

GURU KASHI UNIVERSITY



**Master of Technology in Civil Engineering
(Specialization in Construction Technology &
Management)
Annexure-III**

Session: 2026-27

Faculty of Engineering & Technology

Graduate Attributes of the Programme: -

Type of learning outcomes	The Learning Outcomes Descriptors
Graduates should be able to demonstrate the acquisition of:	
Learning outcomes that are specific to disciplinary/interdisciplinary areas of learning	Strong technical and analytical skills to identify, formulate, and solve complex engineering problems, particularly in construction management, structural design, and materials technology.
	Research capabilities, including the ability to perform scientific investigations, data collection, analysis, and the development of innovative solutions to engineering challenges in fields such as disaster management, concrete technologies, and construction planning.
	The ability to apply core engineering principles to effectively plan and manage construction projects, ensuring safety, sustainability, and compliance with modern construction standards and practices.
	The understanding and application of sustainable practices in construction, focusing on environmental protection, waste management, climate change mitigation, and resource conservation, ensuring that solutions meet societal and environmental needs.
Generic learning outcomes	The ability to apply creativity, critical thinking, and innovative approaches to solve complex engineering problems, especially those that have no straightforward solutions.
	The ability to communicate complex technical information clearly and concisely, both in written and oral forms, in more than one recognized language.
	A motivation for lifelong learning, staying updated with the latest advancements in their field, and utilizing modern digital tools and technologies to analyze and process information.
	Commitment to professional ethics that are compatible with societal and cultural values, participation in finding valuable solutions to some societal issues, and a commitment to responsible citizenship.
	Having the attribute of lifelong learning to keep up with the latest developments in the field of specialization, as well as to use modern digital technologies and applications to analyze and process data and information.
	The ability to evaluate and contribute to mitigating environmental degradation, addressing climate change, promoting sustainability, and actively engaging in community service and well-being activities. The graduates should be able to evaluate critically and apply knowledge, methods and skills through self-identified

	sources and self-directed learning for locating, accessing, and utilizing relevant information sources as related to civil engineering.
	A strong commitment to professional ethics, societal and cultural values, and the importance of contributing to sustainable and responsible development practices in the community.
	A motivation for lifelong learning, staying updated with the latest advancements in their field, and utilizing modern digital tools and technologies to analyze and process information.

Programme Learning outcomes: An Master of Vocational in Civil Engineering (Specialization in Construction Technology & Management) is awarded to students who have demonstrated the achievement of the outcomes located at level 6.5:

Element of the Descriptor	Programme learning outcomes relating to M.Voc
The graduates should be able to demonstrate the acquisition of:	
Knowledge and understanding	knowledge of facts, concepts, principles, theories, and processes in basic sciences, multidisciplinary learning contexts within engineering
	understanding of the linkages between the fundamentals of engineering and its application
	procedural knowledge required for performing skilled or paraprofessional tasks associated with the electrical, mechanical, and computing fields.
General, technical and professional skills required to perform and accomplish tasks	a range of cognitive and technical skills related to manufacturing practices, computing, economics, sciences, communication skills for accomplishing assigned tasks in civil engineering
Application of knowledge and skills	The graduates should be able to demonstrate the ability to apply the acquired operational or technical and theoretical knowledge, and a range of cognitive and practical skills to select and use basic methods, tools, materials, and information to generate solutions to specific problems
Generic learning outcomes	The graduates should be able to demonstrate the ability of effective communication, critical thinking, self-directed and self-managed learning, gather and interpret relevant quantitative and qualitative data, critically evaluate principles and theories associated with the basic sciences and engineering, make judgment and take decisions, based on analysis of data and evidence, for formulating responses to issues/problems.
Constitutional, humanistic, ethical, and moral values	The graduates should be able to demonstrate the willingness to practice constitutional, humanistic, ethical, and moral values in one's life, and practice these values in real-life situations
Employability and job-ready skills, and entrepreneurship skills and capabilities/qualities and mindset	ability to exercise responsibility for the completion of assigned tasks and for the outputs of own work, and to take some responsibility for group work and output as a member of the group.

Credit requirements	The successful completion of the first year (two semesters) of the M.Tech of minimum 44 credit hours followed by an exit 4-credit 8-weeks internship/industrial training.
Entry requirements	Passed B.Tech. or equivalent degree in relevant discipline with at least 50% in the aggregate.

Program Structure

SEMESTER: 1 st									
Course Code	Course Title	Type of Courses	L	T	P	No. of Credits	Int.	Ext.	Total Marks
MCT1450	Construction Management & Equipment	Core course	4	0	0	4	30	70	100
MCT1451	Project Planning & Control	Core course	4	0	0	4	30	70	100
MCT1500	Composite Materials	Core course	3	1	0	4	30	70	100
MCT1501	Concrete Construction Technology	Practicum Course	3	0	0	3	30	70	100
MCT1502	Quality Control Lab	Core Course	0	0	2	1	30	70	100
MCT1503	Seminar	Skill	0	0	4	2	30	70	100
Discipline Specific Elective (DSE) Course 1 (Any one of the following)									
MCT1504	Environment Engineering & Management	Discipline Specific Elective Course	3	1	0	4	30	70	100
MCT1505	Computation Techniques								
Total			17	2	6	22	210	490	700

SEMESTER: 2 nd									
Course Code	Course Title	Type of Courses	L	T	P	No. of Credits	Int.	Ext.	Total Marks
MCT2550	Foundation Design & Construction	Core Course	3	1	0	4	30	70	100
MCT2551	Maintenance of Building Structure	Core Course	3	1	0	4	30	70	100
MCT2552	Building Cost and Quality	Core Course	3	1	0	4	30	70	100
MCT2553	Computer Aided Design	Practicum Course	3	0	0	3	30	70	100
MCT2554	Computer Aided Design Lab	Practicum Course	0	0	4	2	30	70	100
MCT2555	Software Lab – Project Planning	Skill Based	0	0	2	1	30	70	100
Discipline Specific Elective (DSE) Course 2 (Any one of the following)									
MCT2556	Pavement Design, Construction and Maintenance	Discipline Specific Elective Course	3	1	0	4	30	70	100
MCT2557	Rural Construction Technology								
Total			15	4	6	22	210	490	700

Programme learning outcomes: A Master of Technology in Civil Engineering (Specialization in Transportation Engineering) is awarded to students who have demonstrated the achievement of the outcomes located at level 7:

Element of the Descriptor	Programme learning outcomes relating to M.Tech
The graduates should be able to demonstrate the acquisition of:	
Knowledge and understanding	in-depth knowledge of construction practices, project planning, and quality control, with a focus on technology integration. Students gain hands-on experience through mini projects and labs, applying skills to real-world problems. It also covers business, environmental, and legal aspects of construction management.
Application of knowledge and skills	the application of knowledge and skills in construction practices, project planning, and quality control, with a focus on technology integration. They will apply their learning to solve real-world problems through hands-on experience in mini projects and labs. Additionally, they will effectively integrate business, environmental, and legal considerations in construction management.
Generic learning outcomes	generic learning outcomes by applying critical thinking, problem-solving, and analytical skills to construction practices and project management. They will effectively work in teams, communicate complex concepts, and manage projects using technology and software tools. Additionally, they will integrate ethical, environmental, and business considerations into their decision-making processes in construction management.
Constitutional, humanistic, ethical, and moral values	constitutional, humanistic, ethical, and moral values by adhering to legal frameworks and ethical standards in construction management. They will respect societal needs and environmental sustainability while making decisions that promote the welfare of communities. Their approach to project management will be guided by integrity, fairness, and social responsibility in all aspects of their professional practice.
Employability and job-ready skills, and entrepreneurial skills and capabilities/qualities and mindset	employability and job-ready skills, along with entrepreneurship capabilities and a proactive mindset, by applying practical knowledge in construction project management, planning, and quality control. They will be equipped with skills in using industry-specific software, managing projects efficiently, and addressing real-world challenges. Additionally, they will exhibit the ability to identify business opportunities, take initiative, and innovate within the construction sector.
Credit requirements	The successful completion of the first year (two semesters) of the M.Tech of minimum 44 credit hours followed by an exit 4-credit 8-weeks internship/industrial training.

Entry requirements	M.Voc. in relevant field for admission to Second year of M.Tech
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SEMESTER: 3rd									
Course Code	Course Title	Type of Courses	L	T	P	No. of Credits	Int.	Ext.	Total Marks
MCT3600	Dissertation Phase-I*	Research Based	0	0	0	12	30	70	100
MCT3601	Research Methodology and IPR	Core Course	3	1	0	4	30	70	100
MCT3602	Construction Costing and Financial Management	Core Course	3	1	0	4	30	70	100
MCT3603	Project	Skill Based	0	0	4	2	30	70	100
Total			6	2	4	22	120	280	400

***Dissertation Phase – I: -The work begins in the third semester and should focus on a problem with research potential. It should involve scientific investigation, data collection, analysis, solution development, and ideally showcase the student's individual contribution. The seminar will cover the area related to the dissertation, following the general guidelines for all M.Tech branches. For the examination, the student must prepare a report outlining the problem statement, objectives, literature review, and any preliminary findings, if available. This work is presented to a panel of examiners assigned by the Head and PG Coordinator. The student is expected to stay in regular contact with their supervisor, and the dissertation topic should be chosen together by the Supervisor and the student**

SEMESTER: 4 th									
Course Code	Course Title	Type of Courses	L	T	P	No. of Credits	Int.	Ext.	Total Marks
MCT4651	Dissertation Phase-II	Research Based	0	0	0	12	30	70	100
MCT4652	Disaster Reduction and Management	Core Course	3	1	0	4	30	70	100
MCT4653	Business ownership	Employability & Entrepreneurship Skill Course (EEC)	2	0	0	2	30	70	100
Discipline Specific Elective (DSE) Course 3 (Any one of the following)									
MCT4654	Basic Quality and Safety Management in Construction	Discipline Specific Elective	3	1	0	4	30	70	100
MCT4655	Disaster Preparedness & planning								
Total			8	2	0	22	120	280	400
*Dissertation Phase – II: -It is a continuation of research work started in semester III. He has to submit the report in prescribed format and also present a seminar. The dissertation should be presented in standard format as provided by the department. The candidate has to prepare a detailed research report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology (experimental set up or numerical details as the case may be) of solution and results and discussion. The report must bring out the conclusions of the work and future scope for the study. The work has to be presented in front of the examiners panel consisting of an approved external examiner, an internal examiner and a supervisor, co-Supervisor etc. as decided by the Head and PG coordinator. The candidate has to be in regular contact with his supervisor.									

Total Credits and Marks

Semester	L	T	P	Total Credits	Total Marks	Qualification
I	17	2	6	22	700	M.Voc
II	15	4	6	22	700	
III	6	2	4	22	400	M.Tech
IV	8	2	0	22	400	
Total				88	2200	

SEMESTER: I

COURSE TITLE: Construction Management & Equipment	L	T	P	Credits
COURSE CODE: MCT1450	4	0	0	4

Total Hours: 60

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 and specifications; Gradeability Bull dozers and their use; tractor pulled scrapers, their sizes and output; effect of grade and 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: Project Planning & Control	L	T	P	Credits
COURSE CODE: MCT1451	4	0	0	4

Total Hours: 60

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

1. Understand the principles of project management, resource management and inventory.
2. Prepare work break down plan and estimate resources requirements.
3. Learn in depth about project scheduling and time management.
4. Solve problems of resource allocation and levelling using network diagrams.

Course Content

UNIT I

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. 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

15 Hours

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

15 Hours

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

15 Hours

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.

Transactional Mode:

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

Suggested Readings:

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.

COURSE TITLE: Composite Materials	L	T	P	Credits
COURSE CODE: MCT1500	3	1	0	4

Total Hours: 60

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

1. Explain the behavior of constituents in the composite materials.
2. Enlighten the students in different types of reinforcement.
3. Develop the student's skills in understanding the different manufacturing methods available for composite material.
4. Illuminate the knowledge and analysis skills in applying basic laws in mechanics to the composite materials.
5. Apply constitutive equations of composite materials and understand mechanical behavior at micro and macro levels.

Course Content

UNIT I

15 Hours

Fiber Reinforced Concrete: Properties of Constituent Materials, Mix Proportions, Mixing and Casting Procedures, Properties of Freshly mixed FRC, Mechanics and properties of Fiber reinforced concrete, Composite Material approach, Application of fiber 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

15 Hours

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

15 Hours

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

15 Hours

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.

Transactional Mode:

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

Suggested Readings:

1. P.K. Mehta, and P.J.M. Monterio, 'Concrete, its Properties and Microstructure', McGrawHill 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.

COURSE TITLE: Concrete Construction Technology	L	T	P	Credits
COURSE CODE: MCT1501	3	0	0	3

Total Hours: 45

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

7 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

10 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

13 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: Quality Control Lab	L	T	P	Credits
COURSE CODE: MCT1502	0	0	2	1

Course Content

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

COURSE TITLE: Seminar	L	T	P	Credits
COURSE CODE: MCT1503	0	0	4	2

Course Content

Every student requires to present a seminar talk on a topic approved by the department except on his/her dissertation & submit the report to the department. The committee constituted by the Head of the department will evaluates the presentation and will award the marks. Student who is awarded with 'F' grade will be required to repeat the seminar on the same topic.

COURSE TITLE: Environment Engineering & Management	L	T	P	Credits
COURSE CODE: MCT1504	3	1	0	4

Total Hours: 60

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

15 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

17 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

18 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: Computation Techniques	L	T	P	Credits
COURSE CODE: MCT1505	3	1	0	4

Total Hours: 60

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: Roots 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 18 Hours

Finite Difference Technique: Initial and Boundary Value Problems of Ordinary and Partial differential equations, Solution of Various types of Plates. New Marks Method: Solution of determinate and indeterminate Structures by using New Mark's Procedure.

UNIT III 17 Hours

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

UNIT IV 10 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.

SEMESTER: II

COURSE TITLE: FOUNDATION DESIGN & CONSTRUCTION	L	T	P	Credits
COURSE CODE: MCT2550	3	1	0	4

Total Hours: 60

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 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

20 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

10 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	L	T	P	Credits
COURSE CODE: MCT2551	3	1	0	4

Total Hours: 60

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 life 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, Non-destructive 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, earthing, switches and outlet, lamp holder.

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	L	T	P	Credits
COURSE CODE: MCT2552	3	1	0	4

Total Hours: 60

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: Computer Aided Design	L	T	P	Credits
COURSE CODE: MCT2553	3	0	0	3

Total Hours: 45

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

10 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.

UNIT II

15 Hours

Computer Graphics: introduction, point plotting techniques, line drawing displays, two-three-dimensional transformation, clipping and windowing, segmentation geometric modelling. 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 III

10 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.

UNIT IV

10 Hours

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.*

COURSE TITLE: Computer Aided Design Lab	L	T	P	Cr.
COURSE CODE: MCT2554	0	0	4	2

List of Experiments

1. Structural Analysis of 2D and 3D Trusses
2. Structural Analysis of Continuous Beams using for different types of loadings and support conditions
3. Structural Analysis of 2D and 3D Rigid and Braced Frames for different types of loadings, support conditions, section orientations and stiffness variation between columns and beams, Member offsets, End release, Tension only members, Active and Inactive member specifications, Soil - Structure Interaction Problems using Winkler Springs
4. Excel Spread Sheet for analysis of truss, beams and frames, using Direct Stiffness Method
5. Program Development for Design of RC Structural Elements

COURSE TITLE: Software Lab – Project Planning	L	T	P	Credits
COURSE CODE: MCT2555	0	0	2	1

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

COURSE TITLE: Pavement Design, Construction and Maintenance	L	T	P	Credits
COURSE CODE: MCT2256	3	1	0	4

Total Hours: 60

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: Rural Construction Technology	L	T	P	Credits
COURSE CODE: MCT2557	3	1	0	4

Total Hours: 60

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.

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.*

SEMESTER: III

COURSE TITLE: Dissertation Phase-I*	L	T	P	Credits
COURSE CODE: MCT3600	0	0	0	12

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

1. Identify structural engineering problems reviewing available literature.
2. Identify appropriate techniques to analyze complex structural systems.
3. Apply engineering and management principles through efficient handling of project

Course Contents

The dissertation will normally contain:

1. Dissertation-I will have mid semester presentation and end semester presentation. Mid semester
2. Presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.
3. End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions and must bring out individual's contribution.
4. Continuous assessment of Dissertation – I at Mid Sem and End Sem will be evaluated by the departmental committee.
5. The Dissertation – I will be continued in the 4th semester.

Course Title: Research Methodology & IPR	L	T	P	Credits
Course Code: MCT3601	3	1	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

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

Unit-II

15 Hours

Effective literature studies approaches, analysis Plagiarism, Research ethics. Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

Unit-III

15 Hours

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit-IV

15 Hours

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Transactional Mode:

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

Suggested Readings:

- Stuart Melville and Wayne Goddard, “Research methodology: an introduction for • science & engineering students”
- Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction” • Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for • beginners”
- Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
- Mayall , “Industrial Design”, McGraw Hill, 1992.
- Niebel , “Product Design”, McGraw Hill, 1974.
- Asimov , “Introduction to Design”, Prentice Hall, 1962.
- Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in New • Technological Age”, 2016.
- T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

Course Title: Construction Costing & Financial Management	L	T	P	Credits
Course Code: MCT3602	3	1	0	4

Total hours: 60

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

1. Learn how to accurately estimate the costs associated with various stages of a construction project.
2. Create, manage, and monitor construction budgets, ensuring projects are completed within financial constraints.
3. Perform financial analyses and prepare reports that assess the financial health of construction projects.
4. Understanding the financial and legal aspects related to contracts, including compliance with regulations, managing payments, and understanding the financial risks and liabilities involved in construction projects.

Course Content

Unit-I

15 Hours

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

15 Hours

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

15 Hours

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

15 Hours

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

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

Suggested Readings:

1. F.W. Mueller, 'Integrated cost and schedule control for construction projects'.
2. Gobourne, '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.

Course Title: Project	L	T	P	Credits
Course Code: MCT3603	0	0	4	2

Every student will carry out project under the supervision of a supervisor(s). The topic shall be approved by a Committee constituted by the Head of the concerned department. Every student will be required to present two seminar talks, first at the beginning of the project to present the scope of the work to finalize the topic, and second at the end of the semester, presenting the work carried out by him/her in the semester.

SEMESTER-IV

Course Title: Dissertation Phase II*	L	T	P	Credits
Course Code: MCT4651	0	0	0	12

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

1. Create, analyse 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 Contents**The dissertation will normally contain:**

Dissertation – II will be extension of the to work on the topic identified in Dissertation – I. Continuous assessment should be done of the work done by adopting the methodology decided involving numerical analysis/ conduct experiments, collection and analysis of data, etc. There will be pre - submission seminar at the end of academic term. After the approval the student has to submit the detail report and external examiner is called for the viva-voce to assess along with guide.

Course Title: Disaster Reduction And Management	L	T	P	Credits
Course Code: MCT4652	3	1	0	4

Total hours: 60

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

1. Develop the ability to assess the vulnerabilities and risks associated with different types of disasters.
2. Learn and apply strategies for disaster preparedness, risk assessment, and hazard mitigation in the planning and construction phases of projects.
3. Understand the logistics and operations involved in disaster response, including the roles of government agencies, NGOs, and the private sector.
4. Learn strategies for post-disaster recovery, including reconstruction and rehabilitation efforts that enhance long-term resilience.

Course Content

Unit-I

15 Hours

Earthquake resistant design of structures, Response spectra and design earthquake parameters, Principles and philosophies, Codal provisions, Factors affecting damage to structures, Enforcement of codal provisions, Strong motion instrumentation and data processing, Effective rescue operation, General planning and design aspects, Conventional earthquake resistant design, Seismic base isolation method, retrofitting, Training and lecturing at various levels, Preparedness to meet earthquake disaster, Programmes for public awareness, demonstrations and exhibitions, Information management (Safety, emergencies, management and planning, design, response, user experience problems and case studies), Proper land use practices, long term disaster preparedness measures.

Unit-II

15 Hours

Precautions after a major earthquake, Preparedness for medical supply Emergency care (First aid, Home remedies), Disposal of dead bodies (Human and Cattle) , Care for old and orphans.
Damage due to ground failures, Landslides, rockslides, liquefaction, fire, floods, tsunamis, release of hazardous material like poisonous gas, nuclear radiation.

Unit-III

15 Hours

Management cell, Central crisis management core group, damage reconnaissance, Management of relief and rehabilitation (Infrastructure rehabilitation, Housing rehabilitation, Social rehabilitation), Role of volunteers, Emergency operation centres, Information system, Danger zone restrictions, Cooperation with local authority, Coordination for international relief, Role of government, NGO's, Business and donors, Role

of remote sensing in relief operations, Information management and related technologies in engineering and disaster management.

Unit-IV

15 Hours

The design and management of Disaster Information Resource Network, Asian Disaster Preparedness Centre, Regional data base, Contacts and Sources, CD - ROM Library for Natural Disaster Management, Regional Disaster Documentation Centre, Non Governmental Organisations.

Transactional Mode:

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

Suggested Readings:

1. F.W. Mueller, 'Integrated cost and schedule control for construction projects'.
2. Gobourne, '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.

Course Title: Business Ownership	L	T	P	Credits
Course Code: MCT4653	2	0	0	2

Total Hours: 30

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

1. Assess the commercial viability of new technologies, business opportunities and existing companies
2. Plan, organize, and execute a project or new venture with the goal of bringing new products and service to the market
3. Carry out scientific research in the field of entrepreneurship
4. Improved your interpersonal and collaborative skills

Course Content

UNIT I

10 Hours

Introduction to Generic Skills: Importance of Generic Skill Development (GSD), Global and Local Scenario of GSD, Life Long Learning (LLL) and associated importance of GSD.

Managing Self: Knowing Self for Self-Development- Self-concept, personality, traits, multiple intelligence such as language intelligence, numerical intelligence, psychological intelligence etc., Managing Self – Physical- Personal grooming, Health, Hygiene, Time Management, Managing Self – Intellectual development -Information Search: Sources of information, Reading: Purpose of reading, different styles of reading, techniques of systematic reading, Note Taking: Importance of note taking, techniques of note taking, Writing: Writing a rough draft, review and final draft. Managing Self – Psychological, Stress, Emotions, Anxiety-concepts and significance, Techniques to manage the above.

UNIT II

5 Hours

Managing in Team: Team - definition, hierarchy, team dynamics, Team related skills- sympathy, empathy, co-operation, concern, lead and negotiate, work well with people from culturally diverse background, Communication in group - conversation and listening skills.

UNIT III

5 Hours

Task Management: Task Initiation, Task Planning, Task execution, Task close out, Exercises/case studies on task planning towards development of skills for task management

Problem Solving: Prerequisites of problem solving- meaningful learning, ability to apply knowledge in problem solving, Different approaches for problem solving. Steps followed in problem solving. Exercises/case studies on problem solving.

UNIT IV**10 Hours**

Entrepreneurship: Introduction, Concept/Meaning and its need, Competencies/qualities of an entrepreneur, Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level. Market Survey and Opportunity Identification (Business Planning)- How to start a small-scale industry, Procedures for registration of small-scale industry, List of items reserved for exclusive manufacture in small-scale industry, Assessment of demand and supply in potential areas of growth, understanding business opportunity, Considerations in product selection, Data collection for setting up small ventures.

Project Report Preparation- Preliminary Project Report, Techno-Economic Feasibility Report, Exercises regarding “Project Report Writing” for small projects.

Transaction Modes

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

Suggested Readings

1. Khanka, S. S. (2006). *Entrepreneurial development*. S. Chand Publishing.
2. Desai, V. (2009). *Dynamics of entrepreneurial development and management* (pp. 119-134). Himalaya Publishing House.
3. Kennedy, A. (2015). *Business development for dummies*. John Wiley & Sons

Course Title: Basic Quality and Safety Management in Construction	L	T	P	Credits
Course Code: MTE4654	3	1	0	4

Total hours: 60

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

1. Students will understand the diverse nature of construction projects, including stakeholders, specifications, and quality control systems.
2. The course covers construction safety, hazards, human factors, and effective safety programs.
3. Legal aspects related to quality, safety regulations, and labor laws will be explored. Practical safety engineering techniques, accident investigation, and industry-specific case studies (e.g., steel, concrete, tunneling) will be applied.

Course Content

Unit-I

10 Hours

Diverse nature of construction projects, definitions, stakeholders, specifications, compliance, acceptance, relating quality of materials, components and system, factors influencing quality and safety, contracts, inspection, cost of quality and safety, processes and products, archiving records

Unit-II

20 Hours

Concepts of quality control: Objectives, definitions, systems, ISO 9000 family of standards, third-party certification, QC in construction and large projects (aircraft, ship building); Basic construction safety: Hazards, human factors in construction safety

Unit-III

15 Hours

Introduction to occupational health and safety, problem areas in construction safety, elements of an effective safety program, job-site safety assessment, safety planning, safety audit; Legal issues in quality and safety: Regulatory framework, labour laws, compensation; Safety engineering: Training, audit, management practices, safety planning, PPE

Unit-IV

15 Hours

construction accidents: nature, causes, investigation and reporting accidents; Case studies and examples: Quality and safety issues in steel construction, concrete construction (including pre-cast, pre-stressed), tunnelling, bridges (not all need be covered).

Transactional Mode:

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

Suggested Readings:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books) Model Curriculum of Engineering & Technology PG Courses [Volume-I] [41]
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

Course Title: Disaster Preparedness & Planning	L	T	P	Cr.
Course Code: MCT4655	3	1	0	4

Total hours: 60

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

1. Identify various types of disasters, their causes, effects & mitigation measures.
2. Demonstrate the understanding of various phases of disaster management cycle and create vulnerability and risk maps.
3. Apply emergency management system to tackle the problems.
4. Interpret the role of media, various agencies and organizations for effective disaster management and design an early warning system and the utilization of advanced technologies in disaster management.

Course Content

Unit I:

15 Hours

Introduction to Disaster Management: Define and describe disaster, hazard, vulnerability, risk-severity, frequency and details, capacity, impact, prevention, mitigation.

Disasters: Identify and describe the types of natural and manmade disasters, hazard and vulnerability profile of India, mountain and coastal areas, Factors affecting vulnerability such as impact of development projects and environment modifications (including dams, land-use changes, urbanization etc.), Disaster impacts (environmental, physical, social, ecological, economic etc.); health, psycho-social issues; demographic aspects (gender, age, special needs), Lessons and experiences from important disasters with specific reference to civil engineering.

Unit II:

15 Hours

Disaster Mitigation and Preparedness: Disaster Management Cycle-its phases; prevention, mitigation, preparedness, relief and recovery; structural and nonstructural measures; Preparedness for natural disasters in urban areas.

Risk Assessment: Assessment of capacity, vulnerability and risk, vulnerability and risk mapping, stages in disaster recovery and associated problems; Use of Remote Sensing Systems (RSS) and GIS in disaster Management, early warning systems.

Unit III:

15 Hours

Post Disaster Response: Emergency medical and public health services; Environmental post disaster response (water, sanitation, food safety, waste management, disease control, security, communications); reconstruction and rehabilitation; Roles and responsibilities of government, community, local institutions, role of agencies like NDMA, SDMA and other international agencies, organizational structure, role of insurance sector, DM act and NDMA guidelines.

Unit IV:

15 Hours

Integration of public policy: Planning and design of infrastructure for disaster management, Community based approach in disaster management, methods for effective dissemination of information, ecological and sustainable development models for disaster management.

Transactional Mode:

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

Suggested Readings:

1. *www.http//ndma.gov.in*
2. *http://www.ndmindia.nic.in*
3. *Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill, Publisher*
4. *Natural Disaster management, Jon Ingleton (Ed), Published by Tudor Rose, Leicester 92*
5. *Singh B.K., 2008, Handbook of disaster management: Techniques & Guidelines, Rajat Publications.*
6. *Disaster Management, R.B. Singh (Ed), Rawat Publications*
7. *ESCAP: Asian and the Pacific Report on Natural Hazards and Natural Disaster Reduction*