

**MRSPTU M.TECH. CIVIL ENGG. (CONSTRUCTION TECHNOLOGY & MANAGEMENT)
SYLLABUS 2016 BATCH ONWARDS**

M. Tech. Civil Engg. (Construction Technology and Management)

Total Contact Hours = 24

Total Marks = 600

Total Credits = 22

SEMESTER 1 st		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MCIE6-101	Project Planning & Control	3	1	-	40	60	100	4
MCIE6-102	Construction Engineering & Management	3	1	-	40	60	100	4
MCIE6-103	Concrete Construction Technology	3	1	-	40	60	100	4
MCIE6-104	Software Lab – Project Planning	-	-	4	60	40	100	2
Departmental Elective – I (Select any one)		3	1	0	40	60	100	4
MCIE6-156	Computational Techniques							
MCIE6-157	Environment Engineering & Management							
Departmental Elective – II (Select any one)		3	1	0	40	60	100	4
MCIE6-158	Maintenance of Building Structures							
MCIE6-159	Composite Materials							
Total	Theory = 5 Lab = 1	15	5	4	260	340	600	22

Total Contact Hours = 24

Total Marks = 600

Total Credits = 22

SEMESTER 2 nd		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MCIE6-205	Construction Laws & Contract Management	3	1	-	40	60	100	4
MCIE6-206	Building Cost & Quality Management	3	1	-	40	60	100	4
MCIE6-207	QA & QC Lab	-	-	4	60	40	100	2
Departmental Elective – III (Select any one)		3	1	0	40	60	100	4
MCIE6-260	Construction Costing & Financial Management							
MCIE6-261	Project Safety Management							
Departmental Elective – IV (Select any one)		3	1	0	40	60	100	4
MCIE6-262	Foundation Design & Construction							
MCIE6-263	Rural Construction Technology							
Open Elective – I (Select any one)		3	1	0	40	60	100	4
Total	Theory = 4 Lab = 1	15	5	6	260	340	600	22

**MRSPTU M.TECH. CIVIL ENGG. (CONSTRUCTION TECHNOLOGY & MANAGEMENT)
SYLLABUS 2016 BATCH ONWARDS**

Total Contact Hours = 24

Total Marks = 500

Total Credits = 26

SEMESTER 3 rd		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MREM0-101	Research Methodology	4	0	0	40	60	100	4
MCIE6-309	Seminar	0	0	2	60	40	100	4
MCIE6-310	Project	0	0	10	60	40	100	10
Departmental Elective – V (Select any one)		3	1	0	40	60	100	4
MCIE6-364	Advanced Structural Design & Detailing							
MCIE6-365	Pavement Design, Construction & Maintenance							
Open Elective – II (Select any one)		3	1	0	40	60	100	4
Total	Theory = 3 Lab = 0	10	2	12	240	260	500	26

Total Credits = 20

SEMESTER 4 th		Contact Hrs			Evaluation Criteria	Credits
Subject Code	Subject Name	L	T	P	Satisfactory/ Unsatisfactory	
MCIE6- 411	Thesis	0	0	0		20

Overall

Semester	Marks	Credits
1 st	600	22
2 nd	600	22
3 rd	500	26
4 th	--	20
Total	1700	90

PROJECT PLANNING AND CONTROL

Subject Code –MCIE6-101

**L T P C
3 1 0 4**

Duration: 45 Hrs.

UNIT-I (13 Hrs.)

Construction Planning: Need of construction planning, Constructional Resources, construction team, stages in construction, preparation of construction schedule, Job layout, inspection and quality control. Pre-tender planning; contract planning; planning and scheduling construction jobs by bar charts; Planning and scheduling construction jobs by critical path network techniques; allocation of resources, Planning and decision making Nature of planning, steps in planning, types of planning, levels of planning- planning process, decision making.

UNIT-II (11 Hrs.)

Work-study, work breakdown structure, Time estimates, Applications of CPM/PERT, statical concepts, Man-Material-Machinery-Money optimization, scheduling, monitoring, updating. Cost functions, cost control, time-cost trade off, resource planning-leveling and allocation. Resources - based networks, crashing, master networks, interface activities and dependencies, line of balancing techniques, application of digital computers, Material management purchases management and inventory control, Human Resource Management.

UNIT-III (11 Hrs.)

Quality control and safety in construction Quality and safety concerns, organizing for quality and safety, work and material specifications, total quality control, Safety: importance of safety, accident-prone situations at construction site i.e, safety measures for excavation, drilling/blasting, scaffolding/formwork, hoisting & erection demolition and hot bituminous work. Fire Safety: Safety record of construction industry, safety campaign.

UNIT-IV (10 Hrs.)

Supervision, Inspection and Quality Control: Supervisor's responsibilities; keeping records; control of field activities handling disputes and work stoppages; storage and protection of construction materials and equipment; testing and quality control. Purpose of inspection: Inspection of various components of construction; reports and records; statistical quality control.

Recommended Books

1. K.K. Chitkara, 'Construction Project Management: Planning Scheduling and Control', Tata McGraw Hill Publishing Company, New Delhi, 1998.
2. M. Popescu Calin, Chotchal Charoenngam, 'Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications', Wiley, New York, 1995.
3. Chris Hendrickson and Tung Au, 'Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders', Prentice Hall Pittsburgh, 2000.
4. J. Moder, C. Phillips and E. Davis, 'Project Management with CPM, PERT and Precedence Diagramming', Van Nostrand Reinhold Company, 3rd Edn., **1983.**
5. E.M. Willis, 'Scheduling Construction Projects', John Wiley & Sons, 1986.

6. D.W. Halpin, 'Financial and Cost Concepts for Construction Management', John Wiley & Sons. New York.

CONSTRUCTION ENGINEERING AND MANAGEMENT

Subject Code – MCIE3-102

L T P C

Duration: 45 Hrs.

3 1 0 4

UNIT-I (13 Hrs.)

General Management: Introduction and characteristics of management, Principle and function of management, Scientific management.

Introduction: Definition, functions and scope of construction management; scientific methods of management; construction team.

UNIT-II (12 Hrs.)

Materials Management: Scope, Objective and functions of material management, Procurement and store management, Materials handling management, Inventory control and management, Disposal of Surplus Materials

UNIT-III (10 Hrs.)

Time-cost Optimization: Direct cost, indirect cost, total cost; purpose, stages and methods of cost control techniques of time cost optimization; examples and case studies.

UNIT-IV (10 Hrs.)

Site Layout: Principles governing site lay out; factors effecting site lay out; preparation of site lay out. Feasibility study; project reports; progress reports; monitoring and controlling construction activities.

Recommended Books

1. Mahesh Verma, 'Construction Equipment and its Planning and Application'.
2. R.L. Peuripo, 'Construction Planning Equipment and Methods', Tata McGraw Hill.
3. Jagman Singh, 'Heavy Construction Planning Equipment and Methods', Oxford.

CONCRETE CONSTRUCTION TECHNOLOGY

Subject Code: MCIE6-103

L T P C

Duration: 45 Hrs.

3 1 0 4

UNIT-I (10 Hrs.)

Introduction of Concrete materials, Admixtures, Fly Ash, Polymers, Early Age Properties, Strength, Permeability & Durability. Principles of Concrete mix design, Concrete Mix Design procedure by: IS/ACI/British Standards.

UNIT-II (10 Hrs.)

Concreting Operations-Practices and Equipment, batching; Mixing; Transporting; Placing and Compacting; curing. Properties and technique of construction for concrete, Fiber reinforced concrete, light weight concrete, Heavy weight concrete, Foam concrete, High performance Concrete.

UNIT-III (13 Hrs.)

Special concrete operations, shot Crete, grouting, Grunting, under water concreting, hot and cold weather concrete, pumpabale concrete. Construction techniques for reinforced concrete elements-materials, Principles and procedures for beams, slabs, columns, Foundations, walls and tanks, design and fabrication of form work for R.C.C. elements.

UNIT – IV (12 Hrs)

Pre-stressed concrete Construction-Principle, methods, materials, Tools and equipment for the construction of a pre-stressed bridge.

Inspection and Quality Control of Concrete Construction-Stages, Principles, Checklist, Statistical Controls, procedures.

Recommended Books

1. M.L. Gambhir, 'Concrete Technology', McGraw Hill Education.
2. Neville and Brooks, 'Concrete Technology', Prentice Hall.
3. M.S. Shetty, 'Concrete Technology', S. Chand.

SOFTWARE LAB –PROJECT PLANNING

Subject Code – MCIE6-104

L T P C

0 0 4 2

List of Experiments

PRIMAVERA

1. Planning and Scheduling of Multi storied building
2. Planning and scheduling of Road Project
3. Prepare the resource sheet, assign and level the resource
4. Preparing different reports available in Primavera
5. Plot the variance graphs for the given Project

COMPUTATIONAL TECHNIQUES

Subject Code – MCIE6-156

L T P C

Duration: 45 Hrs.

3 1 0 4

UNIT-I (12 Hrs.)

Equations: Rotts of Algebraic, Transcendental equations, Solution of linear simultaneous Equations by different methods using - Elimination, Inversion, Gauss - Jordan methods. Homogeneous Problems and Eigen Value Problems. Nonlinear Equations, Interpolation.

UNIT-II (12 Hrs.)

Finite Difference Technique: Initial and Boundary Value Problems of Ordinary and Partial Differential equations, Solution of Various types of Plates.

UNIT-III (11 Hrs.)

New Marks Method: Solution of determinate and indeterminate Structures by using New Mark's Procedure. Newmark's Implicit and Explicit Solutions for Non Linear Problems and Convergence Criteria

UNIT-IV (10 Hrs.)

Statistical Methods: Method of Correlation and Regression Analysis. Initial Value Problems: Galerkin's Method of Least Square, Initial Value problem by Collocation points, Runge Kutta Method.

Recommended Books

1. M.K. Jain, S.R.K. Iyenger and R.K. Jain, 'Numerical Methods for Scientific and Engineering Computations', New age International Publication (P) Ltd.
2. S.S. Sastry, 'Introductory Numerical Methods', Prentice Hall India Ltd.
3. Erwin Kreyszig, 'Advanced Engineering Mathematics', John Wiley & Sons, INC.

ENVIRONMENT ENGINEERING AND MANAGEMENT

Subject Code – MCIE6-157

L T P C

Duration: 45 Hrs.

3 1 0 4

UNIT-I (12 Hrs.)

Global Environmental Problems: Global warming, green-house effect, ozone depletion, acid rain, oil pollution, radiation hazard and control, global climate change. Main clauses and basic steps for Environmental Management System certification. Environmental Laws/Acts.

UNIT-II (10 Hrs.)

Cleaner Production Technologies Need and benefits, cleaner production techniques and options, zero impact manufacturing initiatives CDM and carbon credits/case studies.

UNIT-III (11 Hrs.)

Environment Impact Assessment: Definition and its importance for environment management, constituents of environment impact assessment, project data for EIA study, prediction of impacts, EIA methodologies, constraints in implementation of EIA, impact prediction on water resources projects and other relevant case studies. Environment pollution.

UNIT-IV (12 Hrs.)

Degradation of Land Resources: Deforestation: Forest land, deforestation and its effects on land use and Environmental quality, wetland and their importance in environment, causes and extent of wasteland, Soil degradation problems, erosion, salinization, water logging, land use management & planning.

Recommended Books

1. Peavy, Rowe, 'Techobanoglous, Environmental Engg.', Tata McGraw Hill.
2. Mackenzie L. Davis, 'Environmental Engg.', Tata McGraw Hill.
3. Baljeet S. Kapoor; 'Environmental Engg. An overview', Khanna Publishers.
4. Gilbert H. Masters, 'Environmental Engineering and Science', Prentice Hall of India Pvt. Ltd.
5. G.N. Panday, G.C. Carney Environmental Engineering, Tata McGraw Hill.
6. P.D. Sharma, Ecology and Environment, Rastogi Publications.
7. P.A. Ray, Lcances, 'Environmental Impact Assessment', Hand National Environmental Protection Council, Manile.

MAINTAINANCE OF BUILDING STRUCTURES

Subject Code – MCIE3-158

L T P C

Duration: 45 Hrs.

3 1 0 4

UNIT-I (12 Hrs.)

Importance of maintenance, deterioration and durability, factors affecting decision to carryout maintenance, maintenance and GNP, agencies causing deterioration, effect of deterioration agencies on materials. Factors to reduce maintenance at design stage, consideration of maintenance aspects in preparing tender document and specifications, sources of error in design which enhances maintenance, importance of working drawings and schedules, provision of access for maintenance and its importance at design stage. Economic consideration in maintenance: physical life, functional life, economic life of different types of buildings, discounting technique for assessment of economic life.

UNIT-II (8 Hrs.)

Maintenance Management: Definition, organization structure, work force for maintenance, communication needs, building inspections, maintenance budget and estimates, property inspections and reports, specification for maintenance jobs, health and safety in maintenance, quality in maintenance, maintenance manual and their importance. Materials for Maintenance: Compatibility of repair materials, durability and maintenance, types of materials, their specification and application, criteria for selection of material, use of commercial available materials in maintenance.

UNIT-III (12 Hrs.)

Investigation and Diagnosis for Repair of Structures: Basic approach to investigations, physical inspection, material tests, non-destructive testing for diagnosis, estimation of actual loads and environmental effects, study of design and construction practices used in original construction, retrospective analysis and repair steps. Maintenance Problems and Root Causes: Classification of defects, need for diagnosis, type of defects in building elements and building materials defect location, symptoms and causes.

UNIT-IV (13 Hrs.)

Remedial Measures for Building Defects: Preventive maintenance and special precautions - considerations, preventive maintenance for floors, joints, wet areas, water supply and sanitary systems, termite control, common repair techniques, common methods of crack repair.

- Repair of existing damp proofing systems in roofs, floors and wet areas.
- Protection, repair and maintenance of RCC elements.
- Repair, maintenance of foundations, basements and DPC
- Repair of finishes.
- Repair of building joints.
- Repair of water supply and sanitary systems, underground and overhead tanks.
- Common strengthening techniques
- Maintenance of Industrial Floors

Maintenance of Multi-storey Buildings: Special features for maintenance of multi-storeyed buildings, including fire protection system, elevators booster pumps, generator sets.

Recommended Books

1. A.C. Panchdari, 'Maintenance of Buildings', New Age International (P) Limited Publishers.
2. R. Chudley, 'Building Finishes, Fittings and Domestic Services', Longman Technical Services.
3. G. Szechy, D. SC; 'Foundation Failures', Concrete Publications Limited, 14 Dartmouth Street, London.
4. Whitney Clark Huntington Probert E. Mickadeit; Building Construction materials and types of construction Allan Hancock College H.J. Eidridge, Common Defects in Buildings, Her Majesty's Stationery Office, London.
5. W.H. Ransom, 'Building Failures: Diagnosis and Avoidance', New Age Publications (P) Ltd.
6. Housing Defects Reference Manual, The Building Research Establishment E. & F.N. SPON.

COMPOSITE MATERIALS

Subject Code – MCIE6-159

L T P C

Duration: 45 Hrs.

3 1 0 4

UNIT-I (13 Hrs.)

Fibre Reinforced Concrete: Properties of Constituent Materials, Mix Proportions, Mixing and Casting Procedures, Properties of Freshly mixed FRC, Mechanics and properties of Fibre reinforced concrete, Composite Material approach, Application of fibre reinforced concrete. Fly Ash Concrete: Classification of Indian Flashes, Properties of Fly ash, Reaction Mechanism, Proportioning of Fly ash concretes, Properties of Fly ash concrete in fresh and hardened state, Durability of fly ash concrete.

UNIT-II (10 Hrs.)

Polymer Concrete: Terminology used in polymer concrete, Properties of constituent materials, Polymer impregnated concrete, Polymer modified concrete, Properties and applications of polymer concrete and polymer impregnated concrete.

Ferro Cement: Constituent materials and their properties, Mechanical properties of ferro cement, Construction techniques and application of ferro cement.

UNIT-III (10 Hrs.)

High Performance Concrete: Materials for high performance concrete, Supplementary cementing materials, Properties and durability of high performance concrete, Introduction to silica fume concrete, Properties and applications of silica fume concrete.

UNIT-IV (12 Hrs.)

Sulphur concrete and sulphur infiltrated concrete: Process technology, Mechanical properties, Durability and applications of sulphur concrete, Sulphur infiltrated concrete, Infiltration techniques, Mechanical properties, Durability and applications of sulphur infiltrated concrete.

Light Weight Concrete: Properties of light weight concretes, Pumice concrete, Aerated cement mortars, No fines concrete, Design and applications of light weight concrete.

Recommended Books

1. P.K. Mehta, and P.J.M. Monterio, 'Concrete, its Properties and Microstructure', McGraw-Hill Education.
2. B.K. Paul, and R.P. Pama, 'Ferrocement by International Ferrocement Information Center', Asian Institute of Technology.
3. Bentur and Mindess, 'Fibre Reinforced Concrete', CRC Press.
4. Malhotra and Ramezaniapour, 'Fly ash in Concrete', CANMET Natural Resources Canada.

CONSTRUCTION LAW AND CONTRACT MANAGEMENT

Subject Code – MCIE6-205

**L T P C
3 1 0 4**

Duration: 45 Hrs.

UNIT-I (12 Hrs.)

Indian Contracts Act, Elements of Contracts, Types of Contracts- features- suitability, Design of Contract Documents, International Contract Document, Standard Contract Document, Tort Law.

UNIT-II (10 Hrs.)

Prequalification, Bidding, Accepting, Evaluation of Tender from Technical, Contractual and Commercial points of view, Contract formation and interpretation, Potential Contractual Problems, World Bank Procedures and Guidelines.

UNIT-III (13 Hrs.)

Insurance and Bonding, Laws Governing sale- purchase and use of urban and rural land, Land Revenue Codes, Tax Laws, Income tax, Sales tax, Excise and Custom duties and their influence on construction costs, Legal requirements for planning, Property Laws agency law, Local Government Laws for Approval, Statutory Regulations

UNIT-IV (10 Hrs.)

Social Security, Welfare Regulations, Laws related to Wages, Bonus and Industrial disputes, Labour Administration, Insurance and safety regulations, Workmen's compensation Act, Indian Factory Act, Punjab Factory Act, Child Labour Act, other labour laws.

Recommended Books

1. G.T. Gajaria, 'Laws Relating to Building and Engineering Contracts of India'.
2. Jimmie Hinze, 'Construction Contracts', McGraw Hill, 2001.

BUILDING COST & QUALITY MANAGEMENT

Subject Code – MCIE6-206

**L T P C
3 1 0 4**

Duration: 45 Hrs.

UNIT-I (13 Hrs.)

Estimation of Quantities for Excavation, Earthwork, D.P.C., R.C.C. work, flooring and roofing, plastering, pointing, wood work, white washing etc. for construction works- Buildings, Roads, Bridges etc.

UNIT-II (12 Hrs.)

Estimation of Building Services – Plumbing - Water Supply, Electrification, Sanitary Fitting, Mechanical- HVAC etc., and their cost analysis.

UNIT-III (10 Hrs.)

Analysis of rates for various building works – Brick work in foundations and Superstructure, P.C.C, R.C. C., Plastering, Flooring, Timber work etc.

UNIT-IV (10 Hrs.)

Checking of Construction Quality – Bricks, Cement, Concrete, Aggregates, and Steel as per IS codes.

Recommended Books

1. B.N. Dutta, 'Estimating and Costing'.
2. G.S. Birdie, 'Estimating and Costing'.
3. Chakaraborty, 'Estimating and Costing'.

QA & QC LAB

Subject Code – MCIE6-206

L T P C

3 1 0 4

List of Experiments

1. CEMENT
 - a) Sampling procedures and sample collections
 - b) Test for cement
2. AGGREGATE
 - a) Sampling Procedures and Sample Collections
 - b) Test for Fine Aggregate (Sand)
 - c) Test for Coarse Aggregate
3. BRICKS
 - a) Sampling Procedures and Sample Collections
 - b) Test for Bricks IS: 1077- 1992
4. CONCRETE
 - a) Sampling Procedures and Sample Collections
 - b) Test of Cement Concrete
5. STEEL
 - a) Sampling Procedures and Sample Collection
 - b) Test of Steel for Reinforcement IS: 1786 – 2008
6. PIPES
 - a) Sampling Procedures and Sample Collections
7. WATER FOR CONSTRUCTION PURPOSES
 - a) Sampling of Water
8. BRICK BALLAST IS: 3068-1986 and IS: 3182-1986
9. CHECKS AND TESTS OF FINISHED WORKS

CONSTRUCTION COSTING & FINANCIAL MANAGEMENT

Subject Code – MCIE6-260

L T P C
3 1 0 4

Duration: 45 Hrs.

UNIT-I (13 Hrs.)

Costing of construction Works, different methods of costing, cost elements in a projects, analysis of rates, non-scheduled items of work, cost estimation for a small construction job, purpose, methods and stages of cost control, cost monitoring, cost forecasting methods, variations in individual items of work and their effect on total contract price, valuation of variations.

UNIT-II (12 Hrs.)

Determining the funds required for a construction job, preparing cash flow statements; cash inflow and outflow during contract period, Precautions in custody of cash, imprest account and temporary advance; maintenance of temporary advance; and advance account; different types of payment, first, running, advance and final payments.

UNIT-III (10 Hrs.)

Objectives and Scope of Material Management classification, Codification, ABC Analysis, Standardization and Substitution, introduction to inventory control, Stores Management, Organization and Lay out, Receipt, Inspection and Issue, Care and Safety, Store Records and Store Accounting.

UNIT – IV (10 Hrs.)

Meaning and Scope, Financial Statement Analysis, Funds Flow Analysis, Capital Budgeting, Cost- Benefit Analysis.

Recommended Books

1. F.W. Mueller, 'Integrated cost and schedule control for construction projects'.
2. Gbourne, 'Cost control in the construction industry'
3. Chris Hendrickson and Tung Au, 'Project Management for Construction'.
4. Datta, 'Material Management Procedures, Text and Cases', Prentice Hall.
5. P. Gopalakrishnan, M. Sundaresan, 'Material Management - An Integrated Approach', Prentice Hall.

PROJECT SAFETY MANAGEMENT

Subject Code – MCIE6-261

L T P C
3 1 0 4

Duration: 45 Hrs.

UNIT-I (12 Hrs.)

Safety in construction- Safety Concerns, Importance of Safety, Factors affecting safety: Psychological and Technological, Planning for safety provisions, Safety consideration during construction, demolition and during use of equipment.

UNIT-II (11 Hrs.)

Accidents and their causes, Human factors in construction safety, cost of construction injuries, occupational and safety hazard assessment, legal implications.

UNIT III (10 Hrs.)

Problems areas in construction safety, Elements of an effective safety programs, job site safety assessment, safety meetings, safety campaigns and safety incentives

UNIT IV (12 Hrs.)

Safety culture, safe workers, Safety and first line supervisors, safety and middle managers, top management practices, company activities and safety, safety personal, workers compensations, project coordination and safety procedures.

Recommended Books

1. Tim Howarth and Paul Watson, 'Construction Safety Management', John Wiley & Sons, 2008.
2. Phil Hughes, Ed Ferrett, 'Introduction to Health and Safety in Construction: The Handbook for Construction Professionals and Students on Neboosh and Other Construction Courses', 3rd Edn, Routledge, 2008.

FOUNDATION DESIGN AND CONSTRUCTION

Subject Code – MCIE6-262

**L T P C
3 1 0 4**

Duration: 45 Hrs.

UNIT-I (12 Hrs.)

Shallow Foundation: Design of footing e.g. isolated footing in B.B.C. and steel grillage, combined footings of rectangular, Trapezoid cantilever types. Mat or raft foundation for dry and saturated soil, floating foundations

UNIT-II (8 Hrs.)

Deep Foundation: Design of Piles, Pile caps and pile foundations buildings, Design of retaining structures

UNIT-III (13 Hrs.)

Earth Retaining Structures: Design of retaining walls for dry and saturated back fills with surcharge loads. Retaining walls resting on piles, Design of bridge abutments, Design of sheet piles used for coffer dams, Design of sheeting bracing in excavation trenches, Special Structures

UNIT-IV (12 Hrs.)

Design of foundation for transmission, Design of basement walls, Bridges structures Analysis and Design: Design of walls foundation and caissons of different types, Design of bridge piers resting on piles.

Recommended Books

1. Pillai & Mennon, 'Advanced RCC Design', Tata McGraw Hill.
2. P.C. Varghese, 'Limit state Design of Reinforced Concrete', Prentice-Hall of India.
3. N. Krishna, 'Advanced Reinforced Concrete Design', CBS Publisher Publication, 2013.

RURAL CONSTRUCTION TECHNOLOGY

Subject Code – MCIE6-263

**L T P C
3 1 0 4**

Duration: 45 Hrs.

UNIT-I (8 Hrs.)

Rural Development Planning- Concept of Appropriate Technology, Scope, Development Plans; Various approaches to rural development planning Concept of Appropriate technology; Role of Civil Engineering in Rural Development; Organizational structures & management rural development programmes/projects.

UNIT-II (12 Hrs.)

Rural Housing: Low cost construction materials for housing low cost housing designs-architectural considerations for individual and group housing ; composite material-Ferro cement & fly ash, Autoclaved Calcium silicate bricks and soil-stabilized unburnt brick; Plinth protection of Mud Walls; Design Consideration and Construction of: Non-erodible Mud Plaster, water-proof and fire-retardant roof treatment for thatch roofs, Precast stone Masonry Block walling scheme; rat-trap bond for walls; Prefab Brick Panels for roof, Ferro cement flooring /roofing units, Precast R.C. Channel Unit for flooring/roofing scheme, Precast R.C. cored unit for flooring/roofing scheme, Precast R.C. Plank flooring/roofing scheme, L-Pan roofing scheme; Glued Plywood Web Beams and Roof Panels; manual & Power Scaffold hoist, lifting device for prefab components; solar passive building design; Building economics and management.

UNIT-III (13 Hrs)

Water Supply and Rural Sanitation: Epidemiology sources of water, BIS & WHO water standards. Quality, Storage and distribution for rural water supply works; Basic Design principles of treatment-Low Cost water treatment technologies; Hand pumps-types, installation operation, and maintenance of Mark-II hand pumps; Conservation of water; Rainwater, Harvesting; Drainage in rural areas, Design of low cost waste disposal systems; Design and constructions of low cost latrines: 2 pit pour flush water seal VIP latrines, septic tank etc.; Biogas technology: Low cost community & individual Garbage disposal systems, Recycling of organic/agricultural wastes: Development of village ponds; Ferro cement water storage tanks & latrines. Cattle shed management; Sewage farming-standards for disposal and use for irrigation.

UNIT-IV (12 Hrs.)

Low Cost Roads and Transport: Low cost pavement materials-testing suitability criteria processing materials; factors affecting pavement thickness & composition of various layers; CRRI Design for rural roads-Traffic Index, strength Index, CBR curve Intermediate Technology & Technology options for specify areas. Labour intensive techniques of road construction Mechanical stabilization; lime stabilization; water bound Macadam Construction; utilization of waste in rural construction one/two coat surface dressing; bitumen premix carpet; low cost improved transport system rural areas.

Recommended Books

1. A.G. Madhov Rao, D.S. Ramachandra Murthy, ‘Apprority Technologies for Low Cost Housing’, Oxford and IBH Pblishing Co. Pvt. Ltd.

2. CBRI, 'Roorkee Advances in building Materials Construction'.
3. C. Satyanarayan Murthy, 'Design of Minor Irrigation and Canal Structures', Wiley Eastern Ltd.
4. K. Park, 'Preventive and Social Medicine', Banarsi Bhnot.
5. Yash Pal Bedi, 'A Hand Book of Preventive and Soc Medicine', Atama Ram & Sons, Delhi.
6. Document on Rural Road Development in India Volume Central Road Research Institute, New Delhi.
7. S.B. Watt, 'Ferrocement Water Tanks and their Construction', Intermediate Technology Publications Ltd, London.
8. Ariane Van Bureu, 'A Chinese Biogas Manual', Publications, London.
9. K.C. Khandelwal and S.S. Mahdi, 'Biogas Technology-A Practice Handbook', Volume 1 & 2, Tata McGraw Hil Publishing Com Ltd. New Delhi.

RESEARCH METHODOLOGY

Subject Code – MREM0-101

L T P C
4 0 0 4

Duration: 45 hrs.

UNIT-I (11 Hrs.)

Introduction to Research: Meaning, Definition, Objective and Process

Research Design: Meaning, Types - Historical, Descriptive, Exploratory and Experimental

Research Problem: Necessity of Defined Problem, Problem Formulation, Understanding of Problem, Review of Literature

Design of Experiment: Basic Principal of Experimental Design, Randomized Block, Completely Randomized Block, Latin Square, Factorial Design.

Hypothesis: Types, Formulation of Hypothesis, Feasibility, Preparation and Presentation of Research Proposal

UNIT-II (10 Hrs.)

Sources of Data: Primary and Secondary, Validation of Data

Data Collection Methods: Questionnaire Designing, Construction

Sampling Design & Techniques – Probability Sampling and Non Probability Sampling

Scaling Techniques: Meaning & Types

Reliability: Test – Retest Reliability, Alternative Form Reliability, Internal Comparison Reliability and Scorer Reliability

Validity: Content Validity, Criterion Related Validity and Construct Validity

UNIT-III (13 Hrs.)

Data Process Operations: Editing, Sorting, Coding, Classification and Tabulation

Analysis of Data: Statistical Measure and Their Significance, Central Tendency, Dispersion, Correlation: Linear and Partial, Regression: Simple and Multiple Regression, Skewness, Time series Analysis, Index Number

Testing of Hypothesis: T-test, Z- test, Chi Square, F-test, ANOVA

UNIT – IV (11 Hrs.)

Multivariate Analysis: Factor Analysis, Discriminant Analysis, Cluster Analysis, Conjoint Analysis, Multi-Dimensional Scaling

Report Writing: Essentials of Report Writing, Report Format

Statistical Software: Application of Statistical Soft wares like SPSS, MS Excel, Mini Tab or MATLAB Software in Data Analysis

**Each Student has to Prepare Mini Research Project on Topic/ Area of their Choice and Make Presentation. The Report Should Consists of Applications of Tests and Techniques Mentioned in The Above UNITs*

Recommended Books

1. R.I. Levin and D.S. Rubin, 'Statistics for Management', 7th Edn., Pearson Education, New Delhi.
2. N.K. Malhotra, 'Marketing Research—An Applied Orientation', 4th Edn., Pearson Education, New Delhi.
3. Donald Cooper, 'Business Research Methods', Tata McGraw Hill, New Delhi.
4. Sadhu Singh, 'Research Methodology in Social Sciences', Himalaya Publishers.
5. Darren George & Paul Mallery, 'SPSS for Windows Step by Step', Pearson Education, New Delhi.
6. C.R. Kothari, 'Research Methodology Methods & Techniques', 2nd Edn., New Age International Publishers.

ADVANCED STRUCTURAL DESIGN AND DETAILING

Subject Code – MCIE6-364

L T P C

Duration: 45 Hrs.

3 1 0 4

UNIT-I (10 Hrs.)

Introduction to limit state method of design, provisions in the Indian standard codes for loading wind loads and seismic loads, design and detailing of concrete structures.

UNIT-II (11 Hrs.)

BIS Handbook for design, Examples of design using handbook.

Design of Structures as per I.S. 1893 for Earthquake Resistant Design Construction

UNIT-III (12 Hrs.)

Design and Detailing Requirements as per 4326-1993.

Design and Detailing of Earthen Buildings as per 13827-1993.

Design and Detailing of Masonry Structures as per I.S. 13828-1993

UNIT-IV (12 Hrs.)

Design and Ductile Detailing of R.C.C. Structures as per I.S. 13920-1993

Repair and Seismic Strengthening of Buildings as per I.S. 13935-1993.

Recommended Books

1. P. Dayaratnam, 'Reinforced Concrete Structure'
2. A. K. Jain, 'Reinforced Concrete, Limit State Method of Design'.
3. B.C. Punmia, 'Reinforced Concrete Structures', Vol II
4. Jain and Jai Krishna, 'Plain and Reinforced Concrete' Vol II.
5. P. Dayaratnam, 'Design of Steel Structures'
6. S.K. Duggal, 'Design of Steel Structures'
7. B.I.S. Codes 1893, 4326, 13827, 13828, 13920, 13935

PAVEMENT DESIGN, CONSTRUCTION AND MAINTENANCE

Subject Code – MCIE6-365

**L T P C
3 1 0 4**

Duration: 45 Hrs.

UNIT-I (13 Hrs.)

Types of pavement structure. Functions of pavement components, Factors affecting pavement design. Design wheel load, Strength characteristics of pavement materials. General design considerations, Methods for design of flexible pavements; Group Index method, California Bearing Ratio (CBR) method, California Resistance Value method, Triaxial Test method, Burmister method, McLeod's method.

UNIT-II (11 Hrs.)

General design considerations, Methods for design of rigid pavements; Westergard's method, F.A.A. method, IRC recommendations for design of concrete pavements, method, Types of joints and their design in cement concrete pavements. Thickness design for Airport pavement, LCN system of pavement design, design of airport pavement overlays.

UNIT-III (10 Hrs.)

Types of highway construction and their selection, materials for construction, construction procedure of different highways: Earth roads, Gravel roads, WBM roads, bituminous pavements, Cement concrete pavements, Low cost roads, Introduction to various equipment used for highway construction.

UNIT-IV (11 Hrs.)

Need for highway maintenance, Pavement failures their causes and remedial measures. Typical flexible and rigid pavement failures, Types of highway maintenance: Routine, periodic and special type, materials used for maintenance of different pavements, Strengthening of existing pavements, Maintenance management system.

Recommended Books

1. E.J. Yoder, 'Principals of Pavement Design'.
2. Khanna and Justo, 'Highway Engineering'.
3. S.K. Sharma, 'Principles, Practice and Design of Highway Engineering'.
4. M.G.L., 'Handbook of Road Technology'.
5. Yang and Huang, 'Pavement Analysis and Design'.
6. D. Cronney and P. Cronney, 'The Design and Performance of Road Pavements'.
7. Horenjeff, 'Planning and Design of Airports'.