

PG Program [M. Tech.- Construction Management] Curriculum Structure
w.e.f. AY 2019-20 and Applicable for batches admitted from AY 2019-20 to 2022-23

List of Abbreviations

Abbreviation	Title	No of courses	Credits	% of Credits
PSMC	Program Specific Mathematics Course	1	4	5.9%
PSBC	Program Specific Bridge Course	1	3	4.4%
DEC	Department Elective Course	3	9	13.2%
MLC	Mandatory Learning Course	2	0	0%
PCC	Program Core Course	6	22	32.4%
LC	Laboratory Course	2	2	2.9%
IOC	Interdisciplinary Open Course	1	3	4.4%
LLC	Liberal Learning Course	1	1	1.5%
SLC	Self-Learning Course	2	6	8.8%
SBC	Skill Based Course	2	18	26.5%

Semester I

Sr. No.	Course Type	Course Code	Course Name	Teaching Scheme			Credits
				L	T	P	
1.	PSMC	CM-19001	Probability and Data Analysis	3	1	--	4
2.	PSBC	CM-19002	Construction Project Planning and Management	3	0	--	3
3.	DEC		Elective – I	3	--	--	3
		CM (DE)-19001	Building Information Management				
		CM (DE)-19002	Application of Geographic Information System				
		CM (DE)-19003	Project Economics and Financial Management				
		CM (DE)-19004	Sustainable Construction				
		CM (DE)-19005	Functional Planning, Building Services and Maintenance Management				
4.	PCC	CM-19003	Operation Research	3	--	--	3
5.	PCC	CM-19004	Construction Equipment and Machinery	3	--	--	3
6.	PCC	CM-19005	Construction Materials and Materials Management	3	--	--	3
7.	LC	CM-19006	Construction Management Laboratory	--	--	4	2
8.	LC	CM-19007	Seminar	--	--	2	1
				Total Credits			22

Interdisciplinary Open Course (IOC): Every department shall offer one IOC course (in Engineering/Science/Technology). A student can opt for an IOC course offered by a department except the one offered by his /her department.

Semester II

Sr. No.	Course Type	Course Code	Course Name	Teaching Scheme			Credits
				L	T	P	
1.	IOC		Interdisciplinary Open Course	3	--	--	3
2.	DEC		Elective – II	3	--	--	3
		CM (DE)-19006	Quality Control in Construction				
		CM (DE)-19007	Construction Safety and Human Resource Development in Construction				
		CM (DE)-19008	Infrastructure Development and Management				
		CM (DE)-19009	Building Sciences				
3.	DEC		Elective III	3	--	--	3
		CM (DE)-19010	Underground Opening				
		CM (DE)-19011	Total Quality Management and MIS in Construction				
		CM (DE)-19012	Sustainability and Urban Planning				
		CM (DE)-19013	Application of Modern Optimization Techniques in Civil Engineering				
		CM (DE)-19014	Formwork in Construction				
4.	LLC	LL-19001	Liberal Learning Course	1	--	--	1
5.	MLC	ML-19011	Research Methodology and Intellectual Property Rights	2	--	--	--
6.	MLC	ML-19012	Effective Technical Communication	1	--	--	--
7.	PCC	CM-19008	Construction Techniques	3	--	--	3
8.	PCC	CM-19009	Construction Cost Dynamics	3	--	--	3
9.	PCC	CM-19010	Professional Practices in Construction	3	--	--	3
10.	LC	CM-19011	Advanced Construction Management Laboratory	--	--	4	2
11.	LC	CM-19012	Mini Project	--	--	2	1
				Total Credits			22

Semester-III

Sr. No.	Course Type	Course Code	Course Name	Teaching Scheme			Credits
				L	T	P	
1.	SBC	CM-19013	Dissertation Phase – I	--	--	18	9
2.	SLC	CM-19014	Massive Open Online Course (MOOC)-I Scheduling techniques in project Advanced concrete technology	3	--	--	3
						Total Credits	Max 12

Semester-IV

Sr. No.	Course Type	Course Code	Course Name	Teaching Scheme			Credits
				L	T	P	
1.	SBC	CM-19013	Dissertation Phase – II	--	--	18	9
2.	SLC	CM-19014	Massive Open Online Course (MOOC) -II Energy efficiency acoustics and day lighting in building Advanced topics in science and technology of concrete	3	--	--	3
						Total Credits	Max 12

Blue Highlighted Text: New Course

(PSMC) CM-19001 Probability and Data Analysis

Teaching Scheme

Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course Outcome

At the end of course, Student will be able to

1. Apply fundamental concepts in exploratory data analysis to civil engineering problems
2. Interpret the classical inference and hypothesis testing
3. Apply various statistical techniques to civil engineering projects

Course Content

Data Collection and Presentation

Data Collection: Primary and Secondary Sources of data, Survey Design, sources of various data in India

Data Presentation: Classification of Data, Tabulation of Data, Charting of Data, Choice of Suitable Diagrams, etc.

Data Analysis: Measures of Central Tendency: characteristics of a Good Average, Arithmetic Mean, Median, Mode, Geometric Mean and Harmonic Mean, etc.

Measures of Variation: Significance of Measuring Variation, Methods of Studying Variation, Average Deviation, Standard Deviation, etc.

Skewness, Moments and Kurtosis: Measures of Skewness, Moments, Kurtosis, etc.

Probability and Data Sampling

Probability: Types of Probability, Random Variable, Probability Function,

Sampling: Purpose and Principle of Sampling, Methods of Sampling, Size of Sample, Merits and Limitations of sampling, Sampling Distribution, etc.

Statistics

Correlation Analysis: Significance, Correlation & Causation, Types of Correlation, Methods of Studying Correlation, Multiple Correlation, etc.

Regression Analysis: Difference between Correlation and Regression, Linear Bivariate Regression Model, Regression Lines, Equations, Coefficients, etc.

Index Numbers: Use of Index Numbers, Unweighted Index Numbers, Weighted Index Numbers, Quantity Index Numbers, Volume Index Numbers, Test for Perfections, etc.

Forecasting and Time Series Analysis

Forecasting: Introduction, Steps in Forecasting, Methods of Forecasting, etc.

Time Series Analysis: Components of Time Series, Straight Line Trends, Non-Linear Trend, etc. Linear Programming & Hypothesis Testing

Linear Programming: methods for maximizing, methods for minimizing, etc. Input-Output Analysis Hypothesis Testing: The Chi (χ^2) Test, The Z-Score Test, The T-Test, Test for Proportion

References

1. Connor, L R and Morreu, A J H (1964): Statistics in Theory and Practice, Pitman, London
2. Kruckerberg and Silvers (1974): Urban Planning Analysis: Methods and Models, John Wiley & Sons, New York

3. Mode, E B (1961): Elements of Statistics, Prentice Hall, New Jersey Naiman, Rosenfeld, Zirekel (1972): Understanding Statistics, McGraw Hill, USA
4. Wannacott and Wannacott (1969): Introductory Statistics, John Wiley & Sons, New York
5. Willams, Ken (ed) (1975): Statistics and Urban Planning, Charles Knight & Co. Ltd, London
6. Yamane, Taro (1964): Statistics – An Introductory Analysis, Harper, New York
7. Gupta S. P. and Gupta M. P. (2005), Business Statistics, Sultan Chand & Sons, New Delhi.

(PCC) CM-19002 Construction Project Planning and Management

Teaching Scheme

Lectures: 3 hrs /week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course Outcome

At the end of course, Students will be able to

1. Evaluate the time cost trade-off of various resources needed on construction project
2. Investigate the practical application of project /construction management
3. Apply, execute and monitor the modern project planning and management practices

Course Content

Traditional management and modern scientific management.

Principles of management, Theories of Taylor, Fayol, Mayo, McGregor, Weber, Gilbreth.

Project Management -Basic forms of organization. Role of planning department in construction projects. Construction Project life cycle. Construction scheduling using Gantt chart, milestone chart.

Network techniques like CPM, PERT, Precedence network (PNA), GERT, Ladder, Line of Balance technique. Updating of network, time-cost trade-offs. Resource constrained scheduling and resource levelling. Applications of CPM/PERT, statistical concepts, Man-Material-Machinery-money optimization

Site layout and mobilization,

Work Study- time and motion study.

Human resource management

References

1. Sengupta and Guha, Construction Management and Planning, Tata McGraw Hill Publication.
2. K Nagrajan, Project Management, New age International Limited.
3. Barrie & Paulson, Professional Construction Management, McGraw Hill Institute Edition.
4. Roy, Pilcher Construction Management
5. Jha, Construction Project Management, Theory and Practice, Pearson

6. Chitkara, Construction Project Management – Planning, Scheduling and Controlling
7. Harris and McCaffer, Modern Construction Management
8. Pilcher R. (1966). Principles of Construction Management. McGraw Hill Publishing Co Ltd
9. O'Brien, Plotnick, CPM in Construction Management, McGraw Hill

(DEC) CM (DE)-19001 Building Information Management

Teaching Scheme

Lectures: 3 hrs /week

Examination Scheme

Test 1 and 2 : 20 marks Each

End-Sem Exam : 60 marks

Course Outcome

At the end of course, Students will be able to

1. Understand BIM concept and process
2. Create architectural, structural & MEP models
3. Extract information from BIM model
4. Creation of families and components
5. Understanding and implementation of 4D, 5D, 6D BIM

Course Content

BIM Concept

What is BIM, BIM development & History, Difference between BIM and Cad, Terms used in BIM, BIM Benefits, Risks and challenges, Present State of BIM Adoption and Road ahead.

Architectural BIM modelling

Building element and Revit element, Revit interface, basic operation, architectural element modelling, views and sheet documentation

Structural BIM modelling

Modelling structural element, create analytical model, structural analysis, documentation

MEP BIM modelling

Modelling for HVAC system, air terminals, mechanical equipment, piping system & plumbing fixture, linking with cross discipline model, create customize families-System families, component families, in place families.

4D- BIM, 5D- BIM, 6D- BIM

Project phasing simulation, Visual validation for construction processes, Real time project monitoring and cost planning, Quantity extraction to support detail cost estimate, Facility Management.

References

1. Willem Kymmell, Building Information Modelling, McGraw-Hill Construction, New York, 2008
2. BS 1192:2007, A2:2016 Collaborative production of architectural, engineering and

construction information. Code of practice

3. PAS 1192-2 Specification for information management for the capital/delivery phase of construction projects using Building Information Modelling.
4. AEC (UK) BIM Technology Protocol Practical implementation of BIM for the UK Architectural, Engineering and Construction (AEC) industry. Version 2.1.1 June 2015 Updated to align with current industry protocols, specification and documents.
5. AEC(UK) BIM Protocol for Autodesk Revit, version 2.0 ,2012
6. Official Autodesk Revit knowledge network guide 2019.
<https://knowledge.autodesk.com/>
7. Marcus Kim, Lance Kirby, Eddy Krygiel, Mastering Autodesk Revit 2017 for Architecture 2016
8. Sham Tickoo, Exploring Autodesk Revit 2017 For Structure 2017
9. Sham Tickoo, Exploring Autodesk Revit 2017 for MEP 2017
10. Brad Hardin, Dave Mccool, BIM and Construction Management: Proven Tools, Methods and Workflows, 2ed, 2015

(DEC) CM (DE) - 19002 Application of Geographic Information System

Teaching Scheme

Lectures: 3 hrs /week

Examination Scheme

Test 1 and 2 : 20 marks Each

End-Sem Exam : 60 marks

Course Outcome

At the end of course, Students will be able to

1. Understand fundamentals of remote sensing
2. Understand GIS
3. Apply knowledge of GIS to construction projects

Course Content

Remote Sensing

Introduction to Remote Sensing – Aerial photography, photogrammetry, Definition of Remote sensing, A tool for resource surveys, Application in land use, land cover analysis and town planning. Electromagnetic Energy – Definition, Properties velocity, wavelength, frequency. Electromagnetic spectrum: definition, wavelength regions, Imaging system, satellite images.

Aerial photography – Types of aerial cameras, Types of photographs, vertical, horizontal, oblique. Geometry of Aerial photographs – Tilt, Swing, Photo nadir, Principle points, principal distance, flying height, air base, overlaps, side laps, methods of scale determination, Image displacement due to relief and tilt, stereoscopic vision.

Satellite Imageries – Satellite platforms and orbit patterns, optical, mechanical, scanners, Infrared scanners, earth resource technology satellite, LANDSAT, SPOT, and IRS.

GIS

Introduction – Definition and meaning, Application to town planning.

GIS Vs. Maps – Advantages and disadvantages

Date Modes for GIS – Raster based data – Rasterization using toposheets, isolines maps and urban maps. Nature of remote sensing data, resolution.

Vector based data – Digitization of point, line aerial boundaries using graphs

Components of GIS – (1) Input (2) Pre-processing (3) Spatial data base – point, line, polygon (4) Analysis (5) Output

Introduction to one Raster based and one vector based GIS package. Application of special functions and compatibility for various types of database.

References

1. Interpretation of Aerial Photography by Thomas Eugene Avery: Bunge Press Pub. Co., Minnesota.
2. Remote Sensing, Principles and Applications by Floyd Sabins; Freeman and Co, New York.
3. Principles of Remote Sensing by P. J. Carran: (ELBS).
4. Remote Sensing and Image Interpretation by Lillesand Thomas M. & Kiefer Ralph W: (John Wiley & Sons Inc. New York)
5. Geographical Information System by D. Hall & R. Babbage (1989) : Bihar – GIS by Lahiri M. (1993)

(DEC) CM (DE)-19003 Project Economics and Financial Management

Teaching Scheme

Lectures: 3 hrs /week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course Outcome

At the end of course, Students will be able to

1. Understand different economic concepts
2. Apply knowledge for financing the projects
3. Analyse and evaluate various investment alternatives and strategies

Course Content

Principles of financial. Capital – fund raising for project, working capital management, Economic Analysis - Cost implication of different forms of construction Financial Planning – sources of finance, Shares and debentures. Construction Accounts – debit, credit, journal, ledger, cash book, trial balance, final balance, depreciation accounting, provisions and reserves. Balance sheet, profit and loss account. Budgeting: types of budgets, budgetary control system. Ratio analysis. Cash flow forecast. Capital budgeting under inflation, risks. Problems of expansion and merger of companies, Corporate tax planning, foreign exchange.

References

1. Prasanna Chandra, Projects Planning, Analysis Selection, Implementation and Review, Tata McGraw Hill, New Delhi.

2. Singh H., Construction Management and Accounts, Tata McGraw Hill, New Delhi.
3. Cormican D., Construction Management: Planning and finance, Construction press, London.
4. Brealey R. A., Principles of Corporate Finance, Tata McGraw Hill, New Delhi.

(DEC) CM (DE)-19004 Sustainable Construction

Teaching Scheme

Lectures: 3 hrs /week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course Outcome

At the end of course, Student will be able to

1. Identify various concepts of sustainable construction
2. Apply sustainability to project planning
3. Choose appropriate sustainable materials and renewable energy techniques for civil engineering projects

Course Contents

MODULE 1

Sustainability and Sustainable Development.

Introduction to course. Introduction to sustainable development Concepts and Theory. Definitions and Prospective on sustainability, Theory and background to sustainable construction planning. The Three E's. Environment, Economics, and Ethics. Ecology of sustainable developments.

MODULE 2

Sustainable Construction Planning.

Introduction to Sustainable construction. Principles of sustainability.

Major Environmental challenges, Global Warming.

Introduction to Green Buildings

Building energy system. Strategies, Energy conservation in buildings. Energy Efficient projects. HVAC Systems.

Water Conservation in buildings. Rain water harvesting and management, Water Cycle strategies.

MODULE 3

Green Buildings

Introduction, Green construction, Site selection for Green Construction, Design Considerations, Objectives of Green building movement.

Green construction materials and resources. Material Selection Strategies. Eco-friendly Materials, Recyclable and Reusable Materials. Embodied Energy in Materials.

MODULE 4

Green Building Codes and Specifications.

Introduction. Green building Codes and Standards.

LEED Credits, IGBC.

International Construction Codes, Carbon accounting, Green building Specifications.

References

1. Green Building Design and Delivery, 2nd Edition, John Wiley, Hoboken -New Jersey.
2. Energy Efficient Buildings in India. Ed. Mujumdar Mili. TERI PRESS.
3. Energy efficient buildings in India. Case Studies by Teri. Video Cassettes, ds.
4. Climate Responsive Architecture. Krishna Arvind.
5. Energy Management Handbook, Steve Doty and Wayne C. Turner, 8th edition.

(DEC) CM (DE)-19005 Functional Planning, Building Services and Maintenance Management

Teaching Scheme

Lectures: 3 hrs /week

Examination Scheme

Test 1 and 2 : 20 marks Each

End-Sem Exam : 60 marks

Course Content

Components of urban forms and their planning. Concepts of neighbourhood unit. Street system and layout in a neighbourhood. Functional planning of buildings, optimization of space: Spatial Synthesis graphical techniques, heuristic procedures, formulation of linear and non-linear optimization problem. Space requirements and relationships for typical buildings, like residential offices, hospitals, etc. Standard fire, fire list, fire resistance, classification of buildings, mean of escape, alarms, etc. Engineering services in a building as a system. Lifts, escalators, cold and hot water systems, wastewater systems, and electrical systems.

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

Few case studies based on above content

(PCC) CM-19003 Operation Research

Teaching Scheme

Lectures: 3 hrs /week

Examination Scheme

Test 1 and 2 : 20 marks Each

End-Sem Exam : 60 marks

Course Outcome

At the end of course, Students will be able to

1. Select appropriate optimization technique
2. Apply optimization techniques in civil engineering problems
3. Analyse practical application of operation research in construction projects

Course Content

Linear Programming:

OR Models, Convex Sets, Graphical Method, Simplex Method, Big M Method, Two Phase Method., Revised Simplex algorithm, Simplex algorithm for Bounded Variables, Primal – Dual construction, Symmetric and Asymmetric Dual, Weak Duality Theorem, Complimentary Slackness Theorem, Main Duality Theorem, Dual Simplex Method, Sensitivity Analysis. Column Generation and Cutting Stock Problems, Decomposition Algorithm, Primal Dual Algorithm, Goodness of the Simplex Algorithm, Goal Programming, Some aspects of polynomial algorithm

Integer Programming

Formulations, Zero-One Problem- additive algorithm, Gomory's cutting plane algorithm, Branch and bound algorithm, all integer primal-dual algorithms
Transportation and Assignment
Formulation of Transportation Problem, Initial Feasible Solution Methods, Optimality Test, Degeneracy in TP; Assignment Problem, Hungarian Method, Traveling Salesman Problem.

Game Theory and Sequencing

Two Person Zero Sum Game, Pure and Mixed Strategies, Algebraic Solution Procedure, Graphical Solution, Solving by Linear Programming; Sequencing Problem, Processing of n Jobs Through Two Machines and m Machines, Graphical Method of Two Jobs m Machines Problem. Games theory simulations applied to construction, Modifications and improvement on CPM/PERT techniques.

Inventory and Queuing Models

Classical EOQ Models, EOQ Model with Price Breaks, EOQ with Shortage, Probabilistic EOQ Model, Newsboy Problem. Elements of Queuing Model, Pure Birth Death Model, Single Server and Multi-Server Markovian Models with Infinite and Finite Capacity, Machine Repair Model, Networks of Queues.

References

1. Mohan, C. and Deep, Kusum, Optimization Techniques, New Age, 2009.
2. Mittal, K. V. and Mohan, C., Optimization Methods in Operations Research and Systems Analysis, New Age, 2003.
3. Taha, H.A., Operations Research - An Introduction, Prentice Hall, (7th Edition), 2002.
4. Ravindran, A., Phillips, D. T and Solberg, J. J., Operations Research: Principles and Practice, John Willey and Sons, 2nd Edition, 2009.
5. Hiller, F. S. and Liebermann, G. J., Introduction to Operations Research, Tata McGraw Hill, 2002.
6. Chandra, Suresh, Jayadeva and Mehra, Aparna, Numerical Optimization with Applications, Narosa, 2009.

(PCC) CM-19004 Construction Equipment and Machinery

Teaching Scheme

Lectures: 3 hrs /week

Examination Scheme

Test 1 and 2 : 20 marks Each

End-Sem Exam : 60 marks

Course Outcome

At the end of course, Student will be able to

1. Understand the use of different construction equipment for specific jobs
2. Calculate the output of equipment based on its performance out of fleet
3. Evaluate useful life of equipment and conclude replacement policy

Course Content

Identification-Planning-Equipment management in projects –Various costs associated with equipment, Maintenance Management-Replacement-Cost control of Equipment-Depreciation Analysis.

Fundamentals of earthwork Operations-Earth moving Operations-Types of Earthwork Equipment-Tractors, Motor Graders, Scrapers, Front end loaders, Earth Movers Equipment for Dredging, Trenching, Tunnelling, Drilling, Blasting-Equipment for Compaction-Erection Equipment-

Types of pumps used in Construction-Equipment for Dewatering and Grouting-Foundation and Pile Driving Equipment.

Forklifts and Related Equipment-Portable Material Bins-Conveyors-Hauling Equipment.

Crushers-Feeders-Screening Equipment-Handling Equipment-Batching and Mixing Equipment-Hauling, Pouring and Pumping Equipment-Transporters. Equipment for production of aggregate and concreting.

Factors affecting selection of equipment - technical and economic, construction engineering fundamentals, Analysis of production outputs and costs, Characteristics and performances of equipment for Earth moving, Erection, Material transport, Pile driving, Dewatering, Concrete construction (including batching, mixing, transport, and placement) and Tunnelling. Few case studies based on above content is recommended.

References

1. Robert L. Purifoy and Clifford J. Schexnayder Construction Planning, Equipment and Methods, McGraw Hill Publication, Sixth Edition, 2002.
2. Singh Jagman, Heavy Construction Planning, Equipment and Methods, Oxford and IBH Publishing Co. Ltd, New Delhi, Second Edition.
3. Varma Mahesh, Construction Equipment and its Planning and application, Metropolitan Book Co., Reprint Edition.
4. CECR's (Construction engineering Construction Reviews) manuals on machinery.
5. Frank Harris and Ronald Caffer, Management of Construction equipment –Macmillan Publication.

(PCC) CM-19005 Construction Materials and Materials Management

Teaching Scheme

Lectures: 3 hrs /week

Examination Scheme

Test 1 and 2 : 20 marks Each

End-Sem Exam : 60 marks

Course Outcome

At the end of course, Student will be able to

1. Identify advanced construction materials and its application in construction
2. Select and apply various inventory models in construction industry
3. Choose the governmental buying process, MIS and experience field work regarding material

Course Content

Materials and their properties required for Modern buildings. Special construction materials like fly ash, silica fume, FRP, FRC, admixtures SCC, HPC. Soils and Rock materials in different zones, cut off trenches in earth dam. Mode of transport and receipt of above materials. Testing at site, inspection procedures. Importance and functions of material management, Classification and Codification of materials, Procurement, identification of sources of procurement, vendor analysis. Application of ABC and EOQ analysis in inventory control. Use of Indices in materials/ inventory models Inventory Management, safety stock, stock outs, stores management: Quality Control, Use of MIS and Materials Management Systems, Foreign purchase, Governmental buying.

Introduction to materials productivity and role of materials management techniques in improved materials productivity. Cost reduction and value improvement. Role of purchasing in cost reduction. Value analysis for right choice and rationalisation of materials. Purchasing research identification of right sources of supplies. Vendor rating. Standardisation and variety reduction.

Negotiations and purchase. Price analysis. Organisation of purchasing function. Product explosion. Materials requirements planning. Make or buy decision. Incoming materials control acceptance, sampling, inspection. Vendor certification plans. Vendor and supply reliability.

Inventory management, inventory models. Inventory models with quantity discount. Exchange curve concept and coverage analysis. JIT. Information systems for inventory management. Stores management and warehousing. Optimal stocking and issuing policies. Inventory management of perishable commodities. Surplus management. Design of inventory distribution systems. Monitoring MM effectiveness. Case studies related to procurement process, tendering process, e-Governance.

References

1. Ghose, Materials of Construction' by, Tata- McGraw Hill Publication.
2. Gopalkrishnan, Handbook of Materials management, Prentice Hall Publication.
3. A.K. Dutta, Materials Management
4. Dean S. Ammer, Materials Management and Purchasing, Taraporevala Publications
5. B.K. Roy Chowdhury, Management of Materials, S. Chand & Sons
6. Deb, Materials Management

7. Lee and Dobler, Purchasing and Material Management, McGraw Hill Publications
8. P. Gopalakrishnan and Sundaresan, Materials Management An Integrated Approach, Prentice Hall of India
9. K.S. Menon Purchasing and Inventory Control, Wheeler Publishing
10. Magee and Boodman, Production, Planning & Inventory Control
11. Martin K. Starr and Miller, Inventory Management, Prentice Hall of India Pvt. Ltd.

(LC) CM-19006 Construction Management Laboratory

Teaching Scheme

Practical: 4hrs/week

Examination Scheme

End-Sem Exam – 100 marks

Course Outcome

At the end of course, Students will be able to

1. Select relevant national and International codes for performing new experiments in various laboratories
2. Exercise hands on experience to develop higher level motor skills
3. Prepare practical and site visit report for various assigned activities

Course Content

Student will perform various sets of experiments in the following laboratories as decided by the Laboratory In-charge and write a test report as a part of Laboratory work. Minimum eight experiments to be performed.

- A. The advance tests on materials will be carried out in
 - a) Transportation Engineering Laboratory
 - b) Geotechnical Engineering Laboratory
 - c) Concrete Technology Laboratory
- B. Field visits for studying construction management
- C. Assignments

(DEC) CM (DE)-19006 Quality Control in Construction

Teaching Scheme

Lectures: 3 hrs /week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Content

Plan, proforma, methods of quality control and its relevance in construction, IS codes and other codes, QC in various structures like tunnel, bridge, road, airport, building etc.

(DEC) CM (DE)-19007 Construction Safety and Human Resource Development in Construction

Teaching Scheme

Lectures: 3 hrs /week

Examination Scheme

Test 1 and 2 : 20 marks Each

End-Sem Exam : 60 marks

Course Outcome

At the end of course, Students will be able to

1. Identify various construction activities prone to accidents and its data collection
2. Prepare action plan to prevent accidents on construction projects
3. Demonstrate competence in development and problem-solving in the area of HR management

Course Content

Construction Safety Management - Safety in construction operations, like excavation, tunnelling, concreting. Safety in use of construction equipment, e.g. vehicles, cranes, hoists and lifts, etc. General trades and their occupational hazards. Fire safety in buildings -Causes of fire hazards, fire control devices, technologies and equipment. First aid on site. Cost aspects of accidents on site. Study of safety policies. Study of various IS codes used for safety in different operations of construction and OSHA guidelines.

Road & building safety audit,

Tools & instrumentation in construction safety

Human Resource Development in Construction - Introduction. Fundamentals of HRM and HRD. Personnel Management - Concept of Personnel Management, Role and function of personnel Manager, Necessity of Personnel Management. Working and policies of HRD Department and HRM- Human resource planning, Recruitment and selection, Training and development, Competencies- generic and functional, Mapping, Gaps and gap closure Remuneration of personnel, performance appraisal systems. Career planning of employees. Challenges in HRM.

References

1. Construction safety manual published by National Safety Commission of India.
2. Safety Management in the Construction Industry - A manual for project managers, NICMAR, Mumbai.
3. Davies V. S. Thomasin K, Construction Safety Handbook - Thomas Telford, London.
4. ISI for safety in Construction - Bureau of Indian Standards.
5. Monappa A, Personnel Management, Tata McGraw Hill, New Delhi, 1997
6. Rao T, HRD in the New Economic Environment, Tata McGraw Hill
7. William J Bruns Jr. Performance Measurement, Evaluation and Incentives, Tata McGraw Hill.

NICMAR Publication on - HRD in the Construction Industry - papers and proceedings of the 5th National HRD round table in the Construction Industry - Pune - March – 2000

(DEC) CM (DE)-19008 Infrastructure Development and Management

Teaching Scheme

Lectures: 3 hrs /week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Content

Introduction to infrastructure and management, need for infrastructure development & its management, factors affecting infrastructure development, various structures under infrastructure development, quality control of infrastructure, cost aspect, constructional details, networking of infrastructures, interrelationship between authority and institute, land acquisition issues

(DEC) CM (DE)-19010 Underground Opening

Teaching Scheme

Lectures: 3 hrs /week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course Outcome

At the end of course, Students will be able to

1. Interpret geological data and determine rock strength properties
2. Identify various excavation methods for tunnelling, calculate stress-strain analysis and the application to fracture and deformation in rocks
3. Apply appropriate support system and HVAC

Course Content

Tunnelling

Tunnel Engineering: Necessity, planning of tunnels, site investigation for tunnels, types of tunnels, tunnel alignment and grade, size and shape of a tunnel, method of constructions, methods of tunnelling in hard rocks - full face method - heading and bench method - drift method - different methods of tunnelling in soft soils including compressed air and shield tunnelling - shafts in tunnels - ventilation of tunnel and various methods - lining of tunnels - drainage and lighting of tunnels, problems in tunnel constructions, boom tunnelling machines, full face tunnel boring machines; support of tunnels; adverse ground conditions; ground treatment and hazards in tunnelling.

Study rock mechanics - RMR & Q-system of classification basic concepts, study of joints, sequence of excavation, support systems, Shape optimization, NATM.

References

1. Robert L. Purifoy and Clifford J. Schexnayder Construction Planning, Equipment and Methods, McGraw Hill Publication, Sixth Edition, 2002;

2. Megaw, Thomas M., and John V. Bartlett. Tunnels. Planning, Design, Construction. Volume 1. No. Monograph. 1981.
3. Space, Underground. "Tunnelling and Underground Space Technology."
4. Széchy, Károly. Tunnelbau. Springer-Verlag, 2013.
5. Varma, Mahesh. Construction Equipment and its planning and Application. Metropolitan Book Co., 1975.
6. Tunnels and Tunnelling, London.
7. Bieniawski, Zdzisław Tadeusz. Rock mechanics design in mining and tunnelling. 1984.
8. Desai, Chandrakant S., and John F. Abel. Introduction to the finite element method: a numerical method for engineering analysis. Van Nostrand Reinhold, 1972.
9. Hoek, Evert, and Edwin T. Brown. Underground excavations in rock. 1980 Goodman, Richard E. "Introduction to rock mechanics." (1989).

(DEC) CM (DE)-19011 Total Quality Management and MIS in Construction

Teaching Scheme

Lectures: 3 hrs /week

Examination Scheme

Test 1 and 2 : 20 marks Each

End-Sem Exam : 60 marks

Course Outcome

At the end of course, Students will be able to

1. Learn and apply appropriate techniques, resources and software to solve complex engineering problems related to quality in construction
2. Develop business ethics, professional integrity and social responsibility along with introspection skills and positive outlook for taking corrective measures based on external feedback
3. Apply the concepts of information systems its implementation, control and system audit

Course Content

Total Quality Management (TQM) In Construction

Quality : Necessity for improving Quality in the context of Global Challenges, Concepts of Quality Control , Quality Assurance , Quality Management and Total Quality Management (TQM) , Study of various Quality Standards in Construction : Indian standards, British, American, German & Japanese standards, Designing of quality manuals, checklists and inspection reports , installing the quality assurance system, monitoring and control , Study of ISO 9000, ISO 14000 & QS 9000 standards and certification procedures.

Management Information System in Construction

Information System - Necessity of IT in management, Information flow, Data processing, Flow charting, System analysis and design, Decision – making, IT Project Management - Web - Based Management - Use of world wide web in managing engineering projects and project teams in one or multiple locations, Entrepreneurs Resources Planning (ERP) - Need for ERP concept, ERP system for organization ERP software available in market, Selection and implementation of ERP system

References

1. Davis G. B. and Olson M. H., "Management Information System -Conceptual Foundations", McGraw Hill.
2. James A. O'Brien, "Management Information System", McGraw Hill.
3. Jain P. L. "Quality Control and TQM "- Tata McGraw Hill.
4. Deming E - "A Clients guide to Quality Assurance in Construction" - CIRIA, London.

(DEC) CM (DE)-19012 Sustainability and Urban Planning

Teaching Scheme

Lectures: 3 hrs /week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course Outcome

At the end of course, Students will be able to

1. Identify application of sustainability and urban development
2. Apply experimental experience to interact directly with the community clients
3. Apply sustainability to urban planning

Course Content

Introduction to Course, Introduction to Sustainable Development Concepts and Theory, current urban problems and opportunities, History, definitions, and perspectives on Sustainability Theory and Background to Sustainability Planning, The Three E's: Environment, Economics, ethics, and ecology of sustainable development.

Analysing the Three E's within an urban development debate, Ethics, Worldviews, and Sustainability, Tools for Sustainability Planning: indicators, ecological footprint, other mechanisms, Planning, planners, and sustainability plans.

Planning for Sustainability at Different Scales, Regional Planning and Sustainability, Municipal Planning and Sustainability, Implementing sustainability, Sustainable Transportation Planning, Concept of New Urbanism and Smart Growth.

Materials, Energy, and Food, The Natural step, Environmental issues, Concepts and Theory: Industrial Ecology and Green Development,

Neighbourhood planning and Sustainability, Ecological Site Design and Architecture, Sustainable building, Green building concept, assessment.

International development on Sustainability in Planning, International Institutions; Sustainability Planning in western world, Sustainability Planning in Developing Countries.

References

1. The Ecology of Place: Planning for Environment, Economy, and Community. Beatley, Timothy and Kristy Manning. 1997 Washington, D.C. Island Press
2. Sustainable Cities in developing Countries. Cedric Pugh. 2000 London, UK. Earthscan
3. Regenerative design for Sustainable Development, John Tillman Lyle. 1994. New York, John Willy & Sons
4. City-Region 2020, Joe Ravetz. 2000 London, UK, Earthscan

(LLC) LL-19001 Liberal Learning Course

Teaching Scheme

Lectures: 1 hr / week

Course Outcomes

At the end of course, Students will be able to

1. Develop capacity to understand multidisciplinary sciences in a friendly manner.
2. Create openness to diversity.
3. Acquire ability to lead and examine life and value the need for life learning.

Course Content

Student will be able to choose and enhance practical learning and application in the subject of his/her choice. One credit course spread over the semester to enhance practical learning and application.

- Agriculture
- Business
- Clay Art & Pottery
- Corporate Culture
- Defense
- French
- Geography
- Holistic Health
- Modern Film Making
- Music (Instrumental)
- Photography
- Political Science
- Music (Vocal)
- Wood and Metal Art
- Japanese
- Painting

(MLC) ML-19011 Research Methodology and Intellectual Property Rights

Teaching Scheme

Lectures: 2 hrs / week

Research Methodology

Course Outcome

At the end of course, Students will be able to

1. Understand research problem formulation and approaches of investigation of solutions for research problems

2. Learn ethical practices to be followed in research
3. Apply research methodology in case studies
4. Acquire skills required for presentation of research outcomes (report and technical paper writing, presentation etc.)

Course Content:

Unit 1: (05 Hrs)
 Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.

Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, necessary instrumentations.

Unit 2: (05 Hrs)

Effective literature studies approaches, analysis

Use Design of Experiments /Taguchi Method to plan a set of experiments or simulations or build prototype

Analyze your results and draw conclusions or Build Prototype, Test and Redesign

Unit 3: (05 Hrs)

Plagiarism, Research ethics

Effective technical writing, how to write report, Paper.

Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

References

1. Willan, Andrew R., and Andrew H. Briggs. Statistical analysis of cost-effectiveness data. Vol. 37. John Wiley & Sons, 2006.
2. Lawless, J.F., 1982, Statistical Models and Methods for Lifetime Data (Wiley: New York).
3. Schneider, H., 1986, Truncated and Censored Samples Normal Populations, (Dekker: New York)
4. Burt, Cyril. "Research in education." (1922).
5. Eliot, Simon, and William Robert Owens, eds. A handbook to literary research. Psychology Press, 1998.

Intellectual Property Rights

Course Outcomes

At the end of course, Students will be able to

1. Infer that tomorrow's world will be ruled by ideas, concept, and creativity.
2. Gather knowledge about Intellectual Property Rights which is important for students of engineering in particular as they are tomorrow's technocrats and creator of new technology.
3. Discover how IPR is regarded as a source of national wealth and mark of an economic leadership in context of global market scenario.
4. Study the national & International IP system.

5. Summarize that it is an incentive for further research work and investment in R & D, leading to creation of new and better products and generation of economic and social benefits.

Course Content

Unit 1: [03]

Introduction to the concepts Property and Intellectual Property, Nature and Importance of Intellectual Property Rights, Objectives and Importance of understanding Intellectual Property Rights

Unit 2: [07]

Understanding the types of Intellectual Property Rights: -

Patents-Indian Patent Office and its Administration, Administration of Patent System – Patenting under Indian Patent Act, Patent Rights and its Scope, Licensing and transfer of technology, Patent information and database. Provisional and Non Provisional Patent Application and Specification, Plant Patenting, Idea Patenting, Integrated Circuits, Industrial Designs, Trademarks (Registered and unregistered trademarks), Copyrights, Traditional Knowledge, Geographical Indications, Trade Secrets, Case Studies

Unit 3: [04]

New Developments in IPR, Process of Patenting and Development: technological research, innovation, patenting, development,

International Scenario: WIPO, TRIPs, Patenting under PCT

References

1. Aswani Kumar Bansal: Law of Trademarks in India
2. B L Wadehra: Law Relating to Patents, Trademarks, Copyright,
3. Designs and Geographical Indications.
4. G.V.G Krishnamurthy: The Law of Trademarks, Copyright, Patents and
5. Design.
6. Satyawrat Ponkse: The Management of Intellectual Property.
7. S K Roy Chaudhary & H K Saharay: The Law of Trademarks, Copyright, Patents
8. Intellectual Property Rights under WTO by T. Ramappa, S. Chand.
9. Manual of Patent Office Practice and Procedure
10. WIPO: WIPO Guide to Using Patent Information
11. Resisting Intellectual Property by Halbert, Taylor & Francis
12. Industrial Design by Mayall, Mc Graw Hill
13. Product Design by Niebel, Mc Graw Hill
14. Introduction to Design by Asimov, Prentice Hall
15. Intellectual Property in New Technological Age by Robert P. Merges, Peter S. Menell, Mark A. Lemley

(MLC) ML-19012 Effective Technical Communication

Teaching Scheme

Lectures: 1 hr /week

Examination Scheme

100 Marks: 4 Assignments
(25 Marks Each)

Course Outcomes (COs):

After successful completion of the course, students will be able -

1. To produce effective dialogue for business related situations
2. To use listening, speaking, reading and writing skills for communication purposes and attempt tasks by using functional grammar and vocabulary effectively
3. To analyze critically different concepts / principles of communication skills
4. To demonstrate productive skills and have a knack for structured conversations
5. To appreciate, analyze, evaluate business reports and research papers

Unit 1: Fundamentals of Communication

[4 Hrs]

7 Cs of communication, common errors in English, enriching vocabulary, styles and registers

Unit 2: Aural-Oral Communication

[4 Hrs]

The art of listening, stress and intonation, group discussion, oral presentation skills

Unit 3: Reading and Writing

[4 Hrs]

Types of reading, effective writing, business correspondence, interpretation of technical reports and research papers

Reference Books

1. Raman Sharma, "Technical Communication", Oxford University Press.
2. Raymond Murphy "Essential English Grammar" (Elementary & Intermediate) Cambridge University Press.
3. Mark Hancock "English Pronunciation in Use" Cambridge University Press.
4. Shirley Taylor, "Model Business Letters, Emails and Other Business Documents" (seventh edition), Prentise Hall
5. Thomas Huckin, Leslie Olsen "Technical writing and Professional Communications for Non-native speakers of English", McGraw Hill.

(PCC) CM-19008 Construction Techniques

Teaching Scheme

Lectures: 3 hrs /week

Examination Scheme

Test 1 and 2 : 20 marks Each

End-Sem Exam : 60 marks

Course Outcome

At the end of course, Students will be able to

1. Identify modern construction techniques and processes
2. Prepare action plan for the various construction activities and the corresponding state-of-the-art in techniques
3. Select relevant technique and corresponding construction sequence

Course Content

Roads: Various techniques for rigid and flexible pavements, overlays.

Bridges: Types, Construction methods for sub-structure and super-structure, various launching methods, coffer dams, caissons.

Tunnels: Construction methods in different strata, Tunnel linings, various methods of construction, trench less technology, underground construction.

Ports: Construction of docks & Jetties, Fender Systems, Container terminals & oil terminals, under water construction, dredging.

High-rise construction: Construction systems for high rise structures, special techniques required for construction and maintenance.

Foundation treatment - Grouting, Underwater concreting, Piles, Earth dams and Gravity dams.

Specialized Constructions and Construction Techniques: Methods of dewatering slip form technique, diaphragm wall construction.

Demolition of tall structures

References

1. Chaundley R. Construction Technology Vol-I to Vol-IV, ELBS Edition
2. Seeley Ivor, Building Technology, McMillan
3. Christian John A., Management, Machines and Methods, Oxford I &IBH
4. Hewry Parker and Clarkson Oglesby, Methods Improvement for Construction Managers
5. Singh Jagman, Heavy Construction Planning, Equipment and Methods, Oxford and IBH
6. Peurifoy and Schexnayder, Construction Planning, Equipment and Methods, McGraw Hill
7. Construction Equipment and its Planning and Application by Mahesh Varma.

(PCC) CM (DE)-19009 Construction Cost Dynamics

Teaching Scheme

Lectures: 3 hrs /week

Examination Scheme

Test 1 and 2 : 20 marks Each

End-Sem Exam : 60 marks

Course Outcome

At the end of course, Students will be able to

1. Identify economic analysis of different construction projects
2. Interpret the importance of risk and its application in construction project
3. Apply knowledge of construction cost dynamics to bid a project

Course Content

Introduction to Engineering economics, importance, demand and supply, types of costs, interest – simple, compound, continuous, effective.

Value of Money – time and equivalence, tangible and intangible factors, introduction to inflation.

Interest factors – Uniform series factors – derivations.

Economic comparisons –

Present worth method, equivalent annual cost method, capitalized cost method, net present value, and internal rate of return evaluation of alternatives.

Project cash flow, Factors affecting project cash flow.

Depreciation and tax considerations in alternative replacement analysis comparisons.

Benefit cost ratio, public projects evaluation.

Breakeven analysis, risk analysis

Earned value management, Escalation

Bidding Model

Basic concept of financial management- working capital management, balance sheet, funds flow statement.

References

1. Riggs, J.L., Bedworth, D.D., and Randhawa, S.U. (2005). Engineering Economics Tata-McGraw Hill Publishing Co Ltd.
2. Tarquin, A.J. and Blank, L.T. (2012) Engineering Economy, A Behavioural Approach McGraw Hill Book Company, 7e.
3. Taylor, G.A. (1968). Managerial and Engineering Economy. East-West Edition
4. Thuesen, H.G. (1959). Engineering Economy, Prentice-Hall, Inc.
5. Van Horne, J.C. (1990). Fundamentals of Financial Management, Prentice-Hall of India Ltd.
6. Brigham, E.F. (1978). Fundamentals of Financial Management, The Dryden Press, Hinsdale, Illinois.
7. Kolb, R.W. and Rodriguez, R.J. (1992). Financial Management. D.C. Heath & Co.
8. Walker, E.W. (1974). Essentials of Financial Management, Prentice Hall of India Private Limited, New Delhi.

9. Wilfred, N. (1971). Accounting for the Building Trade, Hutchinson Educational, London.
10. Pilcher R. (1966). Principles of Construction Management. McGraw Hill Publishing Co Ltd.
11. Lifson, N.W. and Shalfer, E.F. (1982). Decision and Risk Analysis for Construction Management, John Wiley & Sons.
12. Degoff, R.A. and Friedman, H.A. (1985). Construction Management, John Wiley & Sons.
13. Van Horne, J.C. (1990). Management and Policy, Prentice-Hall of India Ltd.
14. Harris, F. and McCaffer, R. (2006). Modern Construction Management. BSP Professional Books, 6e.

(PCC) CM (DE)-19010 Professional Practices in Construction

Teaching Scheme

Lectures: 3 hrs /week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course Outcome

At the end of course, Student will be able to

1. Identify important provisions in various construction contract formats
2. Understand importance of various provisions in Indian Contract Act
3. Prepare valuation report for residential building

Course Content

Introduction to Legal terms, overview of Construction Professional Practice in India, Total Construction Project Cycle and Role of Professionals in Construction Projects, Various Consultants involved in Projects, Managing Consultants, Tendering and Contracts Management, Role of Engineer contractor and employer in Contract Management, Project site Administration and Control, Various Laws related to construction.

Project cost estimation, rate analysis, overhead charges, bidding models and bidding strategies. Qualification of bidders. Tendering and contractual procedures, Indian Contract Act 1872, Definition of Contract and its applicability, Types of contracts, International contracts, Conditions and specifications of contract. Contract administration, Claims, compensation and disputes, Dispute resolution techniques, Arbitration and Conciliation Act 1996, Arbitration case studies, Professional ethics, Duties and responsibilities of parties.

Reference

1. Patil B.S., Building and Engineering Contracts, 5th Edition, Patil, Pune, 2005.
2. Avtar Singh, Law of Contract, Eastern Book Company, Lucknow, 1993.

3. FIDIC, Condition of Contract for works of Civil Engineering Construction Part I – General Conditions with Forms of Tender and Agreement (Red Book), FIDIC, Switzerland, 1998.
4. **Construction Jobsite Management** - William R. Mincks, Hal Johnston Walker A., Project Management in Construction, (4th Ed.), Blackwell Publishing, London, 2002.
5. Total Construction Project Management, George J. Ritz, McGraw Hills 1994,
6. Bids, Tenders& Proposals, Herald Lewis, Kogen Page

(LC) CM-19011 Advanced Construction Management Laboratory

Teaching Scheme

Practical: 4 hrs/week

Examination Scheme

End-Sem Exam – 100 marks

Course Outcome

At the end of course, Students will be able to

1. Learn use of various software related to construction management
2. Visit projects, prepare and present technical report
3. Analyse and apply solution for complex problems using advanced software

Course Content

- Student will do various exercise related with Construction Projects Planning and Management (CPPM) using software like Primavera, M-S Project, Revit, Neviswork, Esite, SPSS, MSP, TORA and other software.
- Students will carry out various assignments related to the courses taught in this semester given by the faculty teaching courses.
- Students will carry out field visits.

(SBC) CM-19013 Dissertation I CM-19015 Dissertation II

Course Outcomes

At the end of course, Students will be able to

1. Identify and carry out research in key areas of construction and management
2. Analyse data collected and interpret the same
3. Develop conclusions based on the analysis which are useful to the society at large