GURU KASHI UNIVERSITY

Master of Technology in Civil Engineering (MCE)

Session: 2023-24

Department of Civil Engineering

Graduate Outcomes of the Programme

The programme emphasizes to civil engineering principles, including structural analysis, geotechnical engineering, transportation engineering, and environmental engineering. Depending on their chosen specialization, graduates often become experts in areas such as structural engineering, geotechnical engineering, water resources engineering, or transportation engineering.

PROGRAMME LEARNING OUTCOMES

After completing the programme, the Learner will be able to:

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Identify, formulate, review research literature, and analysis complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
6. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
7. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
8. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Programme Structure

Semester –I						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**Credits**
MCE101	Construction Management & Equipment	Core	4	0	0	4
MCE102	Concrete Construction Technology	Core	4	0	0	4
MCE104	Building Planning & Design	Core	4	0	0	4
MCE103	Computation Techniques	Ability Enhancement	4	1	0	5
Discipline Elective-I(Any one of the following)						
MCE105	Environment Engineering & Management	Discipline Elective-I	3	0	0	3
MCE106	Bridge Engineering					
Total			**19**	**1**	**0**	**20**

Semester –II						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**Credits**
MCE201	Foundation Design & Construction	Core	4	0	0	4
MCE202	Maintenance of Building Structure	Core	4	0	0	4
MCE204	Building Cost and Quality	Core	4	0	0	4
MCE206	Rural Construction Technology	Core	4	0	0	4
MCE203	Computer Aided Design	Ability Enhancement	4	0	0	4
MCS220	English for Research Paper Writing	Value Added Course	2	0	0	2
		Total	**22**	**0**	**0**	**22**

Semester: III						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**No. of Credits**
MCE302	Pavement Design, Construction and Maintenance	Core	4	0	0	4
MCE303	Research Methodology	Research Based	4	0	0	4
MCE301	Dissertation Phase-I	Skill Based	0	0	20	10
MCE399	XXX	MOOC	-	-	-	4
		Total	**8**	**0**	**20**	**22**

Semester –IV						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**Credits**
MCE401	Dissertation Phase-II	Research Based	0	0	0	20
		Total	**0**	**0**	**0**	**20**
		Grand Total	**49**	**1**	**20**	**84**

Evaluation Criteria for Theory Courses

A. Continuous Assessment: [25 Marks]

   i. Surprise Test (Two best out of three) - (10 Marks)
   ii. Term paper (10 Marks)
   iii. Assignment(s) (5 Marks)

B. Attendance (5 marks)
C. MST: [30 Marks]
D. End-Term Exam: [40 Marks]

Evaluation Criteria for Practical Courses

Performance of Each Practical (10 Marks)

Report (5 Marks)

Practical Viva (5 Marks)

Total (20 Marks) (Each Practical)

SEMESTER: I

COURSE TITLE: Construction Management & Equipment
COURSE CODE: MCE101

L	T	P	Credits
4	0	0	4

Total: 60 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Understand the construction equipment practices and techniques to be used in the field.
2. Apply theoretical and practical aspects of project management techniques to achieve project goals
3. familiar with construction equipment and their capabilities
4. Learn to utilize construction equipment on site work and heavy civil projects.

Course Content

UNIT I **15 Hours**

Engineering Economy: Principle of Engineering Economy, Minimum cost point analysis, breakeven point analysis, Depreciation and depletion. Safety in Construction: Causes, classification, cost and measurement of an accident, safety Programme for construction, protective equipment, accident report, safety measure:
(a) For storage and handling of building materials.
(b) Construction of elements of a building
(c) In demolition of buildings
(d) Safety lacuna in Indian scenario.

UNIT II **15 Hours**

Construction Planning: Need of construction planning, Constructional Resources, construction team, stages in construction, preparation of construction schedule, Job layout, inspection and quality control.
Introduction and characteristics of management, Principle and function of management, Scientific management.

Unit-III **15 Hours**

Scope, Objective and functions of material management, Procurement and store management, Materials handling management, Inventory control and management. Disposal of Surplus Materials Earth Moving Equipment: Crawler and wheel tractors their functions, types an specifications; Gradeability Bull dozers and their use; tractor pulled scrapers, their sizes and output; effect of grade an rolling resistance on the output of tractor pulled scrapers Earth loaders; Placing and compacting earth fills. Power shovels-functions, selection, sizes, shovel dimension and clearances, output. Draglines-functions, types sizes, output clamshells; Safe lifting capacities and working ranges cranes; Hoes, Trenching machine types and production rate calculation of producing rates of equipment;

examples.

UNIT IV **15 Hours**

Hauling Equipment: Truck's; Bottom, dump wagons; capacities of trucks and wagons Balancing the capacities of hauling units with the size excavator; effect of grade, rolling resistance and altitude on the cost/performance of hauling equipment; balancing excavating hauling equipment examples.

Drilling, Blasting and Tunneling Equipment: Definition of terms, bits, Jackhammers, Drifters, wagon drills, che drills, piston drills, blast hole drills, shot drills, diamond drills, tunneling equipment, selecting the drilling method equipment; selecting drilling pattern; Rates for drilling rock, compressors.

Pile Driving Equipment: Pile hammers, selecting a pile hammer, loss of energy due to impact, Energy losses due to causes other than impact.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

- *Verma, Mahesh. (1964), Construction equipment and its planning and application. Metropolitan Book Company.*
- *Peuripo, RL. (2010). Construction Planning equipment and Methods. Tata McGraw Hill.*
- *Singh, Jagman. 1993. Heavy construction planning equipment and methods. Oxford and IBH.*
- *Franklin, John (2004). A. Dusseault, Maurice B. Rock Engineering. Tata McGraw Hill.*
- *John, Christan.(1981). Management Machines and Methods in Civil Engineering. John Wiley and Sons*

COURSE TITLE: CONCRETE CONSTRUCTION TECHNOLOGY
COURSE CODE: MCE102

L	T	P	Credits
4	0	0	4

Total: 60 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Learn about the special ingredients of Concrete.
2. Know different property ingredients of concrete.
3. Understand the use of various admixtures to be used in Preparation of Mixes.
4. Estimate the properties of fresh and harden concrete.

Course Content

UNIT I **15 Hours**

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 **15 Hours**

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 **15 Hours**

Special concrete operations, shot Crete, grouting, grunting, under water concreting, hot and cold weather concrete, pump able 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 **15 Hours**

Prestressed concrete construction- Principle, methods, materials, Tools and equipment for the construction of a prestressed bridge.

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

Transactional Mode:
Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

- *Gambhir, M.L. (2007). Concrete Technology. Tata McGraw-Hill Education.*
- *Mehta, P.K. (2009). Concrete Microstructure, Properties and Materials. PJM Monteiro Publications.*

COURSE TITLE: Building Planning & Design
COURSE CODE: MCE104

L	T	P	Credits
4	0	0	4

Total: 60 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Understand basic principles of building design and planning.
2. Explore building drawing as a way of discovering and developing ideas for designing residential, commercial and public buildings.
3. Develop basic drawing skills; create multilayer architectural and working drawing drawings.
4. Implement planning strategies and policies.

Course Contents

UNIT I – Architecture **15 hours**

Land Acquisition Act 1894 (short titles, extent & definitions only) Municipality act 1911 (short titles, extent & definitions only, Power of committee for making bylaws, for punishment, to sanction). Architectural Planning and Layout: Principles of planning a building, Factors affecting selection of site for building, Sun & the building

UNIT II – Soil **15 Hours**

Soil formation, particle size analysis, Indian Standard Soil Classification, time-settlement curve, Proctor test, compaction of sand, factors affecting compaction, field compaction methods, calculation of Bearing Capacity of soil by Standard Penetration Test, soil investigation report, types of shear failures, effect of water table on B.C., Settlement cases, calculation of B.C. by Plate Load Test.

UNIT III – Structure **15 Hours**

Earthquake: Hazardous effects on structures & Ground, General guidelines for earthquake resistance buildings. Liquid faction, factors affecting liquefaction & prevention.

UNIT IV **15 Hours**

Various Loading Conditions and Analysis of Multistoried Complex (Kani's Method for vertical loads and Portal Method for Lateral loads) Structural Design of Beams, Columns, Slabs, Foundations and Stairs. Structural Drawings.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- *Arora, K R. (2011). Soil Mechanics and Foundation Engg. Standard Publishers.*
- *Verma, Mahesh. (2005). Construction equipment and its planning and application. S.chand Publishers.*
- *Peurify RL. (1995). Construction Planning equipment and Methods. Tata McGraw Hill.*
- *IS- 1888 (1978): Plate Load Test. BIS. New Delhi.*
- *IS – 6403 (1981): Bearing capacity of shallow Foundation. BIS. New Delhi.*

Note*: IS: 6403 is allowed in Exam

COURSE TITLE: Computation Techniques
COURSE CODE: MCE103

L	T	P	Credits
4	0	0	4

Total: 60 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Understand the tradeoffs between easy computation and accuracy.
2. Demonstrate proficiency in the use of input/output commands including: command line, file, and graphical.
3. Create changes in program flow using control structures.
4. Modularize program construction and increase code re-uses using functions.

Course Content

UNIT I **15 Hours**

Equations: Rots 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.

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

UNIT II **15 Hours**

New Marks Method: Solution of determinate and indeterminate Structures by using New Mark's Procedure.

Statistical Methods: Method of Correlation and Regression Analysis.

UNIT III **15 Hours**

Initial Value Problems: Galerkin's Method of Least Square, Initial Value problem by Collocation points, RungaKutta Method.

UNIT IV **15 Hours**

Newmark's Implicit and Explicit Solutions for Non-Linear Problems and Convergence Criteria.

Transactional Mode:
Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

- *Jain, M.K. & Jain, R.K. (2014). Numerical Method Problems and Solutions. Jain, M.K. & Jain, R.K publishers.*
- *Tenkolsky, A. Vellerling, W.T. (2009). Numerical Receipes in Fortran, S. W.H. Press*
- *Syal& Gupta. (2005). Computer Programming & Numerical Analysis. Khanna Publishers.*

COURSE TITLE: Environment Engineering & Management
COURSE CODE: MCE105

L	T	P	Credits
3	0	0	3

Total: 45 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Understood Sewage quantity and quality for better treatment so as to reduce scarcity by recycling waste water.
2. Learn about industrial waste water quantity and quality for achieving better sanitation in society.
3. Use population forecasting methods.
4. Design various water treatment units and plan their operations on the basis of raw water quality and water demand.

Course Contents

UNIT I **10 Hours**

Environment & Ecology: Definition and understanding of concepts. Ecosystem, Energy flow in ecosystem, water, carbon and nitrogen cycle community's inter-relationships in and ecosystem.

Type of Pollutants and Protection of Environment:

Environmental Protection Importance of clean Environment, Control of Environment pollution w.r.t. air, land and water.

UNIT II **10 Hours**

Water pollution:

Sources, causes and measurement of water pollution surface water and underground water, water Quality criteria for various uses of fresh water, river basis studies for surface water pollution control biochemical oxygen demand, effect of oxygen demanding wastes on rivers.

Air and Noise pollution:

Definition Principal materials causing pollution types of air contaminants. Their sources and effects on living and nonliving materials permissible limits. Air pollution control-Basis principles, natural self-cleansing, pollution control methods and various engineering devices to control particulate and gaseous pollutants, controlling and pollution from automobiles.

UNIT III **10 Hours**

Current issues in Environmental Engineering: Global warming, Ozone depletion, Acid Rain, Oil pollution, Radiation Hazard and Control, Role of non-convention sources of energy in environment.

Acts/Legislation Provisions: Need for laws various acts, Rules and notifications. Salient features of various acts: The water (Prevention and Control of pollution) Act 1974. The water (prevention and Control of pollution) Cass Act, 1977. Air (Prevention and control of Pollution) Act 1981. The Environment (Protection) Act 1986, The Public liability insurance Act, 1991. The forest Act 1927, the wild life (Protection) Act 1927, The Forest (Conservation) Act, 11980, various other Rules and notification for control of pollution.

UNIT IV **15 Hours**

Environmental Impact Assessment: Definition and its importance for Environment Management, Constituents of Environment. Impact Assessment Report, Steps involved in preparing EIA,EIA methodologies Projects under EIA, Environment Impact Statement, Constraint in implementation of EIA. Impact prediction water, Resources Projects and other relevant case studies. Application of Biotechnology for Environmental Management: Basic concepts and techniques, Application for industrial effluent: Solid waste management, Bio-fertilizers and Bio-pesticides; Plant tissue culture in forestry. Bio safety aspects, Bio-remedial.

Transactional Mode:
Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- *Peavy, Rowe, Techobanoglous, (2009) Environmental Engg. McGraw-Hill.*
- *L Davis, Mackenzie. Environmental (1990). Engg. Tata McGraw-Hill.*
- *H.Msters, Glbert.(1997). Environmental Engineering. Sc Prentice Hall of India Pvt. Ltd.*
- *Panday, GN. Carney, GC.(2006). Environmental Engineering. McGraw-Hill.*
- *Sharma, P.D. (2004). Ecology and Environment. Rastogi Publication.*

COURSE TITLE: Bridge Engineering
COURSE CODE: MCE106

L	T	P	Credits
3	0	0	3

Total: 45 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Discuss the IRC standard live loads and design the deck slab type bridges.
2. Analyze the box culverts for the given loading and detail the box culverts.
3. Design and detail of T-Beam bridges.
4. Understand the design and check the stability of piers and abutments.

Course Contents

UNIT I **10 Hours**

Introduction: Definition and components of a bridge, Classification of bridges, Choice of abridge type.

Investigation for Bridges: Need for investigation, Selection of bridge site, Determination of design discharge for River Bridge, Linear waterway, Economical span, Vertical clearance, scour depth, Afflux, Traffic projection.

UNIT II **10 Hours**

Standard Specifications for Road Bridges: Indian Road Congress Bridge Code, Width of carriageway, Clearances, loads to be considered; Dead load, I.R.C. standard live loads, Impact effect, Application of Live load on decks, Wind load, Longitudinal forces, Centrifugal forces, Horizontal forces due to water current, Buoyancy effect, Earth pressure, Deformation stresses, Erection stresses, Temperature effects, and Seismic force.

Reinforced Concrete Bridges: General, Types of bridges; balanced cantilever bridges, Continuous girder bridges, rigid frame bridges, Portal Frame and Arch bridges. Detailed design of solid slab and T-beam bridges,

UNIT III **10 Hours**

Steel Bridges: General, Type of Steel bridges; Plate girder bridges, Box girder bridges, Truss bridges, Cantilever bridges, Cable stayed bridges, and Suspension bridges.

Sub-structure and Foundation**:** Design of piers and abutments (Masonry & R.C.C.). Types of foundations; Shallow, Pile, and Well foundations including their construction details.

UNIT IV **15 Hours**

Bearings & Appurtenances: Different types of bearings, joints and handrails. Construction and Maintenance of Bridges**:** Methods of construction of concrete bridges. Causes of Bridge failures, Inspection and maintenance.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

- *Reddy, C.S. (2011). Basic structural Analysis. Mittal Publications. New Delhi.*
- *Vazirani & Ratwani, (2002).Bridge Engineering Vol- I and Vol.-II Khanna Publishers. New Delhi.*
- *Ramamurtham, S. (2011). Bridge Engineering. Dhanpat Rai Publishing Co. (P) Limited.*
- *Concrete Bridge Design SP-23 (ACI Publication)*

SEMESTER: II

COURSE TITLE: FOUNDATION DESIGN & CONSTRUCTION
COURSE CODE: MCE201

L	T	P	Credits
4	0	0	4

Total: 60 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Know the importance of soil investigation and determine various soil properties.
2. Understand the significance and determine the load bearing capacity for shallow and deep foundations.
3. Learn the settlement behavior of different type of soil under different foundation.
4. Understand the concept of earth pressure behind earth retaining structures for different conditions.

Course Content

UNIT I **15 Hours**

General principle of foundation Design.

Functions of foundations, Essential requirements of a good foundation, Types of foundations,

Principal modes of failure, Estimation of allowable bearing pressures, calculation of ultimate bearing capacity by theoretical and empirical methods: Terzaghi's Method, Skempton's analysis for clays, Meyerhof's analysis BIS Method (IS: 6403) settlement of foundations, Factors to be considered in foundation design; Environmental considerations.

Shallow Foundations:

Introduction, Essential requirements Type and depth of footings, contact Pressure below footing strip footing, Isolated footing or Pad footing, eccentrically loaded footings, Grillage foundations; Design features and construction details of combined footing, Strap footing or Cantilever footing Problem of frost heave, its causes and prevention effect of ground water Raft footing.

UNIT II **15 Hours**

Pile Foundations:

Purpose/Uses of pile foundations, Classification of piles based on different criteria, Details of

Timber, Concrete, Steel Piles their advantages and disadvantages selection of Pile Type, Pile action behavior of pile and pile groups under load. Definition of failure load.

Estimation of carrying capacity: Single driven pile in cohesion less soils-methods based of on SPT and CPT, ultimate load on Driven and cast-in-place piles and Bored and cast-in place piles in cohesion less soils. Factors affecting pile capacity. Ultimate capacity of single pile driven in cohesive soils. Modification for driven and cast-in-place piles and Bored and Cast-in-place piles. Carrying capacity of piles on rocks. Piles in fills-negative skin friction. Carrying capacity of Pile groups in cohesive soil and cohesion less soils, efficiency of pile group. piles subjected to horizontal or inclined loads.

UNIT III **15 Hours**

Soil Stability.

Retaining walls-Types Elements for design, construction of cantilever and counter fort retaining walls. Unbraced excavations, braced excavations. Sheet Piles and Bulkheads-Types and design of cantilever and Anchored sheet piles; Anchors and Tie backs. Shorting and Underpinning- Necessity and methods.

Improvement of Foundation Soils.

Purpose: Improvement of Granular Soils: Terms used to describe degree of compactness-Relative Density, Density Ratio and Degree of Compaction;

Methods - Vibration at ground surface, factors influencing, roller compaction; Deep Dynamic Compaction, Vibro compaction, Impact at depth.

Improvement of Cohesive soils: Preloading or Dewatering, Methods of installing sand drains, drain wicks, Electrical and Thermal methods.

Grouting: Purpose, Functions Types of grouts; Soil Bentonite-cement mix, cement mix, emulsions, solutions: Grout Injection methods.

d) Geosynthetics: Types, Functions, Manufacturing of geotextiles, Classification of geotextiles.

Specific Applications: Bearing capacity improvement, Reinforcement, Retaining walls, Embankment etc. Testing of Geosynthetics usage in India and a case study.

UNIT IV **15 Hours**

Special Considerations in Foundation Design and construction: Elementary Principles of design and construction of foundations subjected to earthquake or dynamic loads Special measures for foundations constructed under water.

Design of shallow foundations.

Recommend suitable dimensions. Depth and spacing of pile/pile group for given loading conditions.

Transactional Mode:
Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

- *Tomlinson, Mj. (1996). Foundation Design and Construction. ELBS Longman.*
- *Joseph E, Bowles. (2000). Foundation Analysis and Design. McGraw Hill.*
- *Brahma, SP. (1985). Foundation Engineering. Tata McGraw Hill.*
- *Robert M, Koerner. (1985). Construction and Geotechnical Methods in Foundation*
- *Engineering. McGraw Hill.*
- *Mohan, Dinesh. (1998). Pile foundations. oxford & IBH.*
- *Kurian, N.P. (1982). Modern Foundations. Tata McGraw Hill,*

COURSE TITLE: Maintenance of Building Structure
COURSE CODE: MCE202

L	T	P	Credits
4	0	0	4

Total: 60 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Evaluate the health condition of structures.
2. Inspect and evaluate damage structures.
3. Analysis the asses the condition of properties of existing concrete structures.
4. Implement the techniques for repairing of concrete structures.

Course Content

UNIT-I **15 Hours**

Principles of Maintenance: Importance of Maintenance, Deterioration and durability, Factors affecting decision to carryout maintenance, Maintenance and GNP Agencies causing deterioration, effect of deterioration agencies on materials.

Design and economic consideration in Maintenance: 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 lige of different types of buildings, discounting technique for assessment of economic life.

UNIT II **15 Hours**

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 Commercially available materials in maintenance.

UNIT III **15 Hours**

Investigation and diagnosis for Repair of structures: Basic Approach to investigations, Physical inspection, Material Tests, Nondestructive testing for diagnosis, Estimation of actual, loads and environmental effects, Study of design and construction practices used in original construction, Retrospective analysis, Confirmation and repair steps.

Building Defects and Remedial Measures:

Nature, types of problems, their causes, remedial measures and special treatment for building elements. Foundation, Basements D.P.C. Walls Wall finishes Chimney, stacks and shafts Columns and beams Roof and roof terraces Floor and floor finishes Joinery work Decorative/decorative finishes Services Materials Dampness

Unit -IV **15 Hours**

Acoustics: Basic problems criteria and terminology, Transmission of sources in rooms, speech privacy between offices, co-efficient of source absorption, noise reduction co-efficient, classification selection of acoustical materials, design and installation of acoustical Treatment for of auditorium, schools' religion buildings. Air Conditioning Heating and Ventilation: Different types of heating equipment viz radiation converters, electric radiant panel heaters, Requirements comfort conditions, temperature control, humidity control Mechanical ventilation plenum system, exhaust system fans, air filters of different types, air conditioning plants layout of ducts for cinema auditoriums and offices etc. Fire Fighting: Fire regulations and requirements, cause of fire, fire resistance of materials, fire tests, fire-reissuance of elements, layout escape means for Multi storied buildings, Fire Training equipment different methods of firefighting fire protection.

Electrical Services:

General distribution of electric power: Sub-stations for small schemes and industrial units, meter-rooms, electrical installations in buildings, Fuses and Circuit breakers, various types of conduits, earthling, switches and outlet, lamp holder electrical wiring -different materials employed specifications, electrical appliances and electrical service bye-laws pertaining to electrical installations. Different types of artificial lighting systems, lighting systems for residential buildings, public buildings, hotels,

cinemas, hospitable exhibition, halls, libraries, schools, college, scientific laboratories etc.

Lifts and Escalators:

Classification types of lifts, lift codes and rules. Traffic analysis and selection of lifts, Quantity of service, Quality service, Car speed. Provision form fire safety Angle Arrangements of lifts, Details of information to be given to manufacturers, Escalators, Types and their installation.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

- *Seeley, IVOR H. (1990). Building Technology. Mac Millian.*
- *Shetty, M.S. (2008).Concrete Technology – Theory and Practice. S.Chand and Company.*
- *DovKominetzky, M.S. (2001). Design and Construction Failures. Golgotha Publications Pvt. Ltd.*
- *Ravishankar. K. & Krishnamoorthy, T.S. (2004). Structural Health Monitoring Repair and Rehabilitation of Concrete Structures. Allied Publishers,*
- *Gambhir, M.L. CPWD and Indian Buildings Congress. (2008). Hand book on Seismic Retrofit of Buildings. Narosa Publishers.*
- *Chudley, Building Finishes, fittings and domestic sercielongman, Scientific and Technical.*

COURSE TITLE: Building Cost and Quality Management
COURSE CODE: MCE204

L	T	P	Credits
4	0	0	4

Total: 60 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Evaluate the principles of quality management and to explain how these principles can be applied within quality management systems.
2. Identify the key aspects of the quality improvement cycle and to select and use appropriate tools and techniques for controlling, improving and measuring quality.
3. Analytically appraise the organizational, communication and teamwork requirements for effective quality management.
4. Analyses the strategic issues in quality management, including current issues and developments, and to devise and evaluate quality implementation plans.

Course Contents

UNIT I **15 Hours**

Estimation of quantities for R.C.C. multistoried complex viz. earthwork, concrete in foundation, D.P.C., R.C.C. work, flooring and roofing, plastering and pointing etc., wood work, white washing.

Unit-II **15 Hours**

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

UNIT III **15 Hours**

Checking of construction quality – various tests of bricks, cement, concrete, aggregates, and steel as per IS codes. Preparation of bills for payment, measurement book, mode of payment, running account bill. Ledger and Cash book details, Arbitration.

UNIT IV **15 Hours**

Estimation of building services viz. water supply works, electrification, sanitary fitting etc., and their cost analysis. Completion report of the project; Checking of Plan, Details of various works, and issue of completion report of the project.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

- *Rangwala, S.C. (1982). Estimating and Costing. Anand. Charotar Book Stall*
- *Chakraborti, M. (1992). Estimating Costing and Specification in Civil Engineering. Calcutta Publishers.*
- *Dutta, B.N. (2002). Estimating and Costing. Khanna Publisher.*
- *Mahajan, Sanjay. (2000). Estimating and Costing. Satya Parkashan. Delhi*
- *Singh, Gurbakshish. (1998).Quality surveying. Eagle Prakashan. Jalandher*

COURSE TITLE: Rural Construction Technology
COURSE CODE: MCE206

L	T	P	Credits
4	0	0	4

Total: 60 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Interpret rural construction techniques.
2. Learn design principles of Treatment-Low-Cost water treatment technologies.
3. Understand Low-cost pavement materials-testing.
4. Design & Construction of Tube well, Drip & Sprinkle irrigation systems.

Course Contents

UNIT I **15 Hours**

Rural Development Planning and 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 programmers/projects.

Rural Housing : Low cost construction materials for housing low cost housing designs-architectural considerations for individual and group housing ; composite material-Ferro cement & flay 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, Thin R.C.Ribbed slab fon floors & roofs, 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 II **15 Hours**

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 pump; 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-III **15 Hours**

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 specifies areas. Labor in tensile techniques of road construction Mechanical stabilization; lime stabilization; water bond Macadam Construction; utilization of waste in rural construction one/two coat surface dressing; bitumen premix carpet; low-cost improved transport system rural areas.

UNIT IV **15 Hours**

Low-Cost irrigation: Design & Construction of Tube well, Drip & Sprinkle irrigation systems; Water logging Reclamation land watershed and catchment area development-problem and features of watershed Management Plans watershed structures and their basic design catchment treatment and Rehabilitation Plans; Types of M Hydel Plants, site selection, Advantages of Mini & Mi Hydel projects, and structures required for plants.

Transactional Mode:
Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

- *Madhov Rao, A.G. & Ramachandra Murthy, D.S.(2000). Apprority Technologies for low cost. Housing oxford and IBH Publishing Co. Pvt. Ltd.*
- *CBRI, Roorkee Advances in building Materials Construction.*
- *Satyanarayan Murthy, C.(1998). Design of Minor Irrigation and Canal Structures. Wiley Eastern Ltd.*
- *Document on Rural Road Development in India. (2009). Volume Central Road Research Institute, New Delhi.*

COURSE TITLE: Computer Aided Design
COURSE CODE: MCE203

L	T	P	Credits
2	0	0	2

Total: 30 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Create fully constrained solid models that can be quickly modified using standard software tools.
2. Use, identify and explain standard features in solid modeling including protrusions, revolutions, cutouts, and patterns.
3. Use standard software tools to create engineering drawings, or other documents, to fully describe the geometries and dimensions of parts, as well as to document assemblies according to standard practice.
4. Understand the use of standard software tools to create part assemblies and check for clearances.

Course Contents

UNIT I **30 Hours**

Introduction to CAD and its scope simple description of computer hardware. Micro, mini etc. memory, processor. Peripheral devices-disks, printer. Video terminals. Graphic floater, graphic screen digitizer. Computer Graphics: introduction, point plotting techniques, line drawing displays, two-three-dimensional transformation, clipping and windowing, segmentation geometric modeling. Three-dimensional graphics, curves and surfaces, hidden surface elimination, shading. Graphic input devices. Graphic input technique, input functions. Raster graphic fundamentals, interactive raster graphics, and raster graphic systems.

UNIT II **30 Hours**

Computer aided linkage displays and synthesis, interactive acceleration analysis. Appreciation of graphic packages. Matrix methods of structural analysis and associated computer Programme assembly of matrices. Solution of equilibrium equations. Flow charts. Typical listing as illustrations. Introduction to interactive computer Programme for the design detailing of simple structural elements: RCC slab, beams, columns, isolated footings etc. Steel typical members and connections. Data base management, storing and retrieving of data.

Transactional Mode:
Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

- *Newman, William M. & Sproul, Robert F. Principles of interactive computer graphics.*
- *Hunton& owan (2000). Programming in Finite Element. Golgotha Publications Pvt. Ltd.*
- *Sinha, P.K. (2003). Computer Fundamentals. BPB Publications.*
- *Rooney, Joe & Steadman, Philips. (2007). Principles of Computer Aided design. Golgotha Publications Pvt. Ltd.*

SEMESTER: III

COURSE TITLE: Pavement Design, Construction and Maintenance
COURSE CODE: MCE302

L	T	P	Credits
4	0	0	4

Total: 60 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Study the behavior of pavements under various loads.
2. Design the flexible and rigid pavements using different Empirical, semi-empirical and theoretical approaches.
3. Understand the concept of Pavement Management System, pavement failures and its evaluation.
4. Learn about various methods of flexible pavement design.

Course Contents

UNIT I **15 Hours**

Introduction: Types of pavement structure. Functions of pavement components, Factors affecting pavement design. Design wheel load, Strength characteristics of pavement materials.

Design of Flexible Pavements: 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 **15 Hours**

Design of Rigid Pavements: 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 **15 Hours**

Highway Construction: 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 **15 Hours**

Highway Maintenance: 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.

Transactional Mode:
Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

- *Roess, RP. McShane, WR. & Prassas, ES.(1998), Traffic Engineering. Prentice Hall.*
- *May, A. D. (1990). Fundamentals of Traffic Flow. Prentice Hall.*
- *Papacostas, C.S. (1987). Fundamentals of Transportation Engineering. Prentice Hall.*
- *Kadiyali, L.R. (1987). Traffic Engineering and Transportation Planning. Khanna Publications.*
- *Highway Capacity Manual (2000). Transportation Research Board, USA.*
- *Khanna, S.K. & Justo, C.E. G. (1991). Highway Engineering. Khanna Publications.*
- *Pingnataro, G. J. (1970). Principles of Traffic Engineering. McGraw - Hill*

Course Title: Research Methodology
Course Code: MCE303

L	T	P	Credits
4	0	0	4

Total hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Identify and discuss the role and importance of research in the social sciences.
2. Classify the issues and concepts salient to the research process.
3. Select the appropriate research design and develop appropriate research hypothesis for a research project
4. Discuss the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project.

COURSE CONTENT

Unit-I **15 Hours**

Research: its concept, nature, scope, need and Objectives of Research, Research types, Research methodology, Research process – Flow chart, description of various steps, Selection of research problem.

Unit-II **15 Hours**

Research Design: Meaning, Objectives and Strategies of research, different research designs, important experimental designs,

Methods of Data Collection and Presentation: Types of data collection and classification, Observation method, Interview Method, Collection of data through Questionnaires, Schedules, data analysis and interpretation, editing, coding, content analysis and tabulation

Unit-III **15 Hours**

Sampling Methods:

Different methods of Sampling: Probability Sampling methods, Random Sampling, Systematic Sampling, Stratified Sampling, Cluster Sampling and Multistage Sampling. Non probability Sampling methods, Sample size.

Unit-IV **15Hours**

Report writing and Presentation: Types of reports, Report Format – Cover page, Introductory page, Text, Bibliography, Appendices, Typing instructions, Oral Presentation

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

- *Panneerselvam, R , 'Research Methodology', PHI, New Delhi.*
- *Cooper, D.R.,Schindler,P.S., 'Business Research Methods,' Tata McGraw Hill*
- *Gupta S P,' Statistical Methods', Sultan Chand & Sons, Delhi*
- *Ronald E Walpole, 'Probability and Statistics for Engineers and Scientists' (International Edition) , Pearson Education.*
- *Geode, Millian J. & Paul K. Hatl, "Methods in Research", McGraw Hills, NewDelhi*

Website/Links/Online Portal/ICT

- https://www.academia.edu/
- https://www.studeersnel.nl
- https://www.scribd.com

Course Title: Dissertation Phase-I
Course Code: MCE301

L	T	P	Credits
0	0	8	4

Total hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Create, analyze and critically evaluate different technical/architectural solutions.
2. Analyze the consciousness critically of the ethical aspects of research and development work.
3. Analysis and evaluate different technical/architectural solutions.
4. Explain the capability of critically and systematically integrate knowledge.

Course Content

The dissertation will normally contain:

1. A clear indication, at appropriate stages, of original and critically elements. The level of originality expected is likely to include the application of existing techniques to new environments, the use of original materials, the re-working of existing materials, and the Use of comparative approaches to the provision of information technology;

2. A discussion of its scope and aims, and its theoretical and professional significance, including discussion of the context in which the problem is seen as important;

3. An analysis of the topic within a critically review of the relevant literature;

4. An evaluation of methods used in the dissertation, their reliability, validity, and a comparison with alternative methods;

5. An account of the process of obtaining the data required for the dissertation and the results obtained;

6. An analysis of the results of the dissertation to include a discussion of their significance, their relationship to other research, and any methodological or theoretical implications;

7. The relationship of the findings to existing professional understanding and, where Appropriate, potential implementation difficulties. It is not intended to restrict students to a precisely defined format for the

dissertation but it should follow the standard practices of dissertation writing. Although a written report will normally be expected, it should be accompanied by soft copy on CD.

SEMESTER-IV

Course Title: Dissertation Phase-II
Course Code: MCE401

L	T	P	Credits
0	0	0	20

Total hours:300

Learning Outcomes: After completion of this course, the learner will be able to:

1. Create, analyze and critically evaluate different technical/architectural solutions.
2. Analyze the consciousness critically of the ethical aspects of research and development work.
3. Analyze and evaluate different technical/architectural solutions.
4. Explain the capability of critically and systematically integrate knowledge.

Course Content

The dissertation will normally contain:

1. A clear indication, at appropriate stages, of original and critically elements. The level of originality expected is likely to include the application of existing techniques to new environments, the use of original materials, the re-working of existing materials, and the Use of comparative approaches to the provision of information technology;

2. A discussion of its scope and aims, and its theoretical and professional significance, including discussion of the context in which the problem is seen as important;

3. An analysis of the topic within a critically review of the relevant literature;

4. An evaluation of methods used in the dissertation, their reliability, validity, and a comparison with alternative methods;

5. An account of the process of obtaining the data required for the dissertation and the results obtained;

6. An analysis of the results of the dissertation to include a discussion of their significance, their relationship to other research, and any methodological or theoretical implications;

7. The relationship of the findings to existing professional understanding and, where Appropriate, potential implementation difficulties. It is not intended to restrict students to a precisely defined format for the dissertation but it should follow the standard practices of dissertation writing. Although a written report will normally be expected, it should be accompanied by soft copy on CD.