

INTEGRAL UNIVERSITY

LUCKNOW

SYLLABUS

OF

M. TECH

(Construction Technology and Management)

For Batch Starting 2016-17

Study & Evaluation Scheme (Full Time)

M.Tech (Construction Technology & Management)

SYLLABUS REVISED-2016

w.e.f. July-2016

S. No.	Course Category	Code No	Name of Subject	PERIODS			Credits	EVALUATION SCHEME				Subject Total
				L	T	P		SESSIONAL EXAM			EXAM. ESE	
								CT	AT	Total		
Semester-I												
01.	DC	CE541	Infrastructure Planning & Contract Management	3	1	-	4	25	15	40	60	100
02.	DC	CE542	Project Management in Construction	3	1	-	4	25	15	40	60	100
03.	DC	CE543	Construction Methods & Equipment Management	3	1	-	4	25	15	40	60	100
04.	DC	CE544	Urban Transportation Planning	3	1	-	4	25	15	40	60	100
05.	DC	CE545	Tender & specification preparation Field work	-	-	3	2	---	--	60	40	100
Total							18					500
Semester – II												
01.	DC	CE546	Infrastructural Economics & Finance	3	1	-	4	25	15	40	60	100
02.	DC	*BM540	*Corporate Law & Arbitration	3	1	-	4	25	15	40	60	100
03.	DC	CE547	Quality & Safety Management in Construction	3	1	-	4	25	15	40	60	100
04.	DC	CE548	Modern Construction Techniques	3	1	-	4	25	15	40	60	100
05.	DC	CE549	Advanced Pavement Engineering Laboratory	-	-	3	2	--	--	60	40	100
Total							18					500

TA- Teacher Assessment; **ESE** – End Semester Examination; **CT-** Cumulative Test.

Note : Duration of ESE shall be 03 (Three) hours per subject.

***BM540- Taught by MBA Department**

Study & Evaluation Scheme (Full Time)

M.Tech (Construction Technology & Management)

SYLLABUS REVISED-2016

w.e.f. July-2016

S.No.	Course Category	Code No	Name of Subject	PERIODS			Credits	EVALUATION SCHEME				Subject Total
				L	T	P		SESSIONAL EXAM			EXAM. ESE	
								CT	AT	Total		
Semester-III												
01.	DE	CE641-CE644	Elective –I	3	1	-	4	25	15	40	60	100
02.	DE	CE647-CE650	Elective –II	3	1	-	4	25	15	40	60	100
03.	DC	CE653	Sustainable Design & Value Analysis	3	1	-	4	25	15	40	60	100
04.	DC	CE654	Construction Management Software laboratory	-	-	2	2	---	---	60	40	100
05.	DC	CE655	Dissertation (Phase –I)	-	-	3	4	---	---	60	40	100
Total							18					500
Semester – IV												
01.	DC	CE656	Dissertation (Phase –II)	-	-	12	18	---	---	60	40	100
Grand Total												1600

TA- Teacher Assessment; ESE – End Semester Examination; CT- Cumulative Test.

Note : Duration of ESE shall be 03 (Three) hours per subject.

Study & Evaluation Scheme (Evening)

M.Tech (Construction Technology & Management)

SYLLABUS REVISED-2016

w.e.f. July-2016

S.No.	Course Category	Code No	Name of Subject	PERIODS			Credits	EVALUATION SCHEME				Subject Total
				L	T	P		SESSIONAL EXAM			EXAM. ESE	
								CT	AT	Total		
<u>Semester-I</u>												
01.	DC	CEE541	Infrastructure Planning & Contract Management	3	1	-	4	25	15	40	60	100
02.	DC	CEE542	Project Management in Construction	3	1	-	4	25	15	40	60	100
03.	DC	CEE545	Tender & specification preparation Field work	-	-	3	2	---	---	60	40	100
Total							10					300
<u>Semester – II</u>												
01.	DC	CEE546	Infrastructural Economics & Finance	3	1	-	4	25	15	40	60	100
02.	DC	*BME540	*Corporate Law & Arbitration	3	1	-	4	25	15	40	60	100
03.	DC	CEE549	Advanced Pavement Engineering Laboratory	-	-	3	2	---	---	60	40	100
Total							10					300

TA- Teacher Assessment; ESE – End Semester Examination; CT- Cumulative Test.

Note : Duration of ESE shall be 03 (Three) hours per subject.

***BM540- Taught by MBA Department**

Study & Evaluation Scheme (Evening)

M.Tech (Construction Technology & Management)

SYLLABUS REVISED-2016

w.e.f. July-2016

S.No.	Course Category	Code No	Name of Subject	PERIODS			Credits	EVALUATION SCHEME				Subject Total
				L	T	P		SESSIONAL EXAM			EXAM. ESE	
								CT	AT	Total		
<u>Semester-III</u>												
01.	DC	CEE543	Construction Methods & Equipment Management	3	1	-	4	25	15	40	60	100
02.	DC	CEE544	Urban Transportation Planning	3	1	-	4	25	15	40	60	100
03.	DC	CEE654	Construction Management Software laboratory	-	-	3	2	---	---	60	40	100
Total							10					300
<u>Semester – IV</u>												
01.	DC	CEE547	Quality & Safety Management in Construction	3	1	-	4	25	15	40	60	100
02.	DC	CEE548	Modern Construction Techniques	3	1	-	4	25	15	40	60	100
03.	DE	CEE647- CEE650	Elective –II	3	1	-	4	25	15	40	60	100
Total							12					300

TA- Teacher Assessment; **ESE** – End Semester Examination; **CT-** Cumulative Test.

Note : Duration of ESE shall be 03 (Three) hours per subject.

Study & Evaluation Scheme (Evening)

M.Tech (Construction Technology & Management)

SYLLABUS REVISED-2016

w.e.f. July-2016

S.No.	Course Category	Code No	Name of Subject	PERIODS			Credits	EVALUATION SCHEME					Subject Total
				L	T	P		SESSIONAL EXAM			EXAM. ESE		
								CT	AT	Total			
<u>Semester-V</u>													
1.	DE	CEE641- CEE644	Elective –I	3	1	-	4	25	15	40	60	100	
2.	DC	CEE653	Sustainable Design & Value Analysis	3	1	-	4	25	15	40	60	100	
3.	DC	CEE655	Dissertation (Phase –I)	-	-	3	4	-	-	60	40	100	
Total							12					300	
<u>Semester – VI</u>													
1.	DC	CEE656	Dissertation (Phase –II)			12	18	-	-	60	40	100	
Total												1600	

TA- Teacher Assessment; **ESE** – End Semester Examination; **CT-** Cumulative Test.

Note : Duration of ESE shall be 03 (Three) hours per subject.

M.Tech (Construction Technology and Management) (Full Time)

Lists of Electives

Elective –I

CE641 Ready mix concrete design and quality control

CE642 Maintenance & Rehabilitation of Structures

CE643 Prefabricated Structures

CE644 Solid & Hazardous Waste Management

Elective –II

CE647 Transportation Economics

CE648 Principles of affordable Housing

CE649 Building Services & Maintenance Management

CE650 Construction Information Systems

M.Tech (Construction Technology and Management) - Evening

Lists of Electives

Elective –I

- CEE641** Ready mix concrete design and quality control
- CEE642** Maintenance & Rehabilitation of Structures
- CEE643** Prefabricated Structures
- CEE644** Solid & Hazardous Waste Management

Elective –II

- CEE647** Transportation Economics
- CEE648** Principles of affordable Housing
- CEE649** Building Services & Maintenance Management
- CEE650** Construction Information Systems

Infrastructural Planning & Contract Management (CE-541/ CEE-541)

L	T	P
3	1	0

Unit – I

Definitions of infrastructure; Typical infrastructure planning steps; Planning and appraisal of major infrastructure projects; Screening of project ideas; Life cycle analysis; Multi-criteria analysis for comparison of infrastructure alternatives; Procurement strategies; Scheduling and management of planning activities;

8

Unit – II

Economic Analysis – Concepts and Applications, Principles of methodologies for economic analysis of public works, Social welfare function, indifference curves and tradeoffs, Demand curves and price elasticity's; Benefit-cost ratio and internal rate of return; Shadow pricing; Accounting for risk and uncertainty;

8

Unit – III

Financial Evaluation - Time value of money, Investment criteria, Project cash flows – elements and basic principles of estimation, Financial estimates and projections, Cost of capital, Rate of return; Project risk analysis; Political and social perspectives of infrastructure planning; Case studies.

8

Unit – IV

Construction Law - public law; Government Departments and Local Authorities; Private Law, Contracts, property law and building law.

8

Unit – V

Construction Contracts - Contract Specifications, types of contract documents used for construction, Contract Procurement - selecting a contractor, Introduction to BOT and BOOT projects, EPC contracts
Price Adjustment: need for the formulae, comparison with previous system, Civil Engineering and building formulae, practical implications.

8

Total No of periods: 40

References:

1. *P.Chandra, Projects: Planning, analysis, selection, financing, implementation, and review, TataMcGraw-Hill, New Delhi, 2009.*
2. *J.D.Finnerty, Project financing-Asset-based financial engineering, John Wiley & Sons, New York, 1996.*
3. *A.S.Goodman and M.Hastak, Infrastructure planning handbook: Planning, engineering, and economics, McGraw-Hill, New York, 2006*
4. *J.Parkin and D.Sharma, Infrastructure planning, Thomas Telford, London, 1999.*
5. *Gajaria G.T., Laws Relating to Building and Engineering Contracts in India, M.M. Tripathi Private Ltd., Bombay, 1982.*

Project Management in Construction (CE-542/ CEE-542)

L T P
3 1 0

Unit – I

Introduction to project management processes - Initiating, Planning, Executing, Controlling, and Closing processes; Project Integration Management - Project plan development, Project plan execution, and Overall change control;

8

Unit – II

Project Scope Management - Initiation, Scope planning, Scope definition, Scope verification, and Scope change control;

8

Project Time Management - Activity definition - work breakdown structure, Activity sequencing-scheduling logic, precedence diagramming method, arrow diagramming method, Activity duration estimation, Schedule development and analysis - critical path method, program evaluation and review technique, production curves, line-of-balance method, Duration compression, Resource constrained scheduling, Schedule control;

Unit – III

Project Cost Management - Resource planning, Cost estimating, Cost budgeting, and Cost control – earned value method;

8

Quantitative Methods in Construction management: Introduction and concepts of probability and statistics, Linear programming, Transportation and assignment problems. Dynamic programming, Queuing theory, Decision theory, Games theory simulations applied to construction, Modifications and improvement on CPM/PERT techniques.

Unit – IV

Project Resource Management - Resource aggregation, Resource leveling – method of moments, double moments, Resource allocation; Time-cost Tradeoff;

8

Project Quality Management - Quality planning, Quality assurance, and Quality control;

Project Risk Management - Risk identification, Risk quantification, Risk response development and control;

Unit – V

Project Procurement Management - Procurement planning, Solicitation planning, Solicitation, Source selection, Contract administration, and Contract close-out; Material Management; Life-cycle Costing; Value Management; Knowledge Management.

8

Total No of periods : 40

References:

1. T.Hegazy, *Computer-based construction project management*, Prentice Hall, New Jersey, 2002.
2. S.M.Levy, *Project management in construction*, 5th ed., McGrawHill, New York, 2007.
3. PMI, *A guide to the project management body of knowledge*, 3rd ed., Project Management Institute, Pennsylvania, 1996.
4. M. Mawdesley, W. Askew and M. O'Reilly, *Planning and controlling construction projects*, AddisonWesleyLongman Limited, Essex, 1997.
5. J. Kelly, S. Male and D. Graham, *Value management of construction projects*, Blackwell Publishing, Oxford, 2003.
6. Joy P.K, "Handbook of Construction Management", MacMillan Publications, 1991

Construction Methods & Equipment Management (CE-543/ CEE-543)

	L	T	P
Unit – I	3	1	0
Planning Process for Equipment and Methods; Cost of Owning and Operating Construction Equipment - Ownership cost, Depreciation, Operating cost, and Ownership and operating costs calculation methods;			8
Unit – II			8
Equipment Life and Replacement Procedures -Physical, profit and economic life, Replacement analysis; Engineering Fundamentals of Moving Earth – Rolling resistance, Effect of grade on tractive effort, Effect of altitude on performance of IC engines;			
Unit – III			8
Earthmoving, Excavating, and Lifting Equipment Selection-Bulldozers, Front-end Loaders, Scrapers, Trucks, Excavators, Backhoes, Front shovels, Cranes, and Forklifts; Piles and Pile-Driving Equipment; Production of Crushed-stone Aggregate; Concreting Equipment;			
Unit – IV			8
Asphalt Mix Production and Placement - Asphalt Plants, and Paving Equipment; Estimating and Optimizing Construction Equipment System Productivity - Peurifoy's method of optimizing productivity, Phelps' Method, Optimizing hauling system based on loading facility;			
Unit –V			8
Estimation of Equipment Productivity - Mathematical models, Simulations; Scheduling Equipment-Intensive Horizontal Construction Projects - Linear scheduling method, Precedence diagramming method, Developing equipment resource packages; Scheduling Lifting Equipment for Vertical Construction; Equipment Financing Decision - Financing methods, Rental and lease contract considerations.			

Total No of periods : 40

References:

1. D.G.Gransberg, C.M.PopescuandR.C.Ryan, *Construction equipmentmanagement for engineers,estimators,andowners*,Taylor&Francis,NewYork,2006.
2. R. L. Peurifoy, C. J. Schexnayder, A. ShapiraandR. Schmitt, *Constructionplanning, equipment,andmethods*,8thed.,McGrawHill,NewYork,2008.

Urban Transportation Systems Planning (CE-544/CEE-544)

L T P
3 1 0

Unit – I **8**

Introduction to transportation planning; systems approach to transportation planning; types of models; Transportation Systems, urbanization and transportation systems, concept of travel demand and supply; Hierarchy of roads and Capacity: Concept of PCU, capacity and level of service, factors affecting capacity and level of service; capacity of rural and urban roads.

Unit – II **8**

Socio-economic, land use, network, and transport system characteristics affecting transportation planning; study area definition, zoning principles, cordon and screen lines, data collection through primary and secondary sources, sampling techniques;

Unit – III **8**

Transportation planning surveys, transportation planning process; trip generation, modal split, and trip assignment; integration of different modes; travel demand management measures.

Unit – IV **8**

Public Transportation and Transport Facility Design: Technology in transportation, public transport systems, design of parking facilities, design of pedestrian facilities, design of cycle tracks, design of bus facilities, terminal and its functions, transit planning, transit demand, transit route network.

Unit – V **8**

Logistics concepts, important decision areas in logistics, logistics service providers, brief descriptions of legislations, policies and emerging issues affecting logistics, third party logistics, benchmarking, reverse logistics, city logistics, ITS application, e –logistics

Determinants of freight demand, distribution channels, and distribution costs

Total No of Periods : 40

References:

1. P. Chakroborty and A. Das, *Principles of Transportation Engineering*, Prentice Hall of India Pvt. Ltd., 2003.
2. B.G. Hutchinson, *Principles of Urban Transport Systems Planning*, McGraw- Hill Book Co., New York, 1974.
3. L.R. Kadiyali, *Traffic Engineering and Transport Planning*, Khanna Publishers, New Delhi, 2000.
4. G. E. Gray and L. A. Hoel, *Public Transportation*, Prentice Hall, New Jersey, 1992.
5. P. H. Wright, *Highway Engineering*, John Wiley & Sons, 1996.
6. S. K. Khanna and C. E. G. Justo, *Highway Material Testing*, Nem Chand & Bros., 1999.

Tender, Contracts & Specification Preparation &Field work (CE-545/CEE-545)

L	T	P
0	0	3

1. Preparation of Bill of Quantity (2 Lab turns)
2. Valuation, (2 Lab turns)
3. Drafting of tender documents, Specification, special terms and conditions(2 Lab turns)
4. Contract document – Highway projects - Buildings – Bridges(2 Lab turns)
5. Drafting of tender notices for different types of works (2 Lab turns)
6. Drafting of agreement for a turnkey project clearly showing rules and regulations for subletting, escalation and arbitration matters(2 Lab turns)
7. Feasibility Study of Road Projects(2 Lab turns)
8. Feasibility Study of A Multi-Storey Building (2 Lab turns)

Infrastructural Economics & Finance (CE-546/ CEE-546)

	L	T	P
Unit – I Construction accounting - Income statement - Depreciation and amortization - Engineering economics - Benefit-cost analysis - Replacement analysis	3	1	0
Unit – II Break even analysis - Risks and uncertainties and management decision in capital budgeting - Taxation and inflation - Work pricing - contract - bidding and award – revision - escalation - Turnkey activities - Project appraisal and yield			8
Unit – III Working capital management – International finance - Budgeting and budgetary control – Performance appraisal			8
Unit – IV Introduction to Strategic Management Concepts, Strategy Formation and Implementation, External and Internal Environment Analysis, Financial Strategies,			8
Unit –V Decision and Analytical Tools, Corporate Strategic Events, Leadership and Decision-making, Corporate Social Responsibility.			8

Total No of periods : 40

References:

1. *Danny Myers, Construction Economics: A New Approach, Taylor and Francis Publisher, 2004*
2. *Ofori, G, The Construction Industry Aspects of its economics and Management, Singapore University Press*
3. *David Langford, Steven Male, Strategic Management in Construction, 2nd Edition, John Wiley and Sons, 2008.*

Corporate Law & Arbitration (*BM-540/CEE-540)

L	T	P
3	1	0

8

Unit – I

The Indian Contract Act, 1872: Definition of a Contract and its essentials, Formation of a valid Contract - Offer and Acceptance, Consideration, Capacity to Contract, Free consent, Legality of object, Discharge of a Contract by performance, Impossibility and Frustration, Breach, Damages for breach of a contract, Quasi contracts. **Special Contracts** Contract of Indemnity and Guarantee, Contract of Bailment and Pledge, Contract of Agency.

The Companies Act, 1956: Nature and Definition of a Company, Registration and Incorporation, Memorandum of Association, Articles of Association, Prospectus, Kinds of Companies, Directors: Their powers and duties, Meetings, Winding up.

Unit – II

Challenges of managing people in construction; organization and management theory; HRM theory; strategic HRM approaches; operational HRM approaches; employee relations; employee empowerment; diversity and work/life balance; employee welfare; strategic human resource development; employment legislation.

Labour Legislations: Industrial Dispute Act, Factories Act, Payment of Wages Act, Workmen's Compensation Act. Important Provisions of Employees' State Insurance Act, Payment of Gratuity Act, Employees Provident Fund Act

Unit – III

The Information Technology Act, 2000: Definition, Digital Signature, Electronic Governance, Attribution, Acknowledgment and Dispatch of Electronic Records, Sense Electronic Records and Sense Digital Signatures, Regulation of Certifying Authorities, Digital Signature Certificates, Duties of Subscribers, Penalties and Offences.

Unit – IV

The Right to Information Act, 2005: Right to know, Salient features of the Act, obligation of public Authority, Designation of Public Information officer, Request for obtaining information, Duties of a PIO, Exemption from disclosure of information, Partial disclosure of information, Information commissions, powers of Information Commissions, Appellate Authorities, Penalties, Jurisdiction of courts.

Unit – V

Arbitration and litigation procedure- preparation, settlement, evidence, selection of an arbitrator, Arbitration and conciliation act 1996, Case Studies

Total No of periods : 40

References:

1. *Kuchhal M.C.-Business Law (Vikas Publication, 4th Edition)*
2. *Gulshan S.S. -Business Law Including Company Law (Excel Books)*
3. *Avtar Singh -Principles of Mercantile Law (Eastern Book Company, 7th Edition).*
4. *N.D Kapoor & Rajni Abbi- General Laws & Procedures (Sultan Chand & Sons)*
5. *Durga Das Basu- Constitution of India (Prentice Hall of India)*
6. *Relevant Acts*
7. *Joseph T. Bockrath, Contracts and the Legal Environment for Engineers and Architects, 6th Edition, McGraw Hill, 2000.*

Quality & Safety Management in Construction (CE-547/CEE-547)

	L	T	P
	3	1	0
Unit – I			8
Introduction to quality; Importance of quality; Quality transition - quality control and inspection, quality assurance, total quality management; Evolution of quality management;			
Unit – II			8
Planning and control of quality during design of structures; Tools and techniques for quality management; Inspection of materials and machinery;			
Unit – III			8
Quality assurance in construction; Systems quality management; Quality standards/codes in design and construction; (ISO:9000);			
Unit – IV			8
Total quality management (TQM) - principles, tools and techniques. Introduction to safety; Safety and health programs in construction industry; Planning for safety provisions; Analysis of construction hazards and accidents;			
Unit – V			8
Construction hazards and safety guidelines; Prevention techniques for construction accidents; Site management with regard to safety recommendations; Training for safety awareness and implementation; Construction safety and health manual.			

Total No of periods : 40

References:

1. B.G.Dale, *Managing quality*, 4th ed., Blackwell Publishing, Oxford, 2003.
2. D. Reese and J. V. Eidson, *Handbook of OSHA construction safety and health*, 2nd ed., CRC Press, Bocaaton, 2006.
3. F. Harris, R. Mc Caffer and F. Edum-Fotwe, *Modern construction management*, 6th ed., Blackwell Publishing, Oxford, 2006
4. K. Knutson, C. J. Schexnayder, C. M. Fiori and R. Mayo, *Construction management fundamentals*, 2nd ed., McGrawHill, New York, 2008. .
5. S.J. Holt, *Principles of construction safety*, Blackwell Publishing, Oxford, 2008.

Modern Construction Techniques (CE-548/CEE-548)

	L	T	P
Unit – I	3	1	0
Introduction to mix design, Reinforced and pre stressed concrete construction - Prefabricated structures - Production of ready mixed concrete - Productivity analysis			8
Unit – II			8
Construction techniques associated with steel and reinforced concrete framing; floor systems; roof systems; masonry construction; curtain walls; building insulation; and interior and exterior finishes .			
Unit – III			8
Concrete formwork design, construction techniques for high rise buildings, fire resistant construction techniques			
Unit – IV			8
Cost Effective Construction Technique (CECT), repair techniques, innovative construction techniques, prefabrication and pre-casting, modular construction, in-situ pre-fabrication, lift slab and tilt up construction			
Unit – V			8
Case Studies, Implementation in case of housing sectors, Non Destructive Testing, Modern Construction Materials, Smart Materials			

Total No of periods : 40

References:

1. Allen E, Iano, J, *Fundamentals of Building Construction Material and Method*, John Wiley & Sons, 2011.
2. Cameron K. Andres, Ronald C. Smith, *Principles and Practices of Commercial Construction*, 8th Edition, Prentice Hall, 2009.

Advanced Pavement Engineering Laboratory (CE-549/ CEE-549)

L T P
0 0 3

1. Classification of Bitumen Samples on the basis of Penetration Grades
2. Classification of Bitumen Samples on the basis of Viscosity Grades
3. Dry Mix Design (Gradation of Aggregates)
4. Hot Mix Design using Marshalls Methods
5. Study of Modified Binders
6. Binder Content determination in a given mix sample
7. Classified Traffic Volume Count
8. Spot Speed Studies

Sustainable Design & Value Analysis (CE-653/ CEE-653)

	L	T	P
Unit – I Sustainability, challenges in sustainable construction, design construction and equipment, materials and systems, maintenance and conservation, waste materials, site waste management, re-use and recycling of materials,	3	1	0
Unit – II Energy efficient buildings, concepts of green and sustainable buildings, natural lighting, rainwater harvesting,			8
Unit – III solar panels and solar HVAC systems, sustainable building design, rating system, delivery of green buildings			8
Unit – IV Cost-Benefit analysis, economic performance analysis- incremental analysis, economic feasibility analysis; advanced conceptual estimating techniques, quick methods of determining approximate costs of a project,			8
Unit – V life cycle cost analysis- technique of economic evaluation that sums the costs of initial investments, replacements, operations, maintenance and repair investments, case studies			8

Total No of periods : 40

References:

1. AjlaAksamija, “Sustainable Facades: Design Methods for High-Performance Building Envelopes”, Jhon Wiley & Sons Inc
2. Charles J. Kibert, “Sustainable Construction: Green Building Design and Delivery”, Jhon Wiley & Sons Inc
3. Phillip F. Ostwald, “Construction Cost Analysis and Estimating”, Prentice Hall

Construction Management Software Laboratory (CE-654/CEE-654)

L T P
0 0 3

1. Estimate Preparation Using Spreadsheets(2 Lab Turns)
2. Planning and Scheduling of works using MS Project software (2 Lab Turns)
3. Planning and Scheduling of works using PRIMAVERA (4 Lab Turns)

Ready mix concrete design and quality control (CE-641/CEE-641)

L	T	P
3	1	0
8		

Unit – I

Material Properties: Cement; Introduction, Portland cement, chemical composition of raw materials, composition of Cement clinker, Hydration of cement, rate of hydration, water requirement for hydration. Aggregates; Introduction, classification of aggregates, characteristic of fine aggregate and coarse aggregate. Water; Introduction, basic properties. Concrete Admixtures; Introduction, effect on strength/characteristics of concrete, physical and chemical properties. Concrete; Introduction, water-cement ratio, gel-space ratio, strength of concrete, maturity, Permeability.

Unit –II

Pre-Qualification of Source, Procurement, Storage and Sampling: Source selection, sampling, storage and precautions for cement, aggregates, water, concrete admixtures and concrete. Mix design, Combined grading of aggregates, Moisture content of aggregates, Mix proportion per batch of mixing plant, admixtures for concrete and its use.

Unit –III

Quality Control:-Testing/checking of materials and test/check frequency Cement; Physical tests- Fineness, Soundness, Standard consistency, Setting time, Compressive strength, Chemical Analysis, Status of Stock record. Test on Coarse/Fine Aggregate; Alkali reactivity, Chloride and Sulphate, Deleterious Material, Crushing Value, Abrasion value, Impact value, 10% fines value, Soundness, Size and Gradation, Flakiness/elongation value,

Unit –IV

Specific gravity and water absorption, Density and moisture content, Freedom from impurities. Water; Physical and chemical test, Cleaning of storage tanks, Storage adequacy. Concrete; Weigh Mixture, batching plant, Small concrete mixture, vibrators, calibration of Mixtures and Plant. Laboratory Tests Slump test, compressive strength test, Flexural Modules, NDT, Permeability test.

Unit –V

Machine Use Optimization: Lead time, plant capacity, TM capacity, working hour, TM availability, city/Govt restrictions.

Reference Books

- 1- "Properties of Concrete", Naville, A.M., Longman, India
- 2- "Concrete Technology", Naville, A.M., Longman, India
- 3- "Concrete Technology", Gambhir, M.L., TMH, New Delhi, India

Maintenance & Rehabilitation of Structures (CE-642/CEE-642)

L	T	P
3	1	0

Unit –I

Maintenance, repair and rehabilitation, Facets of Maintenance, importance of Maintenance various aspects of Inspection, Damage assessment and Evaluation models, causes of deterioration.

8

Unit –II

Quality assurance for concrete construction concrete properties – strength, permeability, thermal properties and cracking. – Effects due to climate, temperature, chemicals, corrosion – design and construction errors – Effects of cover thickness and cracking

8

Unit –III

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferrocement, Fibre-reinforced concrete. Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Guniting and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coating and cathodic protection.

8

Unit –IV

Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure. Engineered demolition techniques for Dilapidated structures – case studies

8

Unit –V

Aging of structures - performance of structures - need for rehabilitation - Distress in concrete / steel structures- damage - source - cause - effects - case studies – Damagetesting methods - NDT - Core samples - Rehabilitation methods - Repair and maintenance of buildings -Seismic strengthening.

8

Total No of Lectures: 40

References:

1. Shetty, M.S; *Concrete Technology – Theory and Practice*, S.Chand and Company, New Delhi, 1992.
2. Raikar, R., *Learning from failures – Deficiencies in Design, Construction and Service – R& D Centre (SDCPL), Raikar Bhavan, Bombay, 1987.*
3. P.K.Guha, *Maintenance and Repairs of Buildings*, New Central Book Agency (P)Ltd, Kolkata.
4. V K Raina, *Concrete Bridge Practice Construction, Maintenance and Rehabilitation*, 2nd Edition, Shroff Publishers and Distributors, August, 208.

PREFABRICATED STRUCTURES (CE-643/CEE-643)

	L	T	P
UNIT – I	3	1	0
Types of fabrication – Modular co-ordination, components, prefabrication systems and structural schemes; Design considerations; Economy of prefabrication; prefabrication of load carrying members;			8
UNIT – II			8
Disuniting of structures; Design of cross section of load carrying members; Structural behavior of precast structures. Handling and erection stresses.			
UNIT – III			8
Application of pre-stressing of roof members; floor systems; Two way load bearing slabs, wall panels, hipped plate and shell structures.			
UNIT – IV			8
Dimensioning and detailing of joints for different structural connections; construction and expansion joints.			
UNIT – V			8
Production, Transportation & erection; Organization of production, storing and erection equipment; Shuttering and mould design – Dimensional tolerances; Erection of R.C. structures, Total prefabricated buildings.			
Total No of period			40

References:

1. *A.S.G Bruggeling, G.F Huyghe, "Prefabrication with Concrete", CRC Press, January 1991*
2. *IS 8916, " Building Design & Erection Using Prefabricated Concrete" , 208*
3. *R.L Gilbert, N.C Mickeborough, " Design of Prestressed Concrete", Taylor & Francis*
4. *Architectural Precast Concrete, Prestressed Concrete Institute, third edition 2007*

Solid & Hazardous Waste Management (CE-644/CEE-644)

	L	T	P
Unit –I Solid Waste: Origin, characteristics, Quantity and Analysis; Effects of Solid Wastes; Storage, Collection, Transportation of Solid wastes;	3	1	0
Unit –II Solid waste transformation; Product recovery processes; Sanitary landfills; Legislation in solid waste. Hazardous waste: definition, generation, classification; Magnitude of problem; Risk assessment;			8
Unit –III Environmental Legislation; Characterization and site assessment; Waste minimization and resource recovery; Storage and Transportation of Hazardous wastes;			8
Unit –IV Hazard in processing and treatment; Physical, Chemical, Thermal and Biological processes; Hazardous waste disposal;			8
Unit –V Landfill disposal and land storage; Ground water contamination; Containment; remedial alternatives.			8

Total No. Of Lectures: 40

References:

1. Bagchi, A., *Design, Construction and Monitoring of Landfills*, Wiley Interscience, 1994.
2. Haas, C.N. and Vamos, R.J., *Hazardous and Industrial Waste Treatment*, Prentice Hall, 1995.
3. Martin, E.J. and Johnson, J.H., *Hazardous Waste Management Engineering*, Van Nostrand,
4. 1987.
5. Wentz, C.A., *Hazardous Waste Management*, 2nd Ed., McGraw Hill, 1995.
6. Lewandowski, G.A. and DeFilippi, L.J., *Biological Treatment of Hazardous Wastes*, John Wiley & Sons, INC., 1998.
5. Kuhre, W.L., *Practical Management of Chemicals and Hazardous Wastes: An Environmental and Safety Professional's Guide*, Prentice Hall, 1995.

Transportation Economics (CE-647/CEE-647)

L	T	P
3	1	0

8

Unit – I

Introduction to transport economics, overview of basic components of transport, transport and economic development, transport and urban development, Economic theory, transport as an economic activity, demand and supply issues in transportation sector, cost of transport, pricing of transport, law of diminishing returns, demand, supply, equilibrium, elasticity, consumer surplus, costs, pricing and subsidy policies

Unit – II

8

Demand for Transportation: Demand forecasting methods, factors influencing transport demand, direct and cross-price elasticities of demand, factors that cause shifts in demand function.

Traffic Congestion: Main causes of traffic congestion, mechanisms to deal with traffic congestion - congestion pricing, road space rationing, capacity expansion.

Unit – III

8

Costs of Transport: Direct and External costs of transport, concept of generalized costs, social aspects of transport, joint and common costs of infrastructure, short-term and long-term costs of supply, Congestion costs, External costs.

Pricing of Transport Services: Pricing principles:- the marginal cost pricing rule, Efficient pricing, cost complexities and cost recovery, Peak-load pricing, Second-best pricing, Transport subsidies, Price discrimination.

Unit – IV

8

Regulation of Supply of Transport Capacity: Command and control type of regulation, fiscal measures such as road pricing and environmental taxation, Safety and economic regulations in the context of transport services provided by public, issues of social, geographical and temporal equity.

Unit – V

8

Appraisal and Evaluation of Transport Projects: Feasibility and evaluation, cost, impacts and performance levels, evaluation of alternatives, analysis techniques, cost-benefit analysis, social and financial benefits, valuation of time, measures of land value and consumer benefits from transportation projects, prioritization of projects, multi-criteria decision assessment.

Total No. Of Lectures: 40

References:

1. *Emile Quinet and Roger Vickerman, Principles of Transportation Economics, Edward Elgar Publishing.*
2. *Kenneth A. Small and Erik Verhoef, The Economics of Urban Transportation, Routledge.*
3. *Patrick Mccarthy, Transportation Economics, Blackwell Publishing.*
4. *Kenneth J. Button, Transport Economics, Edward Elgar Publishing.*

Principles of Affordable Housing (CE-648/CEE-648)

	L	T	P
Unit –I	3	1	0
Introduction and overview, current trends in affordable housing, project feasibility, affordable housing policy, practice and issues, affordable housing development process,			8
Unit –II			8
Financing affordable housing, site planning, architecture and cost of new and rehabilitated affordable housing, nonprofit housing development, future of affordable housing production			
Unit –III			8
Alternative Building Materials for Low Cost Housing: introduction, substitutes of scarce materials, industrial wastes, agricultural waste, strategies for promotion of alternative building materials			
Unit –IV			8
Low Cost Infrastructural Services: introduction, present scenario, low cost sanitation, domestic waste disposal, water supply, energy			
Unit –V			8
Approaches and strategies for housing urban poor, Adoption of innovative and cost effective construction technology			

Total No. of Lectures:40

References:

1. Lal A.K, “handbook of low cost housing”, New Age Publications
2. SonikyaWole, “principles of Low cost housing”, Springer
3. Monk Sarah, “making more affordable: the role of intermediate tenures”, Jhon Wiley Inc

Building Services & Maintenance Management (CE-649/CEE-649)

L T P
3 1 0

Unit –I

Orientation and Planning - Grouping and circulation - lighting and ventilation - Termite proofing of buildings- Lightning protection of buildings - Fire protection of buildings - Vertical transportation Prefabricationsystems in residential buildings: Planning and modules and sizes of components in prefabrication – Shellstructures - Domes - Folded plate structures - Skeletal and space frame structures

Unit –II

Grain storage structures- Earthquake resistant structures - Air-conditioning and heating - Acoustics and Sound insulation – Plumbing services

Formwork and false work - Temporary work systems, construction planning and site constraints; Materialsand construction of the common formwork and false work systems; Special, and proprietary forms; Concretepressure on forms.

Unit –III

Design of timber and steel forms; Loading and moment of formwork; Types of beam,decking and column formwork; Design of decking; False work design; Effects of wind load, foundation andsoil on false work design; The use and applications of special forms; Sequence of construction; Safety useof formwork and false work

Unit –IV

Functional planning of buildings, optimization of space: Spatial Synthesis graphical techniques, heuristic procedures, formulation of linear and nonlinear optimization problem. Space requirements and relationships fortypical buildings, like residential offices, hospitals, etc.

Unit –V

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

Building Maintenance: Scheduled and contingency maintenance planning M.I.S. for building maintenance.Maintenance standards.Economicmaintenance decisions.

Total No. Of Lectures: 40

References:

1. Arora and Bindra, *Building Construction*, Dhanpat Rai, 2012.
2. *Hand Book of Housing Statistics*, NBO, 2003.
3. *National Building Code of India*, Bureau of Indian Standards, 2005.
4. Austin, C.K., *Formwork for Concrete*, Cleaver, Hume Press Ltd., London, 1996.
5. Michael P. Hurst, *Construction Press*, London and NewYork, 2003.
6. Robert L. Peurifoy and Garold D. Oberiender, *Formwork for Concrete Structures*, McGraw-Hill, 1996.

Construction Information Systems(CE-650/CEE-640)

	L	T	P
Unit –I	3	1	0
Management information systems in construction industry,current integration of computer aided design (CAD),			8
Unit –II			8
Computerized project management systems, use of automated programs for planning, scheduling, estimating and controlling construction projects, data processing and applications in pricing,			8
Unit –III			8
tendering, scheduling and cost control system, simulation of construction operations,internet technology, web applications in construction, use of project planner software			8
Unit –IV			8
Integrated construction Management Information System-Project Management Information System-Functional Areas, Finance, Marketing, Production, Personnel-Levels, DSS, EIS, ES-Comparison, Concepts and Knowledge Representation-Managing International Information System.			8
Unit –V			8
Implementation and Control -Control-Testing Security-Coding Techniques-Detection of Error-Validating-Cost Benefit Analysis-Assessing the Value and Risk of Information System.			8
System audit -Software Engineering Qualities-Design-Production, Service, Software Specification, Software metrics, Software Quality assurance-Systems Methodology-Objectives-Time and Logic, Knowledge and Human Dimension- Software Life Cycle Models-Verification and Validation.			8

Total No. Of Lectures: 40

References:

1. *Kenneth C Laudon and Jane Price Laudon, "Management Information Systems – Organization and Technology", Prentice Hall, 1996.*
2. *Gordon B. Davis, " Management Information System: Conceptual Foundations ", Structure and Development, McGraw Hill, 1974.*
3. *Joyce J Elam, " Case Series for Management Information Systems ", Simon and Schuster, Custom Publishing, 1996.*
4. *Ralph H Sprague and Huge J Watson, " Decision Support for managers ", Prentice Hall, 1996.*
5. *Michael W Evans and John J Marciniak, " Software Quality assurance and Management ", John Wiley And Sons , 1987*
6. *Card and Glass, "Measuring Software Design Quality ", Prentice Hall, 1990.*
7. *Sadagopan S., "Management Information Systems" , Phi Learning, 1997*