

DEPARTMENT OF CIVIL ENGINEERING
M.E. (CONSTRUCTION TECHNOLOGY AND PROJECT MANAGEMENT)
SCHEME OF INSTRUCTION AND EXAMINATION

I-SEMESTER

Code No	Course title	Scheme of Instruction		Scheme of examination			Total Marks	Credits
		Lec.	Lab	Duration of Exam. (hrs)	Theory/ Lab/viva	Sessionals		
CTPM 1.1	Construction management	4	-	3	70	30	100	5
CTPM 1.2	Material technology	4	-	3	70	30	100	5
CTPM 1.3	Construction planning and scheduling	4	-	3	70	30	100	5
CTPM 1.4	Construction equipment and methods	4	-	3	70	30	100	4
CTPM 1.5	Construction engineering laboratory	-	4	-	50	50	100	3
Total		16+4 = 20			330	170	500	22

II-SEMESTER

Code No	Course title	Scheme of Instruction		Scheme of examination			Total Marks	Credits
		Lec.	Lab	Duration of Exam. (hrs)	Theory/ Lab/viva	Sessionals		
CTPM 2.1	Project Administration	4	-	3	70	30	100	5
CTPM 2.2	Computer aided design and application	4	-	3	70	30	100	5
CTPM 2.3	Management Information Systems	4	-	3	70	30	100	4
CTPM 2.4	Contracts and legal issues	4	-	3	70	30	100	5
CTPM 2.5	Soft skills & software laboratory	-	4	-	50	50	100	3
Total		16+4 = 20			330	170	500	22

III- SEMESTER

Code No	Course title	Scheme of Instruction		Scheme of examination			Total Marks	Credits
		Lec.	Lab	Duration of Exam. (hrs)	Theory/ Lab/viva	Sessionals		
CTPM 3.1	Environmental Impact Assessment	4	-	3	70	30	100	5
CTPM 3.2	Safety & Quality management	4	-	3	70	30	100	5
CTPM 3.3	Seminars	-	-	-	50	50	100	3
CTPM 3.4	Case studies/mini project	-	-	-	50	50	100	3
Total		8			240	160	400	16

IV- SEMESTER

Course Code	Course Title	Total Marks	Credits
CTPM 4.1	Thesis/Dissertation	100	20

Total Marks =1500

Total No. of Credits=80

Notes:

1. Dissertation which will commence from the beginning of III semester will be industry oriented done in the industry with two guides one from University and one from industry.
2. The viva voce for the labs by design projects shall be held with course instructor and one external member from academic institution/ industry/ R&D organizations.

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CTPM 1.1 CONSTRUCTION MANAGEMENT

UNIT – I

Introduction, Major problems in Construction Industry, History of Construction Management, Functions and Responsibilities of Construction Manager, Case Studies, Future of Construction Management.

UNIT – II

Decision Making in Construction Industry – Benefit-Cost Analysis, Replacement Analysis, Break Even Analysis, Risk Management in Construction Industry.

UNIT – III

Value Engineering, Definition, Fundamentals of Value Engineering, Life Cycle Costing, Delphi Technique and Uses of Value Engineering – Its applications to Construction Industry.

UNIT – IV

Concept of Safety in Construction Industry, Importance of Construction Safety, Safety Benefits to Employers, Employees and Customers, Construction Safety Problems, Approaches to improve Construction Safety.

UNIT – V

Management Information and Control Systems, Communication, System Concepts, Need for Management Information, Design of Management Information Systems, Computer Processing, Value of Information, Management Information Systems in Construction Industry.

Reference Books :

1. Raina, C.M. "Construction Management and Practice." Tata McGraw-Hill,
2. Tenah, K.A. (1985). "The Construction Management Process" Reston Publishing Company, Inc. Virginia, U.S.A.
3. Roy Pilcher (1985) "Project Cost Control in Construction," Collins Professional and Technical Books, London.

CTPM 1.2 MATERIAL TECHNOLOGY

UNIT – I

Materials for Concrete : (a) Cements – OPC, PPC, Blended Cement, Low Heat Cement, High Alumina Cement Composition, Hydration, Heat of Hydration, Properties and Testing (b) Aggregates – Coarse and Fine aggregates – Properties – size, Shape Texture, Bulk Density, Specific gravity, bulking, grading, Rules for storing Cement and aggregate (c) Water – Quality, Sea Water Use (d) Admixtures, Chemicals and their action – Plasticizers, Super Plasticizers, Retarders, Accelerators, Air Entraining Agents, Mineral Admixtures, Fly ash, Silica fume, GGBS, Corrosion inhibiting Agents – IS Specifications for OPC.

UNIT – II

Fresh concrete : (a) Properties – Workability and its measurement, Segregation, Bleeding, setting of Concrete (b) Industrial Production of Concrete – batching, mixing, Transporting, Placing, Compaction, Finishing and Curing Methods (c) Tools – Mixer and its Maintenance, Truck Mixer, Dumper, Transport of Materials and concrete, Belt, Conveyors, Pumps and Pipeline, Pin and form Vibrators, their use, steam Chamber for Curing (d) Construction details for pile, raft and individual foundations, columns, Beams, Slabs and Filler Walls, Tremie Concreting.

UNIT – III

Hardened Concrete : (a) Properties : Strength and Factors affecting strength, high strength and high performance, elasticity, creep, shrinkage and factors affecting (b) Durability Significance, Permeability, Factors Contributing cracks and their prevention (c) Joints in Concrete – Construction, Expansion, Contraction, isolation Joints (d) Action of Chemicals, Sulphate attack, Alkalie Aggregate

Attack, chloride attack, Acid attack, Carbonation, Corrosion of Steel and methods of minimizing their affects.

UNIT – IV

Testing (a) Compression Test – Types of failures, Cube and Cylinder Strength, Factors affecting, flexural tensile strengths and relations of strength and other properties (b) Nondestructive testing procedures – Rebound hammer, penetration and pull out tests, pulse velocity methods, determination of cement content and original W/C ration (c) I.S. Codal Provisions for strength, workability, mixing time, desheetering, curing, covers, durability requirements, accepting criteria for concrete (d) Special Concretes : Light Weight Concrete, No fines Concrete, Fibre Reinforcement Concrete, Ferro-cement, Polymer Concrete, Polymer Modified and inprignated concrete, Guniting, Hot and Cold Weather Concreting, Vacuum Concrete, Ready; Mixed Concrete, Pre-cast Concrete elements.

UNIT – V

Miscellaneous Materials : (a) Plastics – Classification, Composition, uses, Resins, P.V.C. (b) Asphalt, Bitumen, Tar – Specifications, use and Tests – Cork, Rubber, Gypsum, Ceramics, Glass, Fibre Glass. (c) Iron and Steel – Pig Iron, Cast Iron, Wrought Iron Steel – Properties, Treatment, Mild Steel, Fe 415, Fe 500 for reinforcement – Structural Steel. (d) Non Ferrous Materials, Aluminum Copper, Brass, Bronze, Lead, Magnesium, Glass, Paints, Varnishes, Distempers, Galvanizing.

Reference Books:

1. M.S. Shetty – “Concrete Technology”, 2004, S. Chand & Company Ltd.
2. A. Tretyakov – “Concrete and Concreting”, 1968, Mir Publications
3. A.M. Neville – “Properties of Concrete”, Second edition, The English Language book society, Pitman Publications.
4. J.F. Youn – “Materials and processes”, Second edition, Asia Publishing house.
5. Parbin Singh – “Civil Engineering materials”, Sixth edition, S. K. kataria & sons.

CTPM 1.3 CONSTRUCTION PLANNING AND SCHEDULING

UNIT I

Introduction to Project Management, Project Planning, Scheduling and Controlling- Introduction to methods of planning and scheduling.

Bar charts and Milestone Charts – Development of Bar charts – Shortcomings – Remedial measures – Milestone charts.

PERT- Elements of Networks – Event, Activity, and Dummy Activity – Guidelines for the construction of the network – Development of PERT network – Numbering - Fulkerson’s rule - Skip numbering.

UNIT II

Time estimates – Optimistic, Pessimistic and Most likely time estimates – Earliest Expected time and Latest Allowable Occurrence time.

Critical Path – Slack – Identification of Critical Path – Probability of Completion of projects.

UNIT III

CPM – Construction of network – Earliest Possible Occurrence time and Latest Possible Occurrence time – Start and Finish times of activities – Floats – Identification of Critical Path using floats.

UNIT IV

Cost Analysis – Direct and Indirect project costs – Total costs – Cost Slopes – Crashing - Cost and Time Optimization.

UNIT V

Updating – Data required for updating – Process of updating – When to update.

Resource allocation – Resources – Usage profiles – Histograms – Resource Smoothing – Resource leveling.

References:

1. PERT and CPM – BC Punmia and KK Khandelwal
2. PERT and CPM – LS Srinath.

CTPM 1.4 CONSTRUCTION EQUIPMENT AND METHODS

UNIT I

Skills related to Construction Management will be covered in a laboratory setting including plan reading, specification reading, construction scheduling and estimating using industry standard state-of-the-art software and hardware, and other applied tasks.

UNIT II

Course Description: Study of construction operations as dynamic production processes. Utilization of equipment and other resources to achieve highest levels of productivity, safety, and quality. Covers a wide range of traditional and state-of-the-art construction methods.

UNIT III

Working of GPS and Total Stations for road alignment, project lay out and marking. Particulars of related Software.

UNIT IV

Description and Working of equipment related to Earth Work, Concrete, Road Laying.

Attachments components parts – Compactors, Cranes, Crawler Loaders, Dozers, Drills, Dumpers, Excavators, Forklifts, Graders, Hoists, Lifts, Loader Backhoe, mixers, Pavers, Rollers, Scrapers, Skid Steer Loaders, Skidders, Trucks, Truck (Off Highway), Wheel Loaders and others.

UNIT V

Equipment related to repairs rehabilitation and renovation.

CTPM 1.5 CONSTRUCTION ENGINEERING LABORATORY - I

1. Concrete Mix Design – by BIS, ACI and BS method – proportioning, Batching, Mixing, Moulding of specimens for compression, Modulus of Elasticity and Modulus of Rupture – Testing of specimens as per relevant of practice (comparative study).
2. Development of correlation between Non-Destructive and Destructive Tests using Rebound Hammer & UPV instruments.
3. Influence of following parameters on NDT readings – experimental observations.
 - I. Aggregate – Cement ratio
 - II. Water Cement Ratio
 - III. Excess / Deficient Cement
 - IV. Excess / Deficient Water
 - V. Aggregate Type.(Some of the above parameters may be considered depending upon time).
4. Strain and deflection measurement for a structural member under single point / two point loading – crack propagation observation, measurement and plotting.

CTPM 2.1 PROJECT ADMINISTRATION

UNIT – I

Construction Administration, Control of Quality in Construction, Organizational Structure, Design Build Contracts, Responsibility for Coordination of the trades.

UNIT – II

Lines of Authority on Construction Projects, Responsibility, Familiarization with construction documents, Staffing Responsibilities.

UNIT – III

Certainty, Risk and Uncertainty, Risk Management, Identification and Nature of Construction Risks, Contractual allocations of Risk, Types of Risks, Minimizing risks and mitigating losses, use of expected values, utility in investment decisions, decision trees, sensitivity analysis.

UNIT – IV

Specifications and drawings – Specifications, Conflicts due to drawings and specifications, unenforceable phrases, content of the specifications, CSI specifications format, allowances and tolerances in specifications, problems.

UNIT – V

Preconstruction Operations – Constructability Analysis, Issuance of Bidding Documents, Prequalification of Bidders, Bonds, Opening Acceptance and Documentation of Bids.

Reference Books :

1. Fisk, E.R. (2000) “Construction Project Administration,” Prentice hall International, London.
2. Kwakye, A.A. (1977), “Construction Project Administration,” Addison Wesley Longman, London.

CTPM 2.2 COMPUTER AIDED DESIGN AND APPLICATIONS

UNIT – I

Introduction: Computer Systems, Computer specifications, peripherals, computer language and developments, concepts of programming, flow charts, algorithms and debugging.

C-Language: C-Character set, identifiers and keywords, data types, constants, variables, arrays, declarations, expressions, statement and symbolic constants, Data input and output. Arithmetic, unary and relational operators, expressions, assignment and conditional operators, library functions, control statements and functions.

UNIT – II

File Management: File management, Pointers and their applications, structures and pointers, arrays and strings, processing of arrays.

Object Oriented programming: Introduction to object oriented programming, basic concepts of object oriented programming and its advantages.

UNIT – III

Computer Graphics: Introduction, Devices and world co-ordinates, transformation principles, windowing and clipping, display devices, graphics input devices, graphical input techniques, realism in graphics, geometric modeling, drafting and computer graphics in CAD.

UNIT – IV

Civil Engineering Applications : Preparing and running complete programs in C for Civil Engineering problems such as analysis of beams, trusses and determinate frames, design of pipes, pavements and footings, slope stability analysis and construction engineering problems – exposure to graphics primitives.

UNIT – V

Computer Aided Design: Computer aided design of civil engineering problems such as plane frame and space frame analysis and construction engineering and management problem – exposure to software packages such as NISA & STAD-PRO.

Reference Books :

1. “Computer Aided Design” by C.S. Krishna Murthy & S. Rajeev, Narosa Pub., 1993.
2. “Computer Applications in Construction”, Boyd C. Panbou, Tata McGraw-Hill, 1997.

CTPM 2.3 MANAGEMENT INFORMATION SYSTEMS

UNIT – I

Importance of Management Information Systems (MIS), Logical Foundation of MIS, Manger's View of Information systems, Functions of Management, managerial role, Activities of an Construction Organization.

UNIT – II

Management and Decision Making in Construction Industry, Classification of Information Systems and Impact of construction work on Management Information Systems.

UNIT – III

Strategic Uses of Information Technology, Inter Organizational Systems, Strategic Information Systems related to Construction Industry.

UNIT – IV

Information Technology, Role of Information Technology in Construction Industry, Impact of Information Technology on the Individuals, Impact on the Construction Organization and Process of Reengineering Work.

UNIT – V

File Structures and Processing methods in Construction Organizations, Data base Concepts, An Data Base management systems.

Reference Books :

1. Robert Schultheis, mary Sumner. (1999). "Management Information Systems - The Manager's View". Tate McGraw Hill Edition, New Delhi.
2. Kwakye, A.A.(1997), "Construction Project Administration", Adisson Wesley Longman, London.

CTPM 2.4 CONTRACTS AND LEGAL ISSUES

UNIT I

Execution of Works – Direct execution by Department – Muster Roll (form 21) – Piece work agreement – Work Order.

Execution through contractor – Definitions – Types of contracts – Lump sum contract, Item rate contract, Cost plus fixed fee contract, Cost plus percentage contract, Special contracts.

UNIT II

Contract document – Conditions of Contract – Tender notice – Bidding procedure – Scrutiny and acceptance of tender, award of contract – Earnest money deposit and Security deposit - Termination of contract.

Disputes – Settlement through arbitration – Indian Arbitration Act 1940 – Clauses and advantages of arbitration.

UNIT III

Specifications – Importance, Design and Writing of Specifications – Types of Specifications – General, Detailed, Standard, Special, Restricted and Manufacturer's specifications.

Accounts – Advances, Earnest money and Security deposits, First and final bills, Fines, Recovery, Closing of accounts.

UNIT IV

Labour legislation – Factory Act 1948, Contract Labour Act 1970, Trade Union Act, Minimum Wages Act 1948, Workmen Compensation Act 1923, Industrial Disputes Act 1947.

UNIT V

Labour Welfare – Labour welfare fund act 1965, Employees State Insurance act 1948, Incentives, Labour welfare measures.

References Books:

1. Construction Management and Accounts – BL Gupta and Amit Gupta
2. Construction Management and Projects – B Sengupta and H Guha
3. Construction Planning and Management – PS Gelhot and BM Dhir.

CTPM 2.5 SOFT SKILLS & SOFTWARE LABORATORY

Training in the following software & packages

- 1) Packages related to Construction & Project Management like:
 - a. STAAD
 - b. PRIMAVERA
 - c. ESTIMATION Software etc.
- 2) Communication skills like:
 - a. audio visual and inter personal
 - b. Listening skills, show and tell skills and skills to manage difference.
 - c. Social skills
 - d. Skills in dealing with selected work groups: clients, construction workers, government inspectors, trade unionists.
 - e. Skills in understanding the socio-political state of projects and groups
- 3) GIS Software like:
 - a. ARCInfo
 - b. ARCVIEW
 - c. ILWIS

CTPM 3.1 ENVIRONMENTAL IMPACT ASSESSMENT

UNIT I

Concept of Environment – Definition of EIA and EIS – Elements of EIA – Guidelines for the preparation of EIS – Governmental policies for environmental protection.

UNIT II

Environmental setting – Environmental attributes – air, water, soil, noise, ecological, social, economical, cultural, human and aesthetic aspects – Environmental indices.

UNIT III

Methodology for the identification of Impacts – Criteria for the selection of methods – Methodologies- Adhoc, checklist, Overlaying, Matrix and Network methods.

UNIT IV

Prediction and Assessment of Impacts on – air, water, soil, noise, ecological, social, economical, cultural, human environments and aesthetic aspects.

UNIT V

Review of Environmental Impact Statement – Cost benefit analysis – Measures for environmental impact mitigation and control – Case Studies.

References Books:

1. Environmental Impact Analysis – Urban and Jain.
2. Environmental Impact Analysis – Canter.

CTPM 3.2 SAFETY MANAGEMENT IN CONSTRUCTION

UNIT – I

Safety management function, line versus staff authority, safety responsibility and accountability in construction industry.

UNIT – II

Safety and its importance in construction industry, hazards in construction projects, causes of accidents, cost of an accident.

UNIT – III

Experience Modification Rating, Workers insurance, general safety programs in construction industry, construction safety problems.

UNIT – IV

Case based reasoning, case indexing, retrieval, accident prevention and forecasting using CBR method.

UNIT – V

Systems safety analysis, faulty tree analysis, failure modes and effects analysis in construction industry.

Reference Books :

1. John V. Grimaldi, (1996). “Safety Management”. AITBS Publishers & Distributors, New Delhi, India.
2. Kwakye, A.A. (1997), “Construction Project Administration”. Adisson Wesley Longman, London.