Scheme and syllabus

M.Tech Civil Engineering with specialization in
(Transportation Engineering)

Session 2013-14
Two years Full Time

Credit Based System
(70:30)

Om Institute of Technology and Management
Juglan, Hisar
M.Tech Civil Engineering with Specialization in Transportation Engineering

The Total minimum credit required for completing the M.Tech civil engineering with specialization in (Transportation Engineering) course is 70

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<th>Time Of Exam (Hrs)</th>
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*To be evaluated internally by Committee constituted by Chairperson of the Department/ Director-Principal of the Institute.

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## Semester-III

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## Semester-IV

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**Total credit for All semester = 70**

**NOTE:** One credit in theory paper is equivalent to 1 hour classroom teaching per week & 1 credit in practical/lab course is equivalent to 2 hour practical/lab work per week. A teacher will conduct practical class in a group of 10-15 students.
List of Elective for M.Tech Civil engineering with specialization in (Transportation Engineering)

List of Elective-I
1. CET-710  Statistics And Operation Research
2. CET-711  GIS In Transportation
3. CET-712  Concrete Technology
4. CET-719  Advanced Geology

List of Elective-II
1. CET-713  Project Management
2. CET-714  Transportation Drainage Systems
3. CET-715  Bridge Engineering
4. CET-716  Land Use And Transportation Planning

List of Elective-III
1. CET-717  Rail Transportation Systems Planning And Design
2. CET-718  Airport System Planning And Design
3. CET-720  Transportation And Traffic Infrastructure Design
4. CET-705  Transportation safety and environment
UNIT - I
Traffic Characteristics: Importance of traffic characteristics. Road user characteristics. Vehicular characteristics. Max dimensions and weights of vehicles allowed in India. Effects of traffic characteristics on various design elements of the road.

Traffic Studies: Traffic volume study, speed study and origin and destination study. Speed and delay study. Use of photographic techniques in traffic surveys.

UNIT - II

UNIT - III


UNIT - IV

Recommended Books
(i) Principles of Transportation Engineering by Chakroborty & Das, Prentice Hall, India.
(v) MORTH Specifications for Road and Bridge Works, IRC Publication.

Note for Paper setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit.
UNIT - I
Highway Alignment: Requirements, factors controlling alignment, Obligatory points, Engineering surveys for Highway location, Route selection, steps in new project, Highway Classifications.

UNIT - II
Super elevation: Requirement of super elevation, Limits and attainment of super elevation in the field.

UNIT - III
Highway Alignment: General, Design speed, Horizontal curves, super elevation, Analysis of super elevation, Super elevation design, Attainment of super elevation, Widening of pavement on horizontal curves, Methods of introducing extra widening, Horizontal Transition curves, Different types of Transition curves, length of transition curve, Setting out of transition curve, Set-back distance on horizontal curves, Curve Resistance.

UNIT - IV
Vertical Alignment: General, Gradients, Compensation in gradient on horizontal curves, Vertical curves, Summit curve, Length of summit curve, Valley Curve, Length of valley curve.
Relevant IRC standards for Urban and Rural roads.

Recommended Books
(i) Principles of Transportation Engineering by Chakroborty & Das, Prentice Hall, India.

Note for Paper setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit.
M.Tech. (Transportation) First Semester
CET - 695 Pavement Materials

Max. Marks: 100

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Theory: 70 Marks
Sessional: 30 Marks
Duration: 3 Hours

UNIT - I
Sub grade: Significance of sub grade soil, Characteristics of soil, Desirable properties, Index Properties of Soil, Soil Classification based on Grain size, Soil Classification System, Evaluation of soil Strength.

Aggregates: Introduction, Desirable properties of Road Aggregates, Tests for Road Aggregates.

UNIT - II
Bituminous Materials: Introduction, Types of Bituminous materials, Tests on Bitumen, Cutback and Emulsions

Bituminous Paving Mixes: Design of Bituminous Mix, Marshal method of bituminous mix design.

UNIT - III

UNIT - IV
Construction Methods: Bituminous and concrete pavements, Relevant IS and IRC codes.

Recommended Books
(i) Principles of Transportation Engineering by Chakroborty & Das, Prentice Hall, India.
(v) MORTH Specifications for Road and Bridge Works, IRC Publication.

Note for Paper setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit.
### CET - 697 Traffic Lab

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<td>70 Marks</td>
<td>30 Marks</td>
<td>3 Hours</td>
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1. Traffic volume study using videography technique.
2. Traffic volume study by Mechanical counters
3. Traffic speed study using videography technique.
4. Speed study by Radar Gun
5. Speed study by endoscope
6. Determination of Reaction time of Driver
7. Traffic study by automatic counter and classifier.
8. Parking study
9. Accident Investigation study
10. Study for Improvement of an Accident Prone location
M.Tech. (Transportation) Second Semester  
CET - 692 Pavement Analysis & Design

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UNIT - I
Pavement Types: Definition, Highway and Airport Pavement comparison, Wheel Loads, Tyre Pressure, Contact Pressure, Design Factors, Type of distresses structural and functional, Serviceability.

Stresses in Flexible: Layered system concept, multilayered solutions, Burmister’s method, Fundamental Design concepts.

UNIT - II
Stresses in Rigid Pavements: Relative stiffness of slabs, Modulus of sub grade reaction, Stresses due to warping, stresses due to friction, effect of warping, contraction and expansion, Plain versus reinforced pavements, stresses in dowel bar, tie bar, combined stresses.

UNIT - III
Design of Flexible Pavements: Design factors, Design wheel load, Equivalent single wheel load, Difference between Airport and Highway Design concept, Different design methods, Examples of comprehensive design process

UNIT - IV
Design of Rigid Pavement: General design considerations, Design of joints in cement concrete pavements, spacing of expansion joint, Spacing of contraction joints, Design of dowel bar, Design of tie bar, IRC recommendations for design of Concrete pavements.

Pavement Evaluation and Rehabilitation: Pavement distresses in flexible and rigid pavements, condition and evaluation survey, Present serviceability index, Methods of measuring condition, skid resistance, Principles of maintenance, Methods of structural evaluation.

Recommended Books.
(i) Principles of Transportation Engineering by Chakroborty & Das, Prentice Hall, India.
(iii) Principles of Pavement Design, by Yoder E.J. and Witczak M.W. 2nd, John Wiley & Sons, INC.

Note for Paper setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit.
UNIT - I
Introduction: history of road construction, stages of construction, seasonal limitations of pavement construction.

Stabilization of soil: mechanical stabilization, cementing additives and chemicals, thermal stabilization.

UNIT - II

Construction of bituminous pavements: various types of bituminous constructions. Prime coat, tack coat, seal coat and surface dressing. Construction of busg, premix carpet, bm, dbm and ac. Brief coverage of machinery for construction of bituminous roads: bitumen boiler, sprayer, pressure distributor, hot-mix plant, cold-mix plant, tipper trucks, mechanical paver or finisher, rollers. Mastic asphalt. Introduction to various irc and morth specifications.

UNIT - III

Construction of other types of pavements: basic concepts of the following: soil stabilized roads, use of geo-synthetics, reinforced cement concrete pavements, prestress concrete pavements, roller compacted concrete pavements and fibre reinforced concrete pavements. Use of fly ash in cement concrete road construction.

UNIT - IV

Related topics: emulsified bituminous mix, precoating of aggregates, recycling of bituminous pavements, shoulder construction.

Recommended Books
(i) Principles of Transportation Engineering by Chakroborty & Das, Prentice Hall, India.

Note for Paper setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit.

UNIT - II
TRANSPORTATION SURVEY: Definition of study area. Zoning. Types of surveys. O-D surveys. Inventories of existing transport facilities, land use and economic activities. TRIP GENERATION: Trip purpose. Factors affecting trip generation. Trip generation estimation by multiple linear regression analysis, brief review of category analysis, advantages and limitations of these methods.

UNIT - III
TRIP DISTRIBUTION: Methods of trip distribution. Basic concepts of uniform factor method, average factor method and opportunity model. Trip distribution by gravity model.

TRAFFIC ASSIGNMENT: Principles of assignment. Assignment techniques. All or nothing assignment. Brief review of multipath assignment, capacity restraint assignment and diversion curves.

UNIT - IV
MODAL SPLIT: General considerations for modal split. Factors affecting modal split. Brief introduction to various methods of modal split.

EVALUATION: Need for evaluation. Several plans to be formulated. Testing. Considerations in evaluation. Economic evaluation, basic principles, brief introduction to various methods of economic evaluation, comparison.

MASS RAPID TRANSIT SYSTEMS: Problems of Urban Transport. Introduction to MRTS. Requirements of MRTS. Types of MRTS. MRTS in India

Recommended Books
(iv) Principles of Transportation Engineering by Chakroborty & Das, Prentice Hall

Note for Paper setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit.
M.Tech. (Transportation) Second Semester

CET - 698 Pavement and Material Laboratory

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Subgrade Evaluation,
Bankelman Beam,
Unevenness Index,
Bitumen content determination,
Granular Mix Design,
Mix Design for Bitumenous Mix and
Mix Design of cement concrete.
UNIT - I

UNIT - II
Vehicle Operating Costs: Introduction, Road used cost study in India, Components of VOC, Factors affecting VOC, Fuel consumption Relationship, Spare parts consumption, Maintenance and Repairs labour cost, Tyre life, Lubricants, Utilisation and fixed costs.

UNIT - III
Value of travel time savings: Introduction, Classes of transport users enjoying travel time savings, Methodology for monetary evaluation of passengers’ travel time, Review of work in India on passengers’ travel time.

Accidents Costs: Introduction, Relevance of accident costing for a developing country, Review of alternative methodologies for accident costing, Indian studies.

UNIT - IV
Traffic Congestion, Traffic Restraints and Road Pricing: Congestion as a factor in road traffic, Traffic Restraint, Road Pricing.

Highway Finance: Basic principles, Distribution of highway cost, Sources of Revenue, Highway Financing in India.

Recommended Books
(i) Principles of Transportation Engineering by Chakroborty & Das, Prentice Hall, India.
(v) MORTH Specifications for Road and Bridge Works, IRC Publication.

Note for Paper setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit.
M.Tech. (Civil) Third Semester
CET - 703 Public Transportation

L T P/D Credits | Max Marks : 100
4 1 - 4.5 | Theory : 70 Marks

Sessional : 30 Marks
Duration : 3 Hours

UNIT - I
Modes of public transportation and application of each to urban travel needs

UNIT - II
Transit system operations, para-transit systems, street transit systems, rapid transit systems, Estimation of transit demand, route development, properties of a good route set, determination of a good route set, stop location and stopping policy, schedule development, properties of a good schedule, determination of a good schedule.

UNIT - III
Capacity of rapid transit systems, line capacity of RTS, capacity of street transit systems.

Transit corridor, identification and planning, mass transport management measures, integration of public transportation modes. Public transport infrastructure, case studies, multi mode transportation system.

UNIT - IV
Planning for public transport, fares and subsidies.

Intermediate Public Transport in Indian Cities, types of IPT vehicles, Characteristics of IPT modes.

Recommended Books:

(iii) Principles of Transportation Engineering by Chakroborty & Das, Prentice Hall, India.

Note for Paper setter : EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit
Exposure to various Transportation Related Softwares like Rate Analysis by MORTH software, MX Road, and other IRC softwares for Pavement Design and Decision modeling.
M.Tech. (Transportation) Elective

CET - 710 Statistics and Operation Research

L  T  P/D  Total  Credit  Max. Marks : 100
4  1  -  5  4.5  Theory  :  70 Marks

Sessional  :  30 Marks

Duration  :  3 Hours

UNIT - I

UNIT - II

UNIT - III

UNIT - IV
Regression Analysis – Simple Linear Regression – Evaluation of Regression – Confidence Intervals and Tests of Hypotheses – Multiple Linear Regression – Correlation and Regression Analysis.

Recommended Books:

Applied Numerical Methods for Engineers by akai

Note for Paper setter : EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit.
M.Tech. (Transportation) Elective
CET - 711 GIS in Transportation

Max. Marks : 100
Theory : 70 Marks
Sessional : 30 Marks
Duration : 3 Hours

UNIT - I

UNIT - II
Map Projection and Coordinate System: Map Projection, Coordinate Systems.

Data Modeling & Data Base Design: Vector Data Model, Spatial Data Model, Data modeling in GIS-T.

UNIT - III
Shortest Path & Routing: Fundamental Network properties, Shortest Path analysis,
Network flows & facility Location: Flow through Network, Closed Facility.

UNIT - IV
GIS Based Spatial Analysis and Modeling: GIS and Spatial analysis, function, Customizing GIS, Geographic Visualization.

Recommended Books:

Note for Paper setter: EIIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit
M.Tech. (Transportation) Elective
CET - 712 Concrete Technology

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UNIT - I
Concrete as Pavement Material: Introduction, Preparation and Grade of Concrete.
Concrete Ingradients: Types of Cement, Aggregates, Classification of Aggregate, Properties of Aggregate, Quality of Mixing Water, Admixtures.

UNIT - II
Properties of Concrete: Introduction, Workability, Stress Strain Characteriscs of Concrete, Young’s Modulus of concrete, Creep and shrinkage of Concrete, Permeability, Durability of Concrete, Joints.

UNIT - III
Production of Concrete: Batching, mixing, Transportation, compaction, vibration, curing, formwork removing, ready mixed concrete.
Non-Destructive Testing of Concrete: Significance, Rebound Hammer, Ultrasonic Pulse Velocity Technique, Penetration Technique, Pullout test, Cover meter, Core tests.

UNIT – IV
Deterioration : Causes, Deterioration by Water, surface weir, Frost action, chemical Reaction, corrosion of reinforcement etc. Preventive Measures
Advances in Concrete: Introduction to Light Weight concrete, High strength Concrete, Prestressed concrete. Fibre reinforced concrete, Polymer concrete composites.

Recommended Books:
(v) Shetty M.S.”Concrete Technology” S. Chand& Co. N Delhi.

Note for Paper setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit.
M.Tech. (Transportation) Elective  
CET - 713 Project Management

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Max. Marks : 100  
Theory : 70 Marks  
Sessional : 30 Marks  
Duration : 3 Hours

UNIT - I  

UNIT - II  
Network Scheduling: Critical Path Method (CPM) , Program Evaluation and Review Technique (PERT), Precedence diagram technique (PDM)

Cost Optimization: cost slope, crashing critical path, Optimum duration.

UNIT - III  
Updating: Introduction, examples, when to update.


UNIT - IV  
Linear Programming and critical path scheduling: Introduction, standard form, formulation by linear programming, transportation model, method of solution, fictitious cost method, Linear programming and critical path.

Note for Paper setter : EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit.
M.Tech. (Civil) Elective

CET - 714 Transportation Drainage Systems

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**UNIT - I**

Introduction, Importance of drainage, Types of Road Drainage, General Criterion for Road Drainage.

**UNIT - II**

Systems of Drainage: Surface and sub-surface drainage systems, Internal drainage of pavement structure, components of surface drainage system, surface drains, road side drains, catch water drains, geometric design of road, hydraulic design of drains, shoulder drainage, drainage layer, subsurface drainage with transverse drains, horizontal drains, sub surface drain in heavy clayey soil, sub surface drain at valley curve / change of grade, capillary cut-off.

**UNIT - III**

Design of surface drainage and subsurface drainage system: Hydrologic analysis, hydraulic analysis, data for drainage design, design steps, Cross Drainage, Sub surface drainage, lowering of water table, control of seepage flow, control of capillary rise, design of filter material, drainage of slopes and erosion control, road construction in water logged areas.

**UNIT - IV**

Drainage in hill roads. Drainage systems for Airports and Railways.

Books recommended:

**Note for Paper setter**: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit.
M.Tech. (Civil) Elective

CET - 715 Bridge Engineering

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UNIT - I

Types of bridges, Consideration of loads and stresses in bridges, bridge loading as per IRC and IRS specifications, traffic lanes, footway, kerbs, railing and parapet loading, impact, wind load, longitudinal forces, temp effects, secondary stresses, erection stresses, earth pressure, effect of live load on back fill and on the abutment.

UNIT - II

Design of RC bridges, slab culvert, box culvert, pipe culvert, T-beam bridge, super structure, design examples, brief introduction to rigid frame, arch and bow string girder bridges.

Design of pre-stressed concrete bridges, pre-tensioned and post tensioned concrete bridges, analysis and design of multi-lane prestressed concrete T-beam bridge super structure.

UNIT - III

Steel bridges, types, economical span, loads, permissible stresses, fluctuation of stresses, secondary stresses, plate girder bridges, general arrangement, bridge floors, plate girder railway bridges, deck type plate girder bridges, design example. Truss bridges, types, wind force on lattice girder bridge, bracings, truss bridge for railway – through type truss bridge.

Pier, abutment and wing walls, types of piers, forces on piers, stability, abutments, bridge code provisions for abutments, wing walls, design examples.

UNIT - IV

Bearings, functions, bearings for steel and concrete bridges, bearings for continuous span bridges, IRC provisions for bearings, fixed bearings, expansion bearings, materials and specifications, permissible stresses, design considerations for rocker and roller cum rocker bearings, sliding bearings.

Foundations, types, general design criterion, design of well and pile foundations for piers and abutments.

Recommended Books:

Rowe RE, Concrete ridge Design

Note for Paper setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit.
M.Tech. (Civil) Elective

CET - 716 Land Use and Transport Planning

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UNIT - I
Land use and transport planning, Selection of land use transport models,

UNIT - II
Lowry Derivative models, Garin-Lowry model, Matrix operations for simplifying computations, applications in India,

UNIT - III
Transpot planning for small and medium sized cities, quick response techniques.

UNIT - IV
Traffic simulation.

Books recommended:

(vii) Principles of Transportation Engineering by Chakroborty & Das, Prentice Hall, India.

Note for Paper setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit.
M.Tech. (Civil) Elective
CET - 717 Rail Transportation Systems Planning and Design

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Theory: 70 Marks
Sessional: 30 Marks
Duration: 3 Hours

UNIT - I
Importance of rail transportation, rail transportation v/s other modes, development of rail transportation in India and abroad, Status of rail transportation.

UNIT - II
Components of permanent way, preparation of formation, requirements and specifications for various components for construction of railway track, laying of tracks.

UNIT - III
Maintenance of track, types of maintenance, mechanized maintenance, M.S.P and D.T.M.

UNIT - IV
Rail transportation system, Demand analysis and forecasting for passenger and freight traffic, costing and pricing principles, project analysis and design, project interdependencies and programming techniques, systems analysis and planning, macroeconomic transportation simulator, case studies and implementation strategies.

Recommended Books:

Note for Paper setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit.
UNIT - I
Air Transport-structure and organization, the challenges and the issues.

Airport planning, site selection, layout plan, Aircraft characteristics affecting airport elements, air traffic control

UNIT - II
Forecasting air travel demand, trend forecast and analytical methods, air freight demand.

Airport capacity and configuration, runway capacity determination.

Geometric design of runways, taxiways and aprons.

UNIT - III
Passenger terminal area, passenger and baggage flow, design concepts, analysis of flow through terminals, parking configurations and apron facilities.

UNIT - IV
Airport pavement design

Airport drainage.

Books Recommended:

(iii) Airport Planning and Design by S.K.Khanna, M.G.Arora, Nem Chand Bros., Roorkee.
(v) Air Transportation Planning and Design by Virender Kumar & Satish Chandra, Galgotia Publications, N.Delhi.

Note for Paper setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit.
M.Tech. (Civil) Elective

CET – 719 Advanced Geology

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UNIT - I
Introduction, object and scope, Importance of Geology in Transportation Engg Projects, external and internal geological forces causing changes, weathering and erosion of surface of earth, soil profile and its importance. Rocks of earth surface, texture, structure and origin of rocks, their engineering uses.

UNIT - II
Forms of structures of rocks, bedding plane and outcrops, dip and strike, folds, faults, joints and unconformity and recognition on outcrops, importance of geological structures in transportation engg projects.

UNIT - III
Hydrogeology, water table, ground water considerations in transportation projects, geological investigations, remote sensing techniques for geological and hydrological investigations. Uses of geological maps, interpretation of data.

UNIT - IV
Geological conditions and their influence on the selection, location, type and design of tunnels, highways, bridges. Land slides, hill slope stability.

Precautions and treatment against faults, joints and ground water.

Books Recommended:

(v) Introduction to Physical Geology by A. Holmes.
(vi) A Text Book of Geology by P.K. Mukherjee.
(vii) Physical and General Geology by S.K. Garg.
(viii) Engineering and General Geology by Prabin Singh.

Note for Paper setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit.
M.Tech. (Civil) Elective
CET – 720 Transportation and Traffic Infrastructure Design

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UNIT - I
Design and drawing of grade intersections, rotaries, mini roundabouts, interchanges,

UNIT - II
Multi-level intersection,

UNIT - III
On-street parking facilities, off-street parking facilities,

UNIT - IV
Layout for buses and trucks, guard rails, retaining sides, pedestrian sidewalks, foot bridges, underpasses.

Books recommended:
(viii) Principles of Transportation Engineering by Chakroborty & Das, Prentice Hall, India.

Note for Paper setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit
M.Tech. (Civil) Elective

CET – 705 Transportation Safety and Environment

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UNIT - I
Trends in Roads and Highways Development, Problem of Road Accidents In India, Characteristics of Road Accidents, Causes of Accidents, Global and Indian Road Safety Scenario, Factors Responsible for Success Stories in Road Safety, Role of Highway Professionals in Highway Safety.

UNIT - II

UNIT - III
Road Safety Audit, Concepts of Road Safety Audit, Road Safety Auditors & Key Personnel in RSA, Organising and Conducting a Road Safety Audit, Example and Commonly Identified, Issues During RSA, Road Safety Audit Report, Development of Cost-effective of Road Safety Audit Accident Investigation and Prevention, Basic Strategies for Accident Reduction, Significance of Accident Data, Accident Investigation and Identification of Potential Sites for Treatment, Problem Diagnosis, Selection of Countermeasures, Example of Selection of Countermeasures, Detailed Design and Implementation of Countermeasures,

UNIT - IV

Fuel crisis and transportation, factors affecting fuel consumption, fuel economy in various modes of transportation, various types of alternative fuels.

Books recommended:

Note for Paper setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least one question from each unit.