M. Tech Civil (Infrastructural Engineering) (1st Year)

Total Contact Hours = 26 **Total Marks = 600** **Total Credits = 22**

SEMESTER 1st		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MCIE4-101	Infrastructure Planning & Management	3	1	-	40	60	100	4
MCIE4-102	Intelligent Transportation System	3	1	-	40	60	100	4
MCIE4-103	Advanced Highway Engineering	3	1	-	40	60	100	4
MCIE4-104	GIS & GPS Lab	-	-	6	60	40	100	2
Departmental Elective – I (Select any one)		3	1	0	40	60	100	4
MCIE4-156	Smart Materials & Structures							
MCIE4-157	Construction Technology & Management							
Departmental Elective – II (Select any one)		3	1	0	40	60	100	4
MCIE4-158	Mass Transportation System							
MCIE4-159	High Rise Buildings							
Total	**Theory = 5 Lab = 1**	**15**	**5**	**6**	**260**	**340**	**600**	**22**

M. Tech Civil (Infrastructural Engineering) (1st Year)

Total Contact Hours = 24 **Total Marks = 600** **Total Credits = 22**

SEMESTER 2nd		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MCIE4-205	Infrastructure Economics & Informatics	3	1	-	40	60	100	4
MCIE4-206	Asset Management	3	1	-	40	60	100	4
MCIE4-207	Infrastructure Lab	-	-	6	60	40	100	2
Departmental Elective – III (Select any one)		3	1	0	40	60	100	4
MCIE4-260	Hydro Power Engineering							
MCIE4-261	Public Transportation Planning and Management							
Departmental Elective – IV (Select any one)		3	1	0	40	60	100	4
MCIE4-262	Air Transportation Engineering							
MCIE4-263	Green & Intelligent Buildings							
Open Elective – I (Select any one)		3	1	0	40	60	100	4
Total	**Theory = 5 Lab = 1**	**15**	**5**	**6**	**260**	**340**	**600**	**22**

M. Tech Civil (Infrastructural Engineering) (2nd Year)

Total Contact Hours = 12 **Total Marks = 500** **Total Credits = 26**

SEMESTER 3rd		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MCIE4-308	Professional Skill	3	1	-	40	60	100	4
MCIE4-309	Seminar	-	-	-	60	40	100	4
MCIE4-310	Project	-	-	-	60	40	100	10
Departmental Elective – V (Select any one)		3	1	0	40	60	100	4
MCIE4-364	Disaster Management							
MCIE4-365	Smart Cities							
Open Elective – II (Select any one)		3	1	0	40	60	100	4
Total	**Theory = 3 Lab = 0**	**9**	**3**	**0**	**240**	**260**	**500**	**26**

M. Tech Civil (Infrastructural Engineering) (2nd Year)

Total Credits = 20

SEMESTER 4th		Contact Hrs			Evaluation Criteria	Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Satisfactory/ Unsatisfactory**	
MCIE4-411	Thesis	0	0	0		20

Overall

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

M.Tech Civil
(Infrastructure Engineering)
First Semester Syllabus

INFRASTRUCTURE PLANNING AND MANAGEMENT

Subject Code - MCIE4-101 **L T P C** **Duration - 45 Hrs**
3 1 0 4

UNIT-I (12 Hrs)

Basic Concepts of Infrastructure: Introduction to Infrastructure., An Overview of the Power Sector in India., An Overview of the Water Supply and Sanitation Sector in India., An overview of the Road, Rail, Air and Port Transportation Sectors in India., An overview of the Telecommunications Sector in India., An overview of the Urban Infrastructure in India., An overview of the Rural Infrastructure in India. An Introduction to Special Economic Zones, Organizations and Players in the field of Infrastructure, The Stages of an Infrastructure Project Lifecycle., an Overview of Infrastructure Project Finance.

UNIT-II (11 Hrs)

Private Involvement in Infrastructure: A Historical Overview of Infrastructure Privatization. The Benefits of Infrastructure Privatization, Problems with Infrastructure Privatization, Challenges in Privatization of Water Supply: A Case Study, Challenges in Privatization of Power: Case Study., Privatization of Infrastructure in India: Case Study, Privatization of Road Transportation Infrastructure in India.

UNIT-III (10 Hrs)

Challenges to Successful Infrastructure Planning and Implementation: Mapping and Facing the Landscape of Risks in Infrastructure Projects, Economic and Demand Risks: The Case study, Political Risks: The case study, Socio-Environmental Risks: Case study, Cultural Risks in International Infrastructure Projects, Legal and Contractual Issues in Infrastructure, Challenges in Construction and Maintenance of Infrastructure.

UNIT-IV (11 Hrs)

Strategies for Successful Infrastructure Project Implementation: Risk Management Framework for Infrastructure Projects, Shaping the Planning Phase of Infrastructure Projects to mitigate risks, Designing Sustainable Contracts, Introduction to Fair Process and Negotiation, Negotiating with multiple Stakeholders on Infrastructure Projects, Sustainable Development of Infrastructure, Information Technology and Systems for Successful Infrastructure Management, Innovative Design and Maintenance of Infrastructure Facilities, Infrastructure Modeling and Life Cycle Analysis Techniques, Capacity Building and Improving the Governments Role in Infrastructure Implementation, An Integrated Framework for Successful Infrastructure Planning and Management - Infrastructure Management Systems and Future Directions.

Recommended Books

1. Grigg, Neil, Infrastructure Engineering and Management, Wiley Publications, **1988.**
2. Haas, Hudson, Zaniewski, Modern Pavement Management, Krieger, Malabar, **1994**.
3. Hudson, Haas, Uddin, Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation, and Renovation, McGraw Hill, **1997.**

INTELLIGENT TRANSPORTATION SYSTEM

Subject Code - MCIE4-102 **L T P C** **Duration: 45 Hrs**
3 1 0 4

UNIT-I (12 Hrs)

Fundamentals of ITS: Definition of ITS, The Historical Context of ITS from Both Public Policy and Market Economic Perspectives, Types of ITS; Historical Background, Benefits of ITS. Sensor Technologies and Data Requirements of ITS: Importance of

Telecommunications in the ITS. Information Management, Traffic Management Centers (TMC). Application of Sensors To Traffic Management; Traffic Flow Sensor Technologies; Transponders and Communication Systems; Data Fusion at Traffic Management Centers; Sensor Plan and Specification Requirements; Elements of Vehicle Location and Route Navigation and Guidance Concepts; ITS Data Collection Techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), GIS, Video Data Collection.

UNIT-II (10 Hrs)

ITS User Needs and Services and Functional areas: Introduction, Advanced Traffic Management systems (ATMS), Advanced Traveller Information systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control systems (AVCS), Advanced Public Transportation systems (APTS), Advanced Rural Transportation systems (ARTS).

UNIT-III (12 Hrs)

ITS Architecture: Regional and Project ITS Architecture; Concept of Operations; ITS Models and Evaluation Methods; Planning and Human Factor Issues for ITS, Case Studies on Deployment Planning And System Design and Operation; ITS and Safety, ITS and Security, ITS as a Technology Deployment Program, Research, Development And Business Models, ITS Planning.

UNIT-IV (12 Hrs)

ITS Applications: Traffic and Incident Management Systems; ITS and Sustainable Mobility, Travel Demand Management, Electronic Toll Collection, ITS and Road-Pricing.; Transportation Network Operations; Commercial Vehicle Operations and Intermodal Freight; Public Transportation Applications; ITS and Regional Strategic Transportation Planning, Including Regional Architectures: ITS and Changing Transportation Institutions Automated Highway Systems- Vehicles In Platoons – Integration Of Automated Highway Systems. ITS Programs in The World – Overview of ITS Implementations In Developed Countries, ITS In Developing Countries.

Recommended Books

1. Mashrur A. Chowdhury, Fundamentals of Intelligent Transportation Systems Planning.
2. Lawrence A. Klein, Sensor Technologies and Data Requirements of ITS.
3. Kan Paul Chen, John Miles, ITS Hand Book 2000: Recommendations for World Road Association (PIARC).
4. J.M. Sussman, Perspective on ITS, Artech House Publishers, **2005**.
5. National ITS Architecture Documentation, US Department of Transportation, **2007.**

ADVANCED HIGHWAY ENGINEERING

Subject Code – MCIE4-103 **L T P C** **Duration – 45 Hrs**

3 1 0 4

UNIT – I (12 Hrs)

Functional Classification of Highway System and Design Controls – Topography, Driver Characteristics, Vehicle Characteristics, Traffic, Capacity and Level of Service, Design Speed. Objectives of Geometric Design, Cross Section Elements: Design Specifications; Pavement Surface Characteristics – Skid Resistance, Road Roughness; Camber, Objectives, Design Standards. Specifications for Hill Roads.

UNIT-II (12 Hrs)

Horizontal and Vertical Alignment of Roads: Sight Distances – Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Objectives of horizontal curves; Super elevation; Extra-widening on Curves; Transition Curves – Objectives and Design. Transition Curve setting methods, Gradients – Types of Gradients, Design Standards; Vertical Curves – Summit Curves, Valley Curves and Design criteria for Vertical Curves; Importance of Sight Distances for Horizontal and Vertical Curves; Combination of Vertical and Horizontal Curves – Grade Compensation,

UNIT-III (11 Hrs)

Geometric Design of Intersections: Types of Intersections; Design Principles for Intersections; Design of At-grade Intersections – Channelization, Objectives; Traffic Islands and Design standards; Rotary Intersection – Concept, Advantages and Disadvantages; Grade separated Interchanges – Types, warrants and Design standards.

UNIT – IV (10 Hrs)

Miscellaneous Elements: Requirements of Pedestrians; Pedestrian facilities on Urban Roads; Cycle Tracks – Guidelines and Design standards; Bus bays –Types and Guide lines; Design of On-street and Off Street Parking facilities – Guidelines for lay out Design, Traffic Signs and Markings. Introduction to MX Roads software.

Recommended Books

1. L.R. Kadiyali and N.B. Lal, Khanna, "Principles and Practice of Highway Engineering", **2007.**
2. L.R. Kadiyali, "Traffic Engineering and Transportation Planning", Khanna Publications, **2007.**
3. C.E.G. Justo and S.K. Khanna, "Highway Engineering,"Nem Chand and Brothers.
4. IRC Codes for Signs, Markings and Mixed Traffic Control in Urban Areas.

GIS & GPS LAB

Subject Code - MCIE4-104 **L T P C**
0 0 6 2

List of Experiments

1. Introduction to GPS receiver
2. Data capture by various techniques using GPS receiver
3. Data processing using software
4. Introduction to GIS Models: Raster and Vector Models
5. Map registration and Digitization process.
6. Attribute table creation and joining to vector data
7. Thematic map generation

SMART MATERIALS & STRUCTURES

Subject Code – MCIE4-156 **L T P C** **Duration – 45 Hrs**
3 1 0 4

UNIT-I (12 Hrs)

Introduction: Introduction to Smart Materials and Structures – Instrumented structures functions and response – Sensing systems – Self-diagnosis – Signal processing consideration – Actuation systems and effectors.

Measuring Techniques: Strain Measuring Techniques using Electrical strain gauges, Types

– Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

UNIT-II (12 Hrs)

Sensors: Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – The LVOT – Fiber optic Techniques.

Chemical and Bio-Chemical sensing in Structural Assessment – Absorptive chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement.

UNIT-III (10 Hrs)

Actuators: Actuator Techniques – Actuator and Actuator Materials – Piezoelectric And Electro strictive Material – Magneto Structure Material – Shape Memory Alloys – Electro Rheological Fluids– Electro-Magnetic Actuation – Role of Actuators And Actuator Materials.

UNIT-IV (11 Hrs)

Signal processing and Control Systems: Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non Linear

Recommended Books

1. Brain Culshaw, "Smart Structure and Materials", Artech House, Borton. London, **1996.**
2. L. S. Srinath, "Experimental Stress Analysis", Tata McGraw-Hill, **1998.**
3. J.W. Dally & W.F. Riley, "Experimental Stress Analysis", Tata McGraw-Hill, **1998.**

CONSTRUCTION TECHNOLOGY & MANAGEMENT

Subject Code – MCIE4-157 **L T P C** **3 1 0 4** **Duration – 45 Hrs**

UNIT-I (12 Hrs)

Form Work Design and Scaffolding, Slip Form and Other Moving Forms, Form Work Materials, Structural Requests, Form Work Systems, Connections, Specifications, Design of Form Work, Shores, Removal for Forms, Reshoring, Failure of Form Work. Mechanization Through Construction Methods/Technologies: Segmental Construction of Bridges/Flyovers, Box Pushing Technology for Tunneling, Trench-Less Technology.

UNIT-II (11 Hrs)

Mechanization in Concrete Production and Placement, Pumping of Concrete and Grouting Mass Concreting (Roller Compacted Concrete), Ready Mixed Concrete, Various Methods of Placing and Handling Concrete, Accelerated Curing, Hot and Cold Weather Concreting, Under Water Concreting, Pre-Stressing. Ultra High Strength Concrete, Self-Compacting Concrete, Fibre Reinforced Concrete, Quality Control, Quality Assurance, Quality Audit.

UNIT-III (10 Hrs)

Project Cost Estimation, Rate Analysis, Overhead Charges, Bidding Models and Bidding Strategies. Qualification of Bidders. Tendering and Contractual Procedures, Indian Contract Act1872, Definition of Contract and Its Applicability, Types of Contracts, International Contracts, Conditions and Specifications of Contract. Contract Administration,

UNIT-IV (12 Hrs)

Claims, Compensation and Disputes, Dispute Resolution Techniques, Arbitration and Conciliation Act 1996, Arbitration Case Studies, Professional Ethics, Duties and Responsibilities of Parties. Management Information Systems, Risk Analysis, Value Engineering.

Recommended Books

1. R.L. Peurifoy, W.B. Ledbetter and C. Schexnayder., Construction Planning Equipment and Methods, McGraw Hill. Singapore, **1995.**
2. S.C. Sharma, Construction Equipment and Management, Khanna Publishers, Delhi, **1988.**
3. Dr. Mahesh Varma, "Construction Equipment and Its Planning and application". Metropolitan Book Company, New Delhi, **1983.**
4. Jimmie Hinze, Construction Contracts, McGraw Hill, **2001.**
5. Joseph T. Bockrath, "Contracts, the Legal Environment for Engineers and Architects", McGraw Hill, **2000.**
6. Oxley Rand Posicit "Management Techniques applied to the Construction Industry", Granda Publishing Ltd., **1980**

MASS TRANSPORATION SYSTEM

Subject Code – MCIE4-158 **L T P C** **Duration – 45 Hrs**

3 1 0 4

UNIT-I (11 Hrs)

History and Role of Transit, Recent Trends Mass Transportation Characteristics, Demand Characteristics, Spatial, Temporal and Behavioural Characteristics of Transportation Demand.

UNIT-II (13 Hrs)

Urban Mass Transportation Planning, Demand Surveys, Estimation and Demand Projection, Four Stages of Planning, Performance Evaluation of Mass Transport System, Structure of Decision Making, Evaluation and Selection Methods, Selection Procedures, Economic Evaluation Methods

UNIT-III (11 Hrs)

Terminals and Their Functions, Design, Typical Characteristics, Scheduling, Service Analysis, Vehicle Dispatch Policy, Vehicle Requirements, Spacing of Bus Tropos, Route Spacing and Performance. Operational and Management Issues, Reserved Bus Lanes, Signal Pre-emption, Dial-a-Bus.

UNIT-IV (10 Hrs)

Vehicle Monitoring and Control System, Modal Coordination, Special Studies, Underground Transportation, Para transit, Rail Transit, Case Studies

Recommended Books

1. V.R. Vuchic, "Urban Public Transportation System and Technology", Prentice Hall, Inc. Englewood Cliffs, New Jersey, **1981.**
2. M.K. Agarwal, "Urban Transportation in India", INAE, Allied Publishers Ltd., **1996.**
3. G.E. Grey & LA. Hoel, "Public Transportation" Prentice Hall, Englewood Cliffs, N.J.

HIGH RISE BUILDINGS

Subject Code – MCIE4-159 **L T P C** **Duration – 45 Hrs**

3 1 0 4

UNIT-I (12 Hrs)

Tall Building Systems and Concepts: Environmental Systems. Service Systems, Construction System, Foundation Design, Architectural- Structural Interaction. Tall Building Criteria and Loading Gravity Load, Earthquake Loadings, Wind Loading and Effects, Fire and Blast, Quality Control Crib Structural Safety

UNIT-II (11 Hrs)

Structural Design of Tall Steel Buildings: Commentary on Structural Standards, Elastic Analysis and Design, Plastic Analysis and Design, Stability, Design Methods Based on Stiffness, Fatigue and Fracture, Load Factor (Limit State) Design.

UNIT-III (11 Hrs)

Structural Design of Tall Concrete and Masonry Buildings: Commentary Structural Standards, Plastic Analysis-Strength of Members and Correction, Non-Linear Analysis and Limit Design, Stability, Stiffness and Crack Control Creep Shrinkage And Temperature Effects, Masonry Structures

UNIT – IV (10 Hrs)

Frame-Shear Wall Systems: Twist of Frame. Analysis of Shear Wall, Frame Wall Interaction, Analysis of Coupled Shear Wall, Computation of Earthquake Load Dynamic Analysis of Tall Building.

Recommended Books

1. Tara Nath Bungale, "Structural Analysis and design of Tall Buildings".
2. L.S. Beedle, "Advances in Tall Buildings".
3. Analysis of Shear Walled Buildings.
4. J.A. Blume, N.M. Newmark. "Design of Multistory Reinforced Concrete Buildings for Earthquake Motion".