.
3. Smith, R.C, Andres, C.K., Principles and Practice of Heavy Construction, Prentice Hall
4. SC Sharma ‘Construction equipment’
5. Chitkara, K. K. Construction Project Management: Panning, Scheduling and Control, Tata Mc Graw Hill Publishing Company, New Delhi, 1998.
6. Frank harris, “Modern Construction Equipment & methods”, John Wiley & Sons

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 1

Subject:**Advances in Concrete Technology**

Subject Code	16CIM13	IA Marks	20
Number of Lecture Hours/week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hour	03

Credit -04

Course objectives:

- To understand the properties of ingredients of concrete
- To study about the concrete design mix
- To study the behavior of concrete at its fresh and hardened state
- To understand special concrete and their use

Modules

Module 1

Properties of Cement - Manufacturing, Types of cement, Testing of Cement, Heat of Hydration , Tests on aggregates - Quality of Water for mixing and curing - use of sea water for mixing concrete

Module 2

CHEMICAL AND MINERAL ADMIXTURES : Accelerators – Retarders- Plasticisers- Super plasticizers- Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline -Their effects on concrete properties.

Module 3

FRESH AND HARDENED PROPERTIES OF CONCRETE : Workability-Tests for workability of concrete-Slump Test and Compacting factor Test-Segregation and Bleeding-Determination of Compressive and Flexural strength as per BIS - Properties of Hardened concrete-Determination of Compressive and Flexural strength-Stress-strain curve for concrete-Determination of Young's Modulus. Introduction to NDT Techniques.

Module 4

PROPORTIONING OF CONCRETE MIX : Principles of Mix Proportioning-Properties of concrete related to Mix Design-Physical properties of materials required for Mix Design - Design Mix and Nominal Mix-BIS Method of Mix Design - Mix Design Examples

Module 5

SPECIAL CONCRETES: Light weight concretes - High strength concrete - Fibre reinforced concrete – SCC - High performance concrete- Geopolymer Concrete.

TEXT BOOKS:

1. Properties of Concrete by A.M.Neville, ELBS publications.
2. Concrete Technology by A.K. Santhakumar, Oxford Press.
3. Concrete Technology by M.S.Shetty, S.Chand& Co.

REFERENCES:

1. Concrete Technology by Dr. Aminul Islam Laskar, University Science Press.
2. Special Structural concretes by Rajat Siddique, Galgotia Publications.
3. Design of Concrete Mixes by N.Krishna Raju, CBS Publications.
4. Concrete: Micro Structure by P.K.Mehta, ICI, Chennai
5. Concrete Mixture Proportioning by François de Larrard E & FN SPON, London, ISBN 0 419 23500 0.

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 1

Subject:**Contract Management**

Subject Code	16CIM14	IA Marks	20
Number of Lecture Hours/week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hour	03

Credit -04

Course objectives: This course will enable students to

- Understand the various types of contracts
- Understand the use and effect of contracts in construction industry

Modules

Module 1

Introduction to contracts: Definitions, Essentials for a legally valid contract, Salient features of contract, Discharging of a contract, Documents for an Engineering Contract; Types of contracts: Classification Based on − Tendering Process, Economic Consideration, Applicability of the various types of contracts in Construction.

Module 2

Tendering process: Definitions, List of Documents, EMD, Security Deposit, Invitation for Tenders and sale of Documents, Preparation of Tender Documents and its submission, Receipt of Tender Documents and its opening, Evaluation of Tender and Award of contract – Letter of Award, Letter of Intent, Issues in tendering process: Pre - Registration, Pre – Qualification, Nominated Tendering, Rejection of Tenders, Repeat Orders, Revocation of Tenders, Unbalanced Bidding

Module 3

Administration/Performance of contract: Responsibilities (Duties and Liabilities) of Principal & Contractor, Monitoring and Quality control/assurance, Settlement of claims − Advances, Bills, Extension for time, Extras & Variations, Cost Escalations. Security Deposit, Retention Money, Performance Bond, Liquidated Damages, Penalties, Statutory Requirements.

Module 4

Breach of contract: Definition and Classification, Common Breaches by – Principal, Contractor, Damage Assessment, Claims for Damages.

Module 5

Dispute resolution: General, Methods for dispute resolution − Negotiations, Mediation, Conciliation, Dispute Resolution Boards, Arbitration, Litigation/Adjudication by courts. Conciliation − Appointment of Conciliator, Role of Conciliator, Special Features of Conciliation Dispute Resolution Boards (DRB) − Constitution Of DRB, Functioning of DRB, Procedure for Hearings, Status of Award.

REFERENCES:

1. Vaid K.N., (1998)"Global perspective on International Construction Contracting Technology and Project Management", NICMAR, Mumbai
2. Prakash V. A.,(1997) “Contracts Management in Civil Engineering Projects”, NICMAR
3. Patil B. S.,(2009) “Civil Engineering Contracts and Estimates”, University Press.
4. John G. Betty(1993/ Latest Edition) “Engineering Contracts”, McGraw Hills.
5. Vasavada B. J.,(1997), “Engineering Contracts and Arbitration”, (Self Publication by JyotiB.Vasavada).
6. Albett Robert W., (1961/ Latest Edition) "Engineering Contracts and Specifications”, John
7. Willey and Sons, New York.

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 1

Subject:**Road Projects**

Subject Code	16CIM151 / 16CHT151	IA Marks	20
Number of Lecture Hours/week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hour	03

Credit -03

Course objectives: This course will enable students to

1 Prepare project report for new and up-gradation type road works by conducting necessary feasibility/detailed studies.
2 Conduct the soil and material investigations to understand their behavior and performance.
3 Perform various traffic related studies helping to finalise the project preparations and methods of forecasting traffic data.
4 Analyse the social impact of road projects and also determine the economic feasibility analysis for justification of investments.
5 Prepare DPR on road projects with relevant drawings and get the knowledge of tendering process for the construction.

Modules

Module 1

Introduction:Variousstepsofpreparationandexecutionofroadprojects,Investigationsforpreparationofprojectreportsfor newandup-gradationofroads.Objectsandscopeofpre–feasibility,feasibilityanddetailedstudiesforprojectpreparation.
TypicalHRstructureforpreparationsandimplementationofroadprojects.

Topographicsurveysandinvestigationsforfinalisationofhorizontalalignmentandverticalprofileofroads, Applicationof GIS.GeometricDesignelements,standardsandspecificationsforroadprojects

Module 2

Soilinvestigationsforassessingthedesigndetailsofroadembankmentsandcuts,drainagerequirementsandfoundationof crossdrainagestructures

Materialsurveysandinvestigationsforavailabilityandchoiceofbasicandalternatematerialsforroadconstructionandfor soilstabilization.

Module 3

Trafficstudies–
classifiedtrafficvolume,growthrate,projectedtrafficforassessingroadwayrequirements,origin-destinationcharacteristicsandstudies,Axleload/wheelloadstudiesusingweighbridgesandanalysisofdataforpavement design

Trafficforecast-
trafficgrowthestimationfrompasttrends,econometricmodels.Commonmethodsoftrafficforecas

Module 4

Environmentalandsocialimpactstudiesandassessmentrelevanttoroadup-gradation/newprojects,Mitigationmeasures, Roadsafetyaudit.

Collectionofrelevantdata,analysisandinterpretationforpre-feasibilityandfeasibilitystudyreportsoftheproposedroad project.Economicevaluationofdifferentpossiblealternatives.Preparationofdrawingsandprojectreports.Useofsoftware

Module 5 Methodologies for Carrying Environmental Impact Assessment
PreparationofDPRdesigndetails,estimates,BOQ,drawingsanddetailedprojectreport,useofsoftware **Tenderingprocess**-Preparationoftenderdocumentsfordifferenttypesofroadprojects,tenderevaluation.
References
1. IRC:SP:19-2001,ManualforSurvey,"InvestigationandPreparationofRoadProjects"-(firstrevision),Indian RoadsCongress 2. IRC:SP:30-1993,"ManualonEconomicEvaluationofHighway"-ProjectsinIndia(firstrevision),IndianRoads Congress 3. IRCSP–38,"ManualforRoadInvestmentDecisionModel"-1992,IndianRoadsCongress 4. IRC:9-1972,35–1997,38-1988,39-1986,52-2001,54-974,62-1976,64-1990,66-1976,67-2001,69-1977,73-1980,79-1981,80-1981,86-1983,98-1997,99-1988,103-1988,104-1988,110-1996 5. MoRTH"SpecificationsforRoadBridgeWorks"-2001,fourthrevision,IndianRoadsCongress 6. MoRTH"StandardandBiddingDocumentProcurementofCivilWorks"-PartIandII,2000,IndianRoadsCongressMoRTH"ModelConcessionAgreementforSmallRoadProjects"-2000,IndianRoadsCongress

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 1

Subject:**Advanced Design of Concrete Structures**

Subject Code	16CIM152	IA Marks	20
Number of Lecture Hours/week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hour	03

Credit -03

Course objectives: This course will enable students
- To learn to design the advanced reinforced concrete structures.
- To learn to design the miscellanies RCC structures like deep beams, corbels etc.

Modules

Module 1

Introduction to the limit state method of design, provisions in the BIS code for different loads tobe considered, Introduction to the design and detailing principles of concrete structures as perBIS code.

Module 2

Compression Elements - procedure for developing interaction curves for axial loads and moments in one /two directions.

Module 3

Behaviour in flexure: Design of singly reinforced rectangular sections, Design of doubly reinforced rectangular sections, Design of flanged beams, Design of shear, Design for Torsion, Limit state of Serviceability: Deflections of Reinforced concrete beams and slabs, short term deflection and long term deflection.

Module 4

Limit Analysis of R.C.Structures: Rotation of a plastic hinge, Redistribution of moments, moment rotation characteristics of RC member, I.S. code provisions, applications for fixed and continuous beam. Introduction to Yield line analysis for slabs: Upper bound and lower bound theorems – yield line criterion –Virtual work and equilibrium methods of analysis.

Module 5

Design of Reinforced Concrete Deep Beams & Corbels: Steps of Designing Deep Beams, Design by IS 456, Checking for Local Failures, Detailing of Deep Beams, Analysis of Forces in a Corbels, Design Procedure of Corbels as per BIS code.

References

1. Dayaratnam, P: Reinforced Concrete Structures.
2. Jain, A.K: Reinforced Concrete,Limit State Method of Design. NemChand& Bros.
3. Punmia B.C: Reinforced Concrete Structures, Vol 1 & 2 Laxmi Publications.
4. Jain and Jaikrishna: Plain and Reinforced Concrete, Vol 1 & 2
5. Devdas Menon and Pillai: Reinforced Concrete Design, McGraw Hill Publication
6. Varghese PC: Advanced Reinforced Concrete Design, PHI Publication.

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 1

Subject: **Introduction to Seismic Resistant Design**

Subject Code	16CIM153	IA Marks	20
Number of Lecture Hours/week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hour	03

Credit -03

Course objectives: This course will enable students to,

- Acquire knowledge of fundamentals of structural dynamics
- Understand: (a) engineering seismology & (b) concepts for earthquake resistant design
- Understand design & detailing aspects to achieve ductility in structures

Modules

Module 1

Introduction to engineering seismology, plate tectonics, seismic waves, characteristics of earthquake and its quantification – Magnitude and Intensity scales, seismic instruments. Study of response of buildings and structures during past earthquakes.

Module 2

Introduction to Theory of Vibration – Single degree of freedom systems, period, frequency, resonance, damping, response spectrum, seismic design philosophy, ductility, base shear calculation by seismic coefficient method (Numerical based on fundamentals only)

Module 3

Site planning, building forms, horizontal and vertical irregularities, mass and stiffness irregularities, soft storey effects, Architectural design concepts for earthquake resistance, shear walls, redundancy, setbacks, torsion, pounding – IS 1893 provisions (No Numerical)

Module 4

Ductility and energy absorption in buildings, Reinforced concrete for earthquake resistance, confinement of concrete for ductility, ductility of columns and beams – codal provisions – Relevant IS codes

Module 5

Behaviour of masonry buildings during earthquakes, failure patterns, strength of masonry in shear and flexure, concepts for earthquake resistant masonry buildings

References

Text Book:

1. P Agarwal and M Shrikande, "Earthquake Resistant Design of Structures", Prentice Hall (India) Ltd, New Delhi, 2006.

2.S.K.Duggal, (2007), "Earthquake Resistant Design of Structures", Oxford University Press, New Delhi 2007.

Codes / Standards:

1. IS – 1893 (Part I): 2002, IS – 13920: 1993, IS – 4326: 1993, IS-13828: 1993 and other relevant Codes.

Reference Books:

1. D J Dowrick, “Earthquake Risk Reduction”- John Wiley and Sons, 2003
2. Minoru Wakabayashi, “Design of Earthquake Resistant Buildings”, McGraw Hill Pub.
3. G GPenelis and A J Kappos, “Earthquake Resistant Concrete Structures”, Chapman and Hall, 1999
4. T Paulay and M J N Priestley, “Seismic Design of Reinforced Concrete and Masonry Buildings”, John Wiley and Sons, 1992
5. Steven L Kramer, “Geotechnical Earthquake Engineering”, Pearson Education pub.
6. Anil K Chopra, “Dynamics of Structures – Theory and Application to Earthquake Engineering”- 2nd ed., Pearson Education pub.
7. Anderson,R.A., “Fundamentals of Vibrations”- Mc Millan
8. Clough and Penzien, “Dynamics of Structures”- McGraw Hill
9. Mukyopadhyaya, “Vibration and Structural Dynamics”, Oxford &IBH James Ambrose and DimitryVergun, “Design for Earthquakes”-David Key, “Earthquake Design Practice for Buildings”.

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 1

Subject:**Highway Construction and Maintenance**

Subject Code	16CIM154 / 16CHT14	IA Marks	20
Number of Lecture Hours/week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hour	03

Credit -03

Course objectives: This course will enable students to

1. Understand the various equipment used for road construction and difficulties associated with highway drainage.
2. Select suitable equipment for preparation of subgrade in cutting or filling and also the preparation steps for base and sub base layers.
3. Characteristics of different types of bituminous layers and design of bituminous surfacing along with safety aspects needed for roads.
4. Design the base course thickness and selection of materials as base layer for CC pavements.
5. Analyse the defects in road construction and general pavement failures with remedies

Modules

Module 1

Componentsofroadandpavementstructureincludingsubgrade,drainagesystem,functions,requirementsandsequenceof constructionoperations

Plantsandequipmentforproductionofmaterials-
crushers,mixers,bituminousmixingplants,cementconcretemixers– varioustypes,advantagesandchoice.

Drainage–
Assessmentofdrainagerequirementsfortheroadanddesignofvariouscomponents,drainagematerials, Constructionofsurfaceandsubsurfacedrainagesystemanddesignoffiltermaterialsforroads.Drainageofurbanroads, problems.

Module 2

Roadconstructionequipment–
differenttypesofexcavators,graders,soilcompactors/rollers,paversandotherequipment forconstructionofdifferentpavementlayers–theirusesandchoiceProblemonequipmentusagecharges.

Pre-constructionsurveysandmarkingonground-
Specificationsandstepsfortheconstructionofroadformationin embankmentandcut,constructionstepsforsubgrade(preparationofsubgrade)incutting,fillingandatgrade. Constructionof subgradeinmarshyareasandweak/expansivesoilsandwater-logged-areas.Constructionstepsforgranularsub-base, qualitycontroltests

Module 3

Differenttypesofgranularbasecourse–
WMM,CRM,WBM,specifications,constructionmethodandqualitycontroltests.

Differenttypesofbituminouslayersforbinderandsurfacecourses,theirspecifications(asperIRCandMORTH), constructionmethodandqualitycontroltests.Specialstructuralcourseslikestonematrixasphaltandmasticasphaltand constructionofporousasphalt.

Module 4

Differenttypesofsub-

baseandbasecourseforcementconcrete(CC)pavementandconstructionmethod. Construction ofcementconcrete(PQC)pavementsandjoints,qualitycontrolduringconstruction.ConstructionofspecialCementconcrete pavementslikeinterlocking concreteblockpavements(ICBP),Continuouslyreinforcedcementconcretepavements(CRCP), Fibrereinforcedcementconcretepavements(FRCP),whitetopping,Ultra-thinwhitetoppingetc.

GeneralAspects: Qualityassurance,statisticalapproach,qualitysystemforroadconstruction.Safetyaspectsduringroad constructionandmaintenanceworks.Installationofvarioustrafficsafetydevicesandinformationsystem Principleofconstructionplanning,applicationofCPMandPERT(Problemsnotincluded)

Module 5

Roadmaintenanceworks– daytodayandperiodicmaintenanceworksofvariouscomponentsofroadworksandroad furniture.Preventivemaintenanceofroaddrainagesystem,pavementsandothercomponentsofroad.Preparationofexisting pavement– patching,profilecorrection,Specialmeasurestodealwithreflectioncracksinpavementlayers,slipperinessof surface,etc.Requirementsforrehabilitation,recyclingandre-construction.

Specialproblemsinconstruction&maintenanceofhillroads,landslide,causes,investigation,andpreventive andremedial measures,protectionofembankmentandcutslopes

References

1. FreddyLRoberts,PrithviSKandhaletal,"HotMixAsphaltMaterials,mixturedesignandconstruction"-(2nd Edition),NationalAsphaltPavementAssociationResearchandEducationFoundation,Maryland,USA
2. NationalAsphaltPavementAssociation"HotMixAsphaltPavingHandbook"-5100ForbesBoulevard,Lanhm,MaryLand,USA
3. "HandBookonCementConcreteRoads"-CementManufacturersAssociation,NewDelhi
4. MoRTH"SpecificationsforRoadsandBridgeWorks"-2001,fifthrevision,IndianRoadsCongress
5. MoRTH"ManualforConstructionandSupervisionofBituminousWorks"-2001,IndianRoadsCongress
6. MoRTH"ManualforMaintenanceofRoads"-1989,IndianRoadsCongress
7. Peurifoy, R.L., and Clifford,JS "Construction Planning Equipment and Method"- McGraw Hill Book Co. Inc

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 1

Subject:**Concrete Technology Laboratory - 1**

Subject Code	16CIM L16	IA Marks	20
Number of Lecture Hours/week	3	Exam Marks	80
Total Number of Lecture Hours	38	Exam Hour	03

Credit -02

Course objectives: This course will enable students to

- Make students to learn principles of laboratory experiments
- Understand the importance of laboratory testing of materials

Modules

Modules

- To determine the physical properties of Cement as per BIS Codes
- To determine flakiness and elongation index of coarse aggregates
- To determine silt in fine aggregate
- Determination of specific gravity, moisture and water absorption of aggregates
- Determination of bulk density and voids of aggregates
- Determination of particle size distribution of fine, coarse aggregate by sieve analysis (grading of aggregate)
- To determine necessary adjustment for bulking of fine aggregate
- To determine workability by slump test:
- Compaction factor test for workability
- Flow table and Vee-bee test
- Tests for compressive strength of concrete cubes/cylinder; Split Tensile strength of concrete cylinder; Flexural Strength of concrete beam.

Reference Books:

1. Properties of Concrete by A.M.Neville, ELBS publications.
2. Concrete Technology by A.K. Santhakumar, Oxford Press.
3. Concrete Technology by M.S.Shetty, S.Chand& Co.
4. Relevant IS Condes / standards
5. Concrete Testing Manual

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 2

Subject:**Special Concrete**

Subject Code	16CIM21	IA Marks	20
Number of Lecture Hours/week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hour	03

Credit -04

Course objectives: This course will enable students to

- Understand the
- Understand the

Modules

Module 1

Basic Design Theory: Comparison of mix design by IS and ACI method, Design of HSC Using ErintroyShaklok Method- Ultra High Strength Concrete.

Ferro cement: Introduction, cracking moment and design of Ferro cement elements under tension, construction technique.

Module 2

Self-compacting concrete: Introduction, Materials, Mix design of SCC, Fresh and Hardened Properties of SCC, Production and transportation, Formwork, Applications.

Module 3

Geo-polymer concrete: Constituents of Geo-polymer Concrete, Mixing, Casting, and Compaction of Geo-polymer Concrete, Curing of Geo-polymer concrete, Design of geo-polymer, short and long term properties of Geo-polymer concrete.

Module 4

Recycled concrete: Introduction, properties of recycled aggregate, Methods of recycling and quality, Applications.

Pumped concrete: Introduction, Types of concrete pump, Requirements of a concrete for pumping,Effects of aggregates, cement and admixtures on the pumpability of concrete.

Module 5

Properties of lightweight concrete: Introduction, Production and properties of No-fines concrete, Production and properties of Aerated and foamed concrete and Production and properties of Lightweight aggregate concrete.

Waste Materials in Concrete: Introduction, waste material, waste glass, waste plastic and waste rubber.

Text Books:

2. Advanced Concrete Technology –Process by John Newman and Ban Seng Choo, ISBN 0 7506 5105 9, Elsevier Ltd.
3. Concrete Construction Engineering Handbook by Dr. Edward G. Nawy, CPC Press, 2nd Edition, ISBN 978-0-84937492-0.
4. "Self-Compacted Concrete by-Applying what we know" By Joseph A. Daczko,CPC Press, ISBN-13:978-0-203-84422-9

References :

1. Shetty, M.S.' Concrete Technology, M/S S. Chand & Co. Ltd. New Delhi.
2. Concrete Technology by Dr. Aminul Islam Laskar, University Science Press.

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 2

Subject:**Construction Costing and Material Management**

Subject Code	16CIM22	IA Marks	20
Number of Lecture Hours/week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hour	03

Credit -04

Course objectives: This course will enable students to

- Understand the various Accounting management techniques for successful completion of Construction projects.
- Understand the effect of material management for project organization

Modules

Module 1

Management Accounting: Nature and scope of management accounting, cost accounting, financial accounting and its limitation, Break even analysis

Module 2

Meaning of fund and fund flow analysis, advantages of fund flow statements, limitation and preparation of fund flow statement and cash flow statement

Module 3

Material Management: importance, Integrated material Management, classification of Material, ABC analysis, standardization, purchase management, codification types and its uses

Module 4

Price forecasting benefits and its methods: Average method, moving average method, weighted average method, exponential smoothening.

Module 5

Inventory Management, Store Accounting: LIFO, FIFO, Average cost and market cost, relevant cost of inventory.

References

1. M. N. Arora: "Management accounting", Himalaya Publishing House.
2. Mueller, F.W. Integrated cost and schedule control for construction projects.
3. Gobourne: Cost control in the construction industry.
4. Schedule of rates, specification manuals etc. from PWD
5. Chris Hendrickson and Tung Au: Project Management for Construction

6. Datta : Material Management Procedures, Text and Cases, 2e Prentice Hall
7. Gopalakrishnan , P,Sundaresan , M: Material Management - an Integrated Approach, Prentice Hall.
8. Dobbler and Bart: Purchasing and Supplies Management, Text and Cases, 6e

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 2

Subject:**Project Planning & Construction Management**

Subject Code	16CIM23	IA Marks	20
Number of Lecture Hours/week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hour	03

Credit -04

Course objectives: This course will enable students to

1. Understand the various management techniques for successful completion of Construction projects.
2. Understand the effect of management for project organization

Modules

Module 1

Scope, Meaning and Definition of Construction Project, Project Categories, Characteristics of Project, Project Life Cycle and Phases, Project Management Functions, Roles of Project Manager

Module 2

Planning for Construction Projects, Principles of Planning, Objectives, Resource Planning, Scheduling, Productivity chart, Project tracking

Module 3

Project Management through Networks, AOA and Precedence Networks, CPM, Pert, Critical Path, Slack, Floats, Probability of completion, Resource smoothening and resource leveling

Module 4

Earned Value Management- meaning and definition, Earned value, cost performance index, schedule performance index, cost variances, schedule variance, Final Cost, Final Project Duration

Module 5

Crashing of networks, direct cost, Indirect Cost , Normal cost, crash cost, cost-time optimization, Use of application software for Project Management

References

1. Punmia B.C. and Khandelwal K.K., (1989), "Project Planning and Control with PERT. and CPM", Laxmi Publication II Edn
2. A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition
3. George 1. Ritz, (1994), "Total Construction Project Management", McGraw - Hill Inc.

4. Sengupta B., Guha M, (1998), "Construction Management and Planning" ,McGraw HillCompanies.

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 2

Subject:**Pre-Engineered Structures**

Subject Code	16CIM24	IA Marks	20
Number of Lecture Hours/week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hour	03

Credit - 04

Course objectives: This course will enable students to
• Understand types and design principles of RC Prefabricated structures and its design principles
• Understand method of analysis and design of structural elements

Modules

Module 1

Types of RC Prefabricated Structures: Long wall and cross wall large panel buildings- One way and two way prefabricated slabs - Framed buildings with partial and curtain walls, single storey industrial buildings with trusses and shells - Crane – Gantry systems.

Module 2

Functional Design Principles: Modular coordination – Standardization - Disuniting, Diversity ofprefabricates – Production – Transportation – Erection - Stages of loading and codal provisions- Safety factors - Material properties - Deflection control - Lateral load resistance - Location andtypes of shear walls.

Module 3

Floors, Stairs and Roofs: Types of floor slabs – Methods of Analysis and design example of cored and panel types and two-way systems - Staircase slab design - Types of roof slabs and insulation requirements - Description of joints, behavior and requirements - Deflection controlfor short term and long term loads - Ultimate strength calculations in shear and flexure.

Module 4

Walls: Types of wall panels - Blocks of large panels – Curtain partition and load bearing walls Load transfer from floor to wall panels – Vertical loads Eccentricity and stability of wall panels –Use of Design curves -Types of wall joints, their behavior and design – Leak prevention, Joint sealents, sandwich wall panels.

Module 5

Industrial Buildings: Components of single storey industrial sheds with crane gantry systems - Design aspects of R.C. Roof Trusses - Roof panels R.C. Crane - Gantry Girders - Corbels and columns and Wind bracing.

References

1. Marashev, V.I.Sigalov, E.Y.Baikov, U.N., “Design of RC Structures”, Mir Publishers, Moscow.
2. “SERC, Design & Construction of Prefabricated Residential & Industrial Buildings”, Organized by SERC, Chennai.
3. B.Leweicki, “Building with Large Prefabrication”, Elsevier Publishing Co.

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 2

Subject:**Statistics & Numerical Analysis in Construction**

Subject Code	16CIM251	IA Marks	20
Number of Lecture Hours/week	3	Exam Marks	80
Total Number of Lecture Hours	38	Exam Hour	03

Credit -03

Course objectives: This course will enable students to

- Develop analytical capability and to impart knowledge in Statistical methods
- Utilize knowledge of statistical methods & its applications in real world construction problems

Modules

Module 1

Various Statistical Measures: basic probability, sample space, events, axioms of probability conditional probability, independent events.
Random variables, continuous/Discrete random variables, exception, valance, Convenience, conditional distributions, moment generating functions.

Module 2

Multiple regressions: Distributions, Bernoulli, Binomial, Poisson, Uniform, Normal, Exponential, Chisquare T and F.

Module 3

Sample statistics, empirical distributions, and goodness of fit, sampling fromnormal populations.
Parameter estimation: moment method, maximum likelihood, interval estimated.Hypothesis Testing, Significance Intervals.

Module 4

Numerical Methods:
Basics: Summary of basic concepts from Linear algebra and numerical analysis, Matrices, Operation counts, Matrix Norms, Type of Errors in Numerical computation.

Module 5

Matrix Factorization and Linear System:
Cholesky Factorization, QR factorization by House holder matrices Lufactorization and Gaussian elimination, partial pivoting, error Analysis (statement of result) soling triangular system by substitution, solving full systems by factorization. Lu-factorization for banded and sparse matrices, storage schemes, Iterative Methods, Jacobi, Gauss – Seidal and SOR Iterations, Conjugate gradient method, preconditioning.

References

1. Miller,FreundHall'ProbabilityandStatisticsforEngineers'–, PrenticeIndiaLtd.
2. PipesandHarvill'AppliedMathematicsforEngineersandPhysiscists'-.McGraw HillInternationalEdition.
3. SamplingtechniquesCochran,WileySeries.
4. Numericalmethods,E.Balaguruswami,McGrawHillpublication.
5. NumericalMethods:Problems&Solutions,JainMk,IyengarSrk,JainRk,WileyEasternLtd.

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 2

Subject:**Bridge and Grade Separated Structures**

Subject Code	16CIM252 / 16CHT252	IA Marks	20
Number of Lecture Hours/week	3	Exam Marks	80
Total Number of Lecture Hours	38	Exam Hour	03

Credit -03

Course objectives: This course will enable students to

1. Understand the
2. Understand the

Modules

Module 1

Geometry -Traffic lane, road way, footpaths, and clearance for vehicles, kerb, crash barrier, parapet, lighting, horizontal and vertical alignment, super-elevation, drainage
Substructures: soil exploration techniques. piling methods, pile types, pile testing, Pile concreting.

Module 2

Caissons or well foundations: Caisson construction and sinking methods,- bed preparation, supporting structures, excavation method, de-watering for freeing a 'hanging' caisson, pneumatic sinking of caissons, methods of staining and bottom plugging

Module 3

Superstructure: Economics of reinforced concrete superstructure, pre-stressed concrete superstructure - composite and steel superstructure, special superstructures. Slab, T-beam and Box girder deck slab construction: Slab type, T-beam and box-girder bridges Decks Construction methods. Span lengths -deck and stiffening system.

Module 4

Segmental Construction, Cantilever Construction and Successive Launching: Introduction to Precast segmental construction for long-span bridges- cables and their profiling – deck section - soffit surface -deflection and pre-camber - expansion joint - bearings - aesthetics. Cable-stayed bridge construction - Construction methods - cable configuration - towers – multi span cable stayed bridges - stay tendons - aerodynamic stability.

Module 5

Composite Construction: Steel - concrete composite construction - theory of composite structures -Introduction to steel - concrete - steel sandwich construction.
RE Panel Structures - Geosynthetics, functions and applications, reinforced retaining walls, construction methods, benefits

References

1.ChewYitLin,Michael,ConstructionTechnologyforTallBuildings,SingaporeUniversity Press,WorldScientific,HongKong,
2. Victor.D.J,EssentialsofBridgeEngineering,OxfordIBH
3.Ponnuswamy.S,BridgeEngineering,TataMcGrawHill
4. RainaV.K.ConcreteBridgepractice,TataMcGrawHillPublishingCo.
5.DerrickBeckett,AnIntroductiontoStructuralDesignofConcreteBridges,SurryUniversityPress,OxfordShire
6. Fleming.W.G.K., et al.,PilingEngineering,SurreyUniversityPress,London.

7. E.C.Hambly,Bridgedeckbehaviour,ChapmanandHall,London
8. N.KrishnaRaju,Designof bridges,Oxford&IBHpublishingCo.Ltd.,NewDelhi.
9. IRC:5, Standardspecificationsandcodeof practiceforroadbridges,SectionsItoV,Indian RoadsCongress,NewDelhi.
10. Indianrailwaystandardcodeof practiceforthedesignof steelorwroughtiron bridgecarryingRail,roadorpedestriantraffic,Govt.ofIndia,MinistryofRailways,

[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 2

Subject:**Ground Improvement Techniques**

Subject Code	16CIM253 / 16CHT253	IA Marks	20
Number of Lecture Hours/week	3	Exam Marks	80
Total Number of Lecture Hours	38	Exam Hour	03

Credit -03

Course objectives: This course will enable students to

- Introduce the various types of improvement methods of engineering properties soils
- Introduce the application of engineering methods to ground improvement projects
- Basic knowledge on various ground improvement techniques and their suitability for various types of soil conditions
- The skills of implementation of geotechnical knowledge in field situations

Modules

Module 1

Introduction - Need and objectives of ground improvement, classification of ground modification techniques , trends in ground improvement, Engineering properties of soft, weak and compressible deposits; Principles of treatment;
Methods of compaction: Blasting, dynamic consolidation, pre-compression and compaction piles.

Module 2

Methods of dewatering: open sumps and ditches, well point system, electro-osmosis, Vacuum dewatering wells; pre-loading without and with sand drains, strip drains and rope drains.
Stabilisation: With admixtures like cement, lime, calcium chloride, fly ash and bitumen. Methods of soil improvement-lime stabilisation and injection; thermal, electrical and chemical methods;

Module 3

Soil reinforcement: Reinforcing materials, concept of confinement, gabbion walls; Dynamic consolidation, Vibroflotation, Pre-consolidation with vertical drains, Granular piles, Soil nailing, Anchors & Thermal methods

Module 4

Improvement of Foundation Soils
(a) Improvement of granular soils: term used to describe degree of compactness –relative density, density ratio and degree of compaction;
Methods - Vibration at ground surface, factors influencing roller compaction;deep dynamic compaction, vibro-compaction impact at depth.
(b) Improvement of cohesive soils: preloading, or dewatering, methods of installing: sand drains,drain wicks, electrical and thermal methods.

Module 5

Grouting: Materials of grouting, grouting techniques and control; purpose, functions, types of grouts; soil bentonite - cement mix; Emulsions & solutions; grout injection methods;

Geo-synthetics: types, functions & Classification ofgeo-textiles. Specific Applications: Bearing capacity improvement, reinforcement, Retaining walls, embankment etc.

References:

1. ManfredR.Hansmann-Engineeringprinciplesofgroundmodification-Me.Graw-Hillpub. Co.,NewYork.
2. RobertM.Koerner-ConstructionandGeotechnicalmethodsinFoundationEngineering- Mc.Graw-HillPub.Co.,NewYork..
3. Winterkornand Fang - Foundation Engineering Hand Book - Van NostrandReinhold Co.,NewYork.
4. ArisC.StamatopoulosPanaghiotisC.Kotzios-SoilImprovementbyPreloading–John Wiley&SonsInc.Canada.
5. P.PurushothamaRao-GroundImprovementTechniques-LaxmiPublications

Subject Code	16CIM254	IA Marks	20
Number of Lecture Hours/week	3	Exam Marks	80
Total Number of Lecture Hours	38	Exam Hour	03
Credit -03			

Course objectives: This course will enable students to

- Understand the concept of fire resistance in structures
- Understand quality policies in the construction industry
- Adopt proper maintenance methods for structures

Modules

Module 1

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

Module 2

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

Module 3

Quality policy in construction industry: Consumer satisfaction, Ergonomics-Time of Completion-Statistical Tolerance-Taguchi's concept of quality.

Module 4

Contract and construction programming-Inspectional procedures. Total QA/QC Program and cost implication.

Module 5

Different aspects of quality - Appraisals - failure mode analysis, Stability methods and tools, Influence of drawings, detaling, specification, Standardization-Bid preparation. Construction activity, Environmental safety, Social and environmental factors

Text Books:

1. Clarkson H. Oglesby, Productivity Improvement in Construction, McGraw Hill, 2000.
2. James, J.O Brian, Construction Inspection Handbook - Quality Assurance and Quality Control, Van Nostrand, New York,1989.
3. Juran Frank, J.M. and Gryna, F.M. Quality Planning and Analysis, Tata McGraw Hill, 1982

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

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 2

Subject:**Concrete Technology Laboratory - 2**

Subject Code	16CIM26	IA Marks	20
Number of Lecture Hours/week	4	Exam Marks	80
Total Number of Lecture Hours	42	Exam Hour	03

Credit -02

Course objectives: This course will enable students to

- Make students to learn principles of laboratory experiments
- Understand the importance of laboratory testing of materials, Concrete Mix Design
- Understand the principles of non destructive testing

Modules

Modules

- Mix design of concrete as per IS, ACI & BS methods for concrete.
- Effect of minerals and chemical admixtures in concrete at fresh and hardened state with relevance to workability, strength and durability.
- Flow Characteristics of Self Compacting concrete.
- Test on Recycle aggregates.
- Permeability tests on hardened concrete – Demonstration.
- Characterization of Geo-polymer concrete.
- Non-destructive test on concrete by: - Demonstration
  (a) Rebound Hammer Test
  (b) Ultrasonic Pulse Velocity Test
  (c) Profometer /covesometer

Reference:

1. Properties of Concrete by A.M.Neville, ELBS publications.
2. Concrete Technology by A.K. Santhakumar, Oxford Press.
3. Concrete Technology by M.S.Shetty, S.Chand & Co.
4. Relevant IS Condes / standards; BS Codes; ACI Codes.
5. Concrete Testing Manual
6. Advanced Concrete Technology –Process by John Newman and Ban Seng Choo, ISBN 0 7506 5105 9, Elsevier Ltd.
7. Concrete Construction Engineering Handbook by Dr. Edward G. Nawy, CPC Press, 2nd Edition, ISBN 978□0□8493□7492□0.
8. “Self-Compacted Concrete by-Applying what we know” By Joseph A. Daczko,CPC Press,ISBN-13:978-0-203-84422-9

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 4

Subject:**Construction Quality & Safety Management**

Subject Code	16CIM41	IA Marks	20
Number of Lecture Hours/week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hour	03

Credit -04

Course objectives: This course will enable students to

1. Understand the various types Quality Management and its importance
2. Understand the importance of safety in construction industry

Modules

Module 1

Evolution of quality management, importance of quality, quality tree, benefits of quality, types of quality, customer driven definitions of quality, quality in production system

Module 2

Cost of quality, quality control: objectives of qc, inspection, quality at source, Quality control strategy and policy, Quality Assurance, Quality assurance system, principles of total quality control

Module 3

Meaning , definition, uses and drawbacks : Total Quality management, ISO Certification, SIX Sigma, Quality Circles, Causes and Effect Diagram

Module 4

Safety in Use of Construction equipments: Human Factors in Construction Safety management Motivation: Management, Supervisors, Workers, Motivational schemes. **Safety Management**: Role of first line supervisors, Role of middle managers, Role of workers, top management practices, safety audit, Safety in site preparation, Design, safety culture, Top Management, Company Activities and Safety - Safety Personnel - Sub-contractual Obligation - Project Coordination and Safety Procedures

Module 5

Safety Procedures for various construction operations: Drilling and Blasting operation, Excavation, storing construction materials Excavation -timbering-scaffolding- safe use ofLadders-safety in welding.

References

1. Leavenworth, “Statistical Quality Control” Grant Publication.
2. BesterField,”Total Quality Management”, by Pearson Education
3. Juran Frank, J.M. and Gryna, F.M, Quality Planning and Analysis, Tata McGraw Hill, 1982.
4. Hutchins.G, ISO 9000, Viva Books, New Delhi, 1993.
5. Clarkson H. Ogiesby, Productivity Improvement in Construction, McGraw-Hill, 1989.
6. IS, IRC, Other codes
7. Jimmy W. Hinze, Construction Safety, Prentice Hall Inc., 1997
8. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and Health
9. Management, Prentice Hall Inc., 2001.
10. Hand Book on Construction Safety Practices, SP 70, BIS 2001.
11. K Sridhara Bhat, Totatl Quality Management, Himalaya Publishing House,2014

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 4

Subject:**Foundation Technology**

Subject Code	16CIM421	IA Marks	20
Number of Lecture Hours/week	3	Exam Marks	80
Total Number of Lecture Hours	38	Exam Hour	03

Credit -03

Course objectives: This course will enable students

- To learn about types and purposes of different foundation systems and structures.
- To provide students with exposure to the systematic methods for designing foundations.
- To discuss and evaluate the feasibility of foundation solutions to different types of soil conditions considering the time effect on soil behavior.
- To build the necessary theoretical background for design and construction of foundation systems.

Modules

Module 1

Bearing Capacity

Definition and terms used related to bearing capacity; Bearing capacity theories and empirical methods - Terzaghi's Method, Skempton's analysis for clays, Mayerhof's analysis, BIS Method (IS: 6403) – (Excluding Numerical Problems) Effects of water table fluctuation and eccentric foundation base in calculating ultimate bearing capacity; Test procedure for determination of Bearing Capacity from field tests - Plate Load Test, Standard Penetration Test, Cone Penetration Test: advantages and limitations (excluding numerical problems); Factors influencing Bearing Capacity;

Module 2

Shallow Foundations

General types of Foundation – Classification and Types; Construction Aspects;
Choice of foundation type and Preliminary Selection;
Design features and construction details related to size and depth of footing; (numerical problems excluded)
Raft Foundations: Common types of Raft foundations; General considerations in design of rafts; construction aspects of raft; (numerical problems excluded)
Coefficient of sub-grade reaction – importance, application;
Environmental considerations - Frost heave: effects, its causes and prevention;

Module 3

Deep Foundations

Types of deep foundations – Piles, Piers and Cassions; Piles: Classification of piles – Based on Function – End Bearing, Friction, Tension, Compaction, anchor, fender, sheet, batter, laterally loaded pile etc.; Based on Composition and material – timber, steel, Concrete; Based on Method of installation – Driven, cast-in-situ, driven and castin- situ - Brief details, advantages and disadvantages; Installation of Pile: Equipment for installation of piles by driving and boring, cast in situ place method;

Module 4

Pile Capacity: Load transfer mechanism (only concept); Methods of determining ultimate load bearing capacity (only methods; no theoretical aspect / problems); Piles in group – concept of pressure isobars and typical arrangement only; Concept of negative skin friction and uplift capacity of piles (only concept);
Drilled Piers: Types - *Straight-shaft end-bearing piers, Straight-shaft side wall friction piers, Combination of straight shaft side wall friction, Belled or under reamed piers;* Advantages and disadvantages; Methods of Construction – The dry, casing and slurry methods;
Cassions: Introduction, Types – Open, Pneumatic & Floating Cassions – Components, Advantages and disadvantages;

Module 5

Soil Stability

Retaining walls: Introduction, Types of earth retaining structures, Modes of failure of retaining walls, drainage of backfill, Types of earth pressure – Active, passive, earth pressure at rest (only concept, no earth pressure theories); Stability considerations for retaining walls; (numerical problems excluded)
Braced and Un-braced Excavations; Sheet Piles: Introduction, Sheet Pile Structures – Cantilever, anchored, braced sheeting, single cell cofferdams, cellular cofferdams; (only types, numerical problems excluded)
Shoring and Underpinning: Necessity and Methods;

References

1. VNSMurthy,GeotechnicalEngineering–PrinciplesandPracticesofSoilMechanicsand FoundationEngineering,MarcelDekkerInc.,NewYork
2. C.Venkatramaiah,GeotechnicalEngineering,3e,NewAgeInternational(P)Ltd.,2006
3. TomlinsonMJ,FoundationDesignandConstruction,PearsonEducation,7e,2001
4. BowlesJosephE,FoundationAnalysisandDesign,McGrawHill.
5. .BrajaM.Das,Principlesof FoundationEngineering,6e,Thomson,2007
6. BCPunmia,SoilMechanicsandFoundations,16e,LaxmiPublications(P)Ltd.,2005
7. IS6403: 1981(Reaffirmed2002)-DeterminationofbearingcapacityofShallowfoundations, Bureauof IndianStandards,NewDelhi.
8. IS8009:1980-Part–I&II-CalculationofSettlementofFoundation,BureauofIndian Standards,NewDelhi.
9. TomlinsonMJ,PileDesignandConstructionPractice,Taylor&Francis,5e,2008

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 4

Subject:**Maintenance and Rehabilitation of Structures**

Subject Code	16CIM422	IA Marks	20
Number of Lecture Hours/week	3	Exam Marks	80
Total Number of Lecture Hours	38	Exam Hour	03

Credit -03

Course objectives: This course will enable students to

- 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

Module 1

Maintenance, repair and rehabilitation: Facets of maintenance- Assessment procedure for evaluating a damaged structure –Inspections, study of soil report, existing as built drawings, variation in design loads etc.
Causes of distress- foundation, floor, walls, roof etc. Durability of materials - types of problems in components such as foundations, roofs, floors, walls, etc - safety evaluation of existing structures -failure patterns and controls. Causes of Deterioration, preventive measurements and maintenance; Principles of assessment of existing structures.

Module 2

Investigation and Diagnosis: General Considerations - Observation - Questioning - Characteristics of materials; Diagnosis of construction failures;
Field and Laboratory Testing - Destructive Testing - Non-Destructive Testing – Rebound Hammer - Ultrasonic Pulse Velocity - Pachometer -Semi-Destructive Testing - Probe Test - Pull- Out Test - Pull-Off Test - Break-Off Test - Core Test - Half-Cell Potential Measurements - Resistivity Measurements - Carbonation Depth Testing - Tests for determining cement content, chloride content and sulphate content.

Module 3

Repair Materials: Dealing with cracks; Methods of repair in concrete, Steel and timber structural components; Corrosion damage of reinforced concrete and its repair and prevention measures; Corrosion of steel reinforcement: Factors influencing corrosion - corrosion protection of steel structure - masonry deterioration.
Surface deterioration, Efflorescence, causes, prevention and protection;

Module 4

Surface coatings and painting; Water proofing; Grouting; Strengthening of existing structures; Special repairs, maintenance, Inspection and planning. Budgeting and management. Patching Materials - Resurfacing Materials - Sealing Materials - Water-Proofing Materials - Admixtures - Substrate Preparation.
Refurbishment and Protection Techniques - Routing and Sealing - Stitching - External Stressing - Resin Injection - Grouting - Blanketing -Overlays - Sprayed Concrete - Prepacked Concrete - Dry packing - Jacketing - Plate Bonding -Protective Coatings - Autogenous Healing – Vacuum Impregnation - Chloride Extraction - Cathodic Protection.

Module 5
Maintenance: Bridge maintenance techniques-factors affecting deterioration of dams, detection methods, remedial measures Maintenance of various buildings and structures – Components of pavement management system – pavement maintenance measures – pavement preservation techniques.
References
1. PeterH.Emmons,ConcreteRepairandMaintenance,GalgotiaPublishers 2. S.Champion,FailureandRepairofConcreteStructures,JohnWiley&Sons 3. Ted Kay, Assessment and Renovation of Concrete Structures, Longman Scientific &Technical 4. R.T.L.AIlen andS.C.Edwards,RepairofConcreteStructures,Blackie&Son,1987 5. SidneyM.Johnson,Deterioration,Maintenanceand RepairofConcrete Structures,McGraw-HillBook 6. P.H.Perkins,Repair,ProtectionandWaterproofingof ConcreteStructures,E&FNSpon 7. R.N.Raikar,DiagnosisandTreatmentof StructuresinDistress,StructwelD&CPvt. Ltd 8. RansemW.H,BuildingFailures,E&F.N,SPONLtd,1981 9. Ralph Haas, Ronald Hudson and Zaneiswki, Modern Pavement Management,KreigerPublications

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 4

Subject:**Construction Demolition and Waste Management**

Subject Code	16CIM423	IA Marks	20
Number of Lecture Hours/week	3	Exam Marks	80
Total Number of Lecture Hours	38	Exam Hour	03

Credit -03

Course objectives: This course will enable students to

- 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

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.

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

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.

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

Module 5

Future developments Potential future markets; ‘smart' materials; use of eco−materials.

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”

SYLLABUS FOR M Tech., Infrastructure Construction and Management
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – 4

Subject: **Sustainable Constructions**

Subject Code	16CIM424	IA Marks	20
Number of Lecture Hours/week	3	Exam Marks	80
Total Number of Lecture Hours	38	Exam Hour	03

Credit -03

Course objectives: This course will enable students to

- Demonstrate competent knowledge of Sustainability, their potentials, their relation, pros and cons;
- Identify specific actions that can be taken to conserve energy and to promote the development and use of renewable energy;

Modules

Module 1

Sustainable Construction Materials - Marginal materials, recycled materials, design aspects, construction practices using non-conventional materials and methods, milling and recycling techniques

Module 2

Energy Savings in Construction - Fundamentals of energy - Energy production systems, Energy and resource conservation, Energy efficient design strategies, Renewable energy sources – advantages and disadvantages; Energy management and conservation: electrical equipment - Improvement of power factor -maximum energy demand

Module 3

Energy savings in electrical appliances used in buildings (pumps, fans, Compressed air systems, lighting systems, Air conditioning systems):
Energy in building materials, energy efficient and environment friendly building: Thermal comfort and solar radiations

Module 4

Green building rating system: Introduction to IGBC and LEED rating systems – various criteria for building rating

Module 5

Pollutions and Management: air, water, noise pollutions and reduction measures during planning, design and construction;

References

1. Moore F:Environmental Control System McGraw Hill, Inc., 1994.
2. K S Jagadish, B V Venkataramana Reddy, K S Nanjunda Rao: Alternative Buildings Materials and Technologies, New Age International Publishers, New Delhi, 2007
3. Brown, G Z, Sun, Wind and Light: Architectural design strategies, John Wiley, 1985