

S Y L L A B U S

**MASTER OF TECHNOLOGY
(TRANSPORTATION ENGINEERING)**

M. Tech.

**M. Tech., First Year Examination, 2015
M. Tech., Second Year Examination, 2016**



**JODHPUR NATIONAL UNIVERSITY
JODHPUR**

Jodhpur National University

M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

I SEMESTER

Subject Code	Subject	Hrs. / Week				Marks Exam			Exam Hrs
		L	T	P	Total	Theory Exam/Viva voce	Internal Assessment	Total	
MCE 101	Strategic Management	4	2	-	6	100	50	150	3
MCE 102	Highway Materials	4	2	-	6	100	50	150	3
MCE 103	Traffic Engg. & Field Studies	4	2	-	6	100	50	150	3
MCE 104	Highway Construction	4	2	-	6	100	50	150	3
MCE 105	Traffic Engineering (LAB)			6	6	50	50	100	3
Total		16	8	6	30	450	250	700	15

II SEMESTER

Subject Code	Subject	Hrs. / Week				Marks			Exam Hrs
		L	T	P	Total	Theory Exam/Viva voce	Internal Assessment	Total	
MCE 201	Pavement Analysis & Design	4	2	-	6	100	50	150	3
MCE 202	Intersection Design and Analysis	4	2	-	6	100	50	150	3
	(Any One from 03)								
MCE 203.1	Pavement Maintenance Management System	4	2	-	6	100	50	150	3
MCE 203.2	Pavement Construction and Management								
MCE 204	Low Cost Roads	4	2		6	100	50	150	3
MCE 205	Materials design & Construction of Pavements (LAB)			6	6	50	50	100	3
Total		16	8	6	30	450	250	700	15

Jodhpur National University

M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

III SEMESTER

Subject Code	Subject	Hrs. / Week				Marks			Exam Hrs
		L	T	P	Total	Theory/ practical Exam	Internal Assess- ment	Total	
	(Any Two from 01 and 02 Each)								
MCE 301.1	Highway Sub-Grade & Foundation Analysis								
MCE 301.2	Advanced Foundation Engineering								
MCE 301.3	Ground Improvement Techniques	4	2	-	6	100	50	150	3
MCE 301.4	Geographic Information System and its Applications								
MCE 302.1	Transportation Planning								
MCE 302.2	Bridge Engineering								
MCE 302.3	Environmental Impact Assessment	4	2	-	6	100	50	150	3
MCE 302.4	Transportation Economics & Evaluation								
MCE 303	Seminar	-	-	6	6	100	-	100	3
	Total	8	4	6	18	300	100	400	9

Jodhpur National University
M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

IV SEMESTER: -

Subject Code	Subject	Hrs. / Week				Marks		
		L	T	P	Total	Theory \ Practical Exam	Internal Assessment	Total
MCE 401	Dissertation	-	-	-	-	200	-	200
	Total	-	-	-	-	200	-	200

Total Marks: 700 + 700 + 400 + 200 = 2000

Jodhpur National University

M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

I SEMESTER

MCE 101 STRATEGIC MANAGEMENT

(4-2-0)

EXAM HRS:-3

M.M.:-100+50 =150

Basics of Management: Scientific management: Fredrick Winslow Taylor; Henry foyal's administrative Management; Managerial Roles; Managerial skills.

Managing Change: Need for change; Paradigm shifts; Organization inertia; Leadership committed to change; Strategy of managing change; case studies highlighting steps needed for managing change successfully.

Crisis Management: Contingencies; contingency planning; Visualizing possible majors problems for the organization in the foreseeable future; Preparing an organization and its staff to deal with such problems; case studies.

Innovation and Creativity: Encouraging creativity at all levels; Innovation; key for future leadership; Innovation for product; process or the organization itself; Increment improvement v/s quantum jump.

Entrepreneurship: Need of the hour: Entrepreneurship; Developing qualities for entrepreneurship; Calculated Risk; Entrepreneurship within an organization.

Work study and Re-engineering: Productivity; Methods of improving productivity by changes in the manufacturing process as well as by better utilization of assts; Re-engineering the product process as well as the organizational set up.

Managing Intangibles: Management at different levels in an organization; Organizational culture; Leadership effective leadership for overall success; Motivation; Developing a diverse workforce; Negotiations within the organization; Attitudes and Behavior.

Communication Skills: Communication Basic: Written and Verbal communication, Presentation skill, Meetings and their effective; organization; Dealing / Interacting with customers.

Quality and Customer Care: Quality Management; Reliability of product; Defect and Defect Analysis; Total Quality; Economics of Quality; Quality Standards and ISO-9000; Customer care and important outcome of quality and quality relationship.

Safety and Ergonomics: Safety its practice at all levels; Safety training; Importance of safety; Cost of neglecting safety; Environment and need to maintain a clean and healthy environment; Ergonomics-a new term combining nature and its inhabitants.

Suggested Books:

1. Principles of Management by Charles WL Hill and steven L Mcshane; Tata McGrawh-Hill' New Delhi; 2008
2. Principles of Management by PC Tripathi and PN Reddy; Tata McGrawh-Hill' New Delhi; 1991.
3. Organizational Behavior by John W. Newstrom and Keith Danis; Tata McGrawh-Hill' New Delhi; 2002

Jodhpur National University
M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 102 HIGHWAY MATERIALS

(4-2-0)

EXAM HRS:- 3

M.M. :- 100+50= 150

Aggregate, Blending of aggregate by Rothfutch, Triangular chart, trial and error and mathematical proportioning methods. Classification, nomenclature, quality manufacture of aggregates with respect to WBM, Bituminous and concrete roads.

Bituminous materials classification and various terms used related to tar and bitumen, uses and application of different bituminous material in highway construction. Origin and preparation of different grades of bitumen and tar used for road construction. The Rheology of bituminous binders, Adhesion, failures, weathering of bituminous road materials.

Bituminous mixes, requirements of bituminous mixes. Methods of bituminous mix design and their suitability, advantages and disadvantages. Design of bituminous mixes by Marshall, Hubbard Field, Hveem methods.

Materials for low cost roads: Stabilized soil, lime, fly ash, Soil – Cement and soil-bitumen stabilization. Soft aggregates, Low cement concrete.

Suggested Books :

1. Highway Materials by Atkins & Harold, Prentice Hall Pearson
2. Kerbs and Walkes “ Highway Materials,” Mc Graw Hill Book Co.
3. Relevant IS, IRC, ASTM Codes
4. ASTM Highway Testing Manulas – EI Centre

Jodhpur National University
M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 103 TRAFFIC ENGINEERING AND FIELD STUDIES
(4-2-0)
EXAM HRS:-3
M.M.:-100+50 =150

Introduction Definitions and normal scope of study within traffic engineering.

Traffic characteristic: Review of road user characteristics and vehicular characteristics.

Various traffic studies:

- i) Spot speed studies-data analysis and interpretations
- ii) Speed and delay studies- Purpose, course of delay, various methods of speed and delay studies.
- iii) Traffic volume studies and characteristics
- iv) Origin and destination studies: Various methods of O and D studies and sampling.

Suggested Books :

1. Mc Shane, W.R. and Roes, R.P “Traffic Engineering,” Prentice Hall, Englewood cliffs, New Jersey,
2. Kadiyali L.R.“Traffic Engineering Transport and Planning,” Khanna Publishers, Dehi -6
3. Matson, T.M. Smith, W.S, and Hurd, F.W, “Traffic Engineering,” Mc Graw Hill Book Company, Inc. New York.
4. C.A.O’ Flaherty, “Transport Planning and Traffic Engineering, Arnold

Jodhpur National University

M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 104 HIGHWAY CONSTRUCTION

(4-2-0)

EXAM HRS:-3

M.M.:-100+50 =150

Classification of types of highway construction, Suitability of each type under Indian conditions, selection of base course and surface course.

Earth work & Soiling: Selection of soils, construction of embankments, excavation and compaction equipments. Field and laboratory tests for quality control. Stone soiling, brick soiling, current practices.

Construction of earth roads, gravel roads, soil stabilized roads, water bound macadam, paved roads, bricks, stones.

Bituminous construction: properties, requirements and specifications of materials, equipments and plants. Detailed construction procedure of each type. Field and laboratory tests for quality control. Choice of binders under different conditions. IRC, and MORTH specifications.

Recommendations under Indian conditions: Bituminous surface treatments, interface treatments – prime-coat and tack-coat, surface dressing and seal-coat, grouted or penetration macadam, bituminous bound macadam, bituminous concrete, mastic asphalt.

Cement Concrete Road Construction: Necessity of providing a base course under cement concrete road. Selection of materials, Construction methods, detailed construction procedure, Quality control tests (lab. and field). Construction equipments.

Joints in Cement Concrete Pavements: Classification of various types of joints, necessity of providing each type, method of construction of joints, load transfer devices, dowel bars, tie bars. Joint filler and sealer materials, IRC specifications.

Reinforced Cement Concrete Road Construction.

Suggested Books :

1. MOSRTH Roads and Bridge Specifications
2. H.M.S.O. (London) “ Bituminous Materials In Road Constructing, 1966
3. Sparkes, F.N. and Smith A.F. “Concrete Roads” Edwards Amola & Co., London

Jodhpur National University
M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 105 TRAFFIC ENGINEERING LAB. (0-0-6)
EXAM HRS:-3
M.M.: 100

- (1) Traffic Surveys like traffic Volume count
- (2) Parking Surveys and Parking Turnover Studies
- (3) Journey Time and Delay Studies.
- (4) Delay Measurement at signalized and Unsignalised Intersection
- (5) Study of driver Characteristics

Suggested Books:

1. Kadiyali L.R, “ Traffic Engineering and Transport Planning ,” Khanna Publishers

Jodhpur National University

M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

II SEMESTER

MCE 201 PAVEMENT ANALYSIS AND DESIGN (4-2-0)
EXAM HRS:-3
M.M.:-100+50 =150

Components of pavement structure, importance of Sub-Grade soil properties on pavement performance. Functions of Sub-Grade, sub-base, base course and wearing course.

Stresses in flexible pavements: Stresses in homogeneous masses and layered system, deflections, shear failures, equivalent wheel and axle loads.

Elements in design of flexible pavement: Loading characteristics-Static, impact and repeated loads, affects of dual wheels and tandem axles, area of contact and tyre pressure, modulus, CBR value of different layers, equivalent single wheel load, equivalent stress equivalent deflection criterion, equivalent wheel load factors, climatic and environmental factors.

Types of distress: Structural and functional, serviceability, fatigue cracking, pavement deformation and low temperature shrinkage cracking. Factors affecting performance. Relation between performance & distress.

Design methods for flexible pavement: Group Index method, California bearing ratio (CBR), Triaxial method, McLeod Method, Benkelman Beam method. Boussiusq's and Burmister's analysis and design method. Design of flexible airport pavements.

Elements in design of Rigid pavements: Wheel load, stresses, Westergaard's analysis. Basic properties of concrete elasticity, shrinkage & creep, durability of concrete, rigid pavement design, concrete mix design.

Temperature stresses: Thermal properties of aggregates and concrete. Effect of temperature variations on concrete pavements, Westergaard's and Tomlinson's analysis of warping stresses. Combination of stresses due to different causes.

Pavement overlays: Flexible overlays and Rigid overlays.

Suggested Books :

1. Kadiyali L.R., "Principles & Practice of Highway Engineering" Khanna Publisher
2. Chakroborty P Das "Principles & Practice of Highway Engineering"
(Khanna Publisher 2000)
3. "Highway Engineering", Khanna & Justo, (Nem Chand & Poros, Roorkee.1997)
4. E.J. Yoder, "Principles of Pavement Design," John Wiley & Sons Inc., New York.
5. Relevant IRC, ASTM, AASHTO and other Codes, Manuals and Specifications.
6. Teng – "Functional Designing of Pavements".
7. Huang - "Pavement Analysis & Design (Prentice Hall – 2003)
8. Yoder E,J, and Witezak – "Principles of Pavement Design". (Wiley & Sons, 1975)
9. Ralph Haos, Ronald Hudson & Zaniesuki "Modern Pavement Management (Kneiger Pubication,1994)

Jodhpur National University
M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 202 INTERSECTION DESIGN AND ANALYSIS

(4-2-0)

EXAM HRS:-3

M.M.:-100+50 =150

Type of intersection, general considerations for the location of various intersection types, principles of intersection design, types of maneuvers, relative speed, conflict points and areas, design surveys for intersection, intersection geometrics for various types including approach and exit details.

Capacity and performance analysis of various types of intersections for various types of operation-capacity level of service, intersection delay, uncontrolled priority controlled and roundabout intersection-their capacity and delay analysis, and overall design. Design and operational evaluation of weaving sections. Design of speed change lanes and median lanes.

Grade separated intersection and interchanges-types, suitability and economic justifications.

Design of intersection controls-signalization design and analysis, turn control, general traffic control by islands, pedestrian control, signs, markings, intersections lighting etc.

Suggested Books:

1. Transport Research Board, "Highway Capacity Manual," SR- 209, TRB, 1985, 1994,
2. Institution of Transportation Engineers, "Transportation and Traffic Engineering Hand Book" ITE Prentice Hall, New Jersey, 1976
3. Mc Shane, W.R. and Roes R.P., "Traffic Engineering." Prentice Hall New Jersey
4. Khistry C.J., "Transportation Engineering, An Introduction," Prentice Hall, New Jersey
5. Mc Shane, W.R.e. Roes, R.P "Traffic Engineering (Prentices Hall, New Jersey, 1990)
6. Institute of Transportation Engineers "Transport & Traffic Engineering Hand Book" (ITE, Prentice Hall new Jersey 1976)
7. Hanburger W.S. & Kell J.H. "Fundamentals of Traffic Engineering (ITS California, 1984)
8. Transportation Research Board, "Highway Capacity Manual (SR- 209 TRB, 1985, 1994)

Jodhpur National University
M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 203.1 PAVEMENT MAINTENANCE MANAGEMENT SYSTEM

(4-2-0)

EXAM HRS:-3

M.M.:-100+50 =150

Introduction to Pavement Maintenance Management System, Components of Pavement Management Maintenance Measures PMMS objectives.

Structural requirements and Evaluation of flexible pavements – Design requirements, factors affecting structural condition of flexible pavements, structural behavior and evaluation of structural condition of pavements.

Design methods for flexible pavements, design of overlays by Benkelman Beam Rebound Deflection Technique.

Pavement Serviceability concepts, Evaluation of riding quality by psycho- physical method.

Pavement Maintenance Measures, Implementation of Maintenance management programs.

Suggested Books :

1. Yoder E.J. and Witezak, "Principles of Pavement Design," John Wiley & Sons
2. Haas and Hudson, Pavement Management System, Mc- Graw Hill Book Co., New York.
3. Shahin M.Y. , Pavement Management for Air Port, Roads and Parking lots, Chapman And hall.
4. Bridge and Pavement Maintenance, Transportation Research Record No. Boo, TRB.

Jodhpur National University

M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 203.2 Pavement Construction and Management (4-2-0)
EXAM HRS:-3
M.M.:-100+50 =150

Components of PMS and their Activities, Major Steps in Implementing PMS, Inputs, Design, Construction and Maintenance, Rehabilitation and Feedback Systems, Example~ of HDM and RTIM Packages, Highway Financing, Fund Generation, Evaluating Alternate Strategies and Decision Criteria.

Serviceability Concepts, Visual Rating, Pavement Serviceability Index, Roughness Measurements, Distress Modes - Cracking, Rutting etc, Pavement Deflection - Different Methods, Skid Resistance, Roughness, Safety Aspects. Inventory System - Assessment of Deficiencies.

Roadway and Drain excavation, Excavation and Blasting, Embankment construction, Construction of Gravel, Lime, Cement stabilised sub-bases, WBM Bases, Wet Mix Construction, Crushed Cement Bases, Shoulder Construction Drainage: Surface/Subsurface, Turfing, Sand Drains, Sand Wicks. Rope Drains, Geo-textile Drainage, Preloading Techniques.

Preparation and Laying of Tack Coat, Bituminous Macadam, Penetration Macadam, Built up Spray Grout, Open Graded Premix, Mix Seal, Semi-dense, Asphalt Concrete - Interface Treatments and Overlay Construction, IRC Specifications, Introducing Mechanical Mixers, Pavers, Finishers.

Construction of Cement Concrete Roads, Manual and Mechanical Methods, Joints in Concrete and Reinforced Concrete Pavements, Interface Treatment and overlay construction - Related Equipment.

Suggested Books :

- 1 Haas and Hudson, W.R. Pavement Management Systems - McGraw Hill
2. Sargious, M.A. - Pavements and Surfacing for Highways and Airports - Applied Science Publishers Ltd.
3. Bridge and Pavement Maintenance - Transportation Research Record No. BOO, TRB
4. Shahin MY, 1994 - Pavement Management for Airports, Roads and parking Lots.
5. Bent Thagesan, 1996 - Highway and Traffic Engineering for Developing Countries.

Jodhpur National University

M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 204 LOW COST ROADS

(4-2-0)

EXAM HRS:-3

M.M.:-100+50 =150

Introduction: Concept Objective, Scope and coverage of low cost and rural roads. Significance of low cost roads for developing countries, with special reference to India.

Rural Road Planning and Investment: State of art, review of existing practices and their deficiencies in rural road planning Socio-economic aspects in planning. Preparation of rural road master plans and their evaluation. Stage construction, planning, and utilization of successive investments.

Geometrics: Traffic and design speed, horizontal alignment, vertical alignment, and cross section elements.

Pavement Design Aspects for Low Cost Rural Roads: Minimum level of serviceability concept. Use of strength index as a substitute to IRC design method.

Materials: Stabilized soils, Design of soil-lime, soil-cement, soil-bitumen and soil-lime-fly ash mixes, Use of soft aggregates.

Construction, Operation and Plants: Surveying and setting, excavation, hauling, Shaping and compaction, Stabilized soils-spreading, mixing and compaction. Appropriate technologies, tools, plants and equipments for construction as per IRC practices.

Road Drainage: Drainage of road surface, pavement layers and cross drainage works. Various low cost drainage alternatives.

Maintenance: Short term routine maintenance, long term maintenance, organizational and financial aspects of maintenance works.

Suggested Books :

1. IRC SP20: Rural Roads Manual, Indians Roads Congress, New Delhi.

Jodhpur National University

M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 205 MATERIALS DESIGN & CONSTRUCTION OF PAVEMENT LAB.

(0-0-6)

EXAM HRS:-3

M.M.:-50+50 =100

- (1) Highway Materials Testing**
 - (i) Tests on Stone Aggregate
 - (ii) Tests on Bitumen
 - (iii) Tests on Emulsion
- (2) Design of Asphalt Concrete Mixes.**
 - (i) Marshal Stability Test
- (3) Pavement Evaluation Test**
 - (i) Benkleman Beam Test
 - (ii) Roughness Test

Suggested Books :

1. S.K.Khanna & Justo C.E.G., Highway Material Testing Manual
2. A.K. Duggal and Vijay P.Puri, "Laboratory Manual in Highway Engineering,"

Jodhpur National University
M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

III SEMESTER

MCE 301.1 HIGHWAY SUB -GRADE AND FOUNDATION ANALYSIS

(4-2-0)

EXAM HRS:-3

M.M.:-100+50 =150

Sub-Grade: Importance, properties & Functions.

Soil survey: Soil Survey procedure for highways and ground water investigations, Identifications and Significance of soil characteristics. Soil Classification for highway engineering purpose – Casagrande, U.S.P.R.A., Unified, CAA, Burmister, HRB, FAA and Compaction classifications and their limitations, Chemical test for soils. Effects of water in soil – swelling shrinkage, cohesion and plasticity in soil.

Soil: Moisture, Movement –Ground water, gravitational water, held water, soil suction.

Sub soil drainage: General principles, elementary groundwater hydrology, control of high water table and seepage flow, drainage of fine grained soils.

Frost action in soils, evaluation and design of Sub-Grade laboratory strength elevations, settlement analysis. Stress-strain relationship in soils.

Compaction of soil, field and laboratory methods, equipments, field control, Sub-Grade and embankment compaction.

Foundation: Methods of reducing settlements, Consolidation of compressible soils estimation of rate of settlement due to consolidation in foundation of road embankments. Construction of high embankments over weak foundations. Various methods of excavation displacement of soft and swampy soil for the construction of embankments.

Vertical Sand Drains: Design criteria, construction and uses; `

Suggested Books; _

1. B.M. Das , “ Advanced Soil Mechanics,” Taylor and Francis
2. Mitchell, James K, “Fundamentals of Soil Behaviour,” John Wiley & Sons.,
3. N.P. Kurien, “ Design of Foundation Systems., Principles and Practices,” Narosa New Delhi.
4. B.M. Das, “ Principles of Foundation Engineering,” Thomson Brooks \ Cole

Jodhpur National University
M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 301.2 ADVANCED FOUNDATION ENGINEERING

(4-2-0)
EXAM HRS:-3
M.M.:-100+50 =150

Bearing capacity of shallow foundation, applications of bearing capacity theories, methods – Terzaghi, Mayerhoff, Brinch Hanson, Skempton, Balla.

Field methods – standard penetration test, factors effecting N value, Plate load test, Coefficient of Sub grade reaction and its determination.

Settlement analysis – Elastic and consolidation settlement, settlement estimates from penetration test, plate load test, construction period correction. permissible total and differential settlement, causes of settlement, control of settlement, remedial measures, proportion of footing, contact pressure and active zone from pressure bulb concept.

Factors effecting failures of foundation, case studies, and remedial measures.

Pile foundations – selection of pile foundation, load carrying capacity – dynamic formula, static formula, pile load test - pull out test, lateral load test, initial load test, routine load test, cyclic load test.

Settlement of pile and pile groups, negative skin friction, laterally loaded piles – Broom's analysis, IS code method. Under reamed piles, method and design.

Caissons and well foundations – design aspects of caissons, open caissons, pneumatic caissons, floating caissons, well foundations, monoliths, design and construction aspects of well foundations.

Suggested Books;_

- 1.Foundation analysis and Design by Bowles, Mc.Graw Hill Inc., second edition.
2. Geotechnical Engineering by C. Venkatramayya, New age international publishers. Soil
- 3.Mechanics and Foundation Engineering, Vol. II, V.N.S. Murthy.

Jodhpur National University
M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 301.3 GROUND IMPROVEMENT TECHNIQUES

(4-2-0)
EXAM HRS:-3
M.M.:-100+50 =150

Need and objectives of Ground Improvement, Classification of Ground Modification Techniques - suitability and feasibility, Emerging Trends in ground improvement.

Methods of compaction, Shallow compaction, Deep compaction techniques -Vibro floatation, Blasting, Dynamic consolidation, pre-compression and compaction piles, Field compaction control.

Methods of dewatering - open sumps and ditches, Wellpoint system, Electro-osmosis, Vacuum dewatering wells; pre-loading without and with sand drains, strip drains and rope drains.

Stabilisation with admixtures like cement, lime, calcium chloride, fly ash and bitumen. . Categories of grouting, Art of grouting, Grout materials, Grouting techniques and control. Concept of soil reinforcement, Reinforcing materials,

Concept of confinement, Gabion walls,

Suggested Books ; _

1. Manfred R. Hansmann - Engineering principles of ground modification - Me. Graw-Hill pub. Co., NewYork.
2. Robert M. Koerner - Construction and Geotechnical methods in Foundation Engineering - MC.Graw-Hill Pub. Co., New'York. .
3. Winterkorn and Fang - Foundation Engineering Hand Book - Van Nostrand Reinhold Co., New York.
4. Aris C. Stamatopoulos & Panaghiotis C. Kotzios - Soil Improvement by Preloading – John Wiley & Sons Inc. Canada.
5. P. Purushothama Rao - Ground Improvement Techniques - Laxmi Publications (P) Limited.

Jodhpur National University
M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

**MCE 301.4 GEOGRAPHIC INFORMATION SYSTEM AND
 ITS APPLICATIONS**

(4-2-0)

EXAM HRS:-3

M.M.:-100+50 =150

Introduction: Definitions of GIS – Components of GIS – Geographic data presentation: maps – mapping process – coordinate systems – transformations – map projectionS – geo referencing - data acquisition.

Geographic Data Representation, Storage, Quality and Standards: Storage - Digital representation of data – Data structures and database management systems – Raster data representation – Vector data representation – Concepts and definitions of data quality– omponents of data quality – Assessment of data quality –Managing data errors – Geographic data standards.

GIS Data Processing, Analysis and Modeling: Raster based GIS data processing – Vector based GIS data processing – Queries – Spatial analysis – Descriptive statistics – Spatial autocorrelation – Quadrant counts and nearest neighbour analysis – Network analysis – Surface modeling – DTM.

GIS Applications: (in one of the following areas)

Applications of GIS in Environment monitoring – Natural hazard management – Natural resources management urban planning – utility management – Land information – Business development

Suggested Books ;

1. Lo, C.P. & Yeung A.K.W., Concepts and Techniques of Geographic Information Systems, PrenticeHall of India, New Delhi, 2002.
2. Anji Reddy, M., Remote Sensing and Geographical Information Systems, B.S.Publications, Hyderabad,2001.
3. Burrough, P.A., Principles of Geographical Information Systems, Oxford Publication, 1998.
4. Clarke, K., Getting Started with Geographic Information Systems, Prentice Hall, New Jersey, 2001.
5. DeMers, M.N., Fundamentals of Geographic Information Systems, John Wiley & Sons, New York,2000.
6. Geo Information Systems – Applications of GIS and Related Spatial Information Technologies, ASTER Publication Co., Chestern (England), 1992
7. Jeffrey, S. & John E., Geographical Information System – An Introduction, Prentice-Hall, 1990
8. Marble, D.F., Galkhs HW & Pequest, Basic Readings in Geographic Information Systems, Sped System Ltd., New York, 1984.

Jodhpur National University

M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 302.1 TRANSPORTATION PLANNING

(4-2-0)

EXAM HRS:-3

M.M.:-100+50 =150

Transportation planning methodology, hierarchical levels of planning-statewide, regional, urban passenger and goods transportation. General concept and process of transportation planning.

Urban transportation planning, urban travel characteristics: private and public, travel behavior analysis.

Travel demand estimation and forecasting. Trip classification and Socio-economic variable in trip making, trip generation; multiple regression analysis, category analysis, comparative study. Modal split analysis- traditional analysis, behavioral approach to mode choice, two-stage modal split models.

Trip distribution: Growth factor method, gravity model. Intervening opportunity and competing opportunity models, comparative study. Traffic assignment network assignment, capacity restrained.

Land-use transport planning: Land-use transport intersections, transport related land use models, their use in transportation planning.

Suggested Books :-

1. Hutchinson, B.G., "Principles of Urban Transportation System Planning," Mc Graw Hill.
2. Khisty, CJ, "Transportation Engineering –An Introduction," Prentice Hall, NJ.
3. Kanafani. A, "Transportation Demand Analyses," Mc Graw Hill.
4. Mishara, R.P., "Regional Development Planning in India," Vikas Publishing House, New Delhi
5. L.R. Kadiyali, "Traffic Engineering and Transport Planning Khanna Publishers."

Jodhpur National University
M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 302.2 BRIDGE ENGINEERING

(4-2-0)

EXAM HRS:-3

M.M.:-100+50 =150

Introduction—classification and components of bridges— layout and planning—

Structural forms of bridge decks – grillage analysis of slab decks, beam and slab decks, cellular decks.

Standard specifications for bridges – IRC loadings for road bridges – standards for railway bridges – design of RC slab, skew slab and box culverts. Design of T beam bridges – balanced cantilever bridges – rigid frame bridges – Arch bridges – bow string girder bridges.

Design of plate girder bridges – steel trussed bridges – Introduction to long span bridges: cable stayed bridges and suspension bridges –instability.

Forces on piers and abutments – Design of piers and abutments – types of wing walls – types of bearings – design of bearings.

Suggested Books :

1. E.C. Hambly, Bridge deck behaviour, Chapman and Hall, London
2. E.J. O'Brien and D.L. Keogh, Bridge deck analysis, E& FN Spon, New York
3. D.Johnson Victor, Essentials of bridge engineering, Oxford & IBH publishing Co. Ltd., New Delhi.
4. N.Krishna Raju, Design of bridges, Oxford & IBH publishing Co. Ltd., New Delhi.
5. Jaikrishna and O.P Jain, Plain and reinforced concrete-vol.II, Nem Chnand & Bros,Roorkee.
6. IRC: 5 -1970, Standard specifications and code of practice for road bridges, Sections I to V, Indian Roads Congress, New Delhi.
7. Indian railway standard code of practice for the design of steel or wrought iron bridge carrying Rail, road or pedestrian traffic, Govt. of India, Ministry of Railways, 1962.

Jodhpur National University

M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 302.3 ENVIRONMENTAL IMPACT ASSESSMENT

(4-2-0)

EXAM HRS:-3

M.M.:-100+50 =150

Introduction: Concepts of environmental impact analysis, key features of National environmental policy act and its implementation, screening in the EIA process, utility and scope of EIA process, Environmental protection acts EIA at national level.

Conceptual approach for environmental impact studies, planning and management of impact studies, matrix and network methodologies for impact identification, description of the affected environmental – environmental indices.

Prediction and Assessment of Impact on Air Environment: Basic information on air quality, sources of air pollutants, effects of air pollutants, key legislations and regulations, conceptual approach for addressing air environment impacts, impact prediction approaches, assessment of significance of impacts, identification and incorporation of mitigation measures.

Prediction & Assessment of Impact on Noise & Social Environment: Basic information on noise, key legislation and guidelines, conceptual approach for addressing noise environment impacts, impact prediction methods, assessment of significance of impacts, identification and incorporation of mitigation measures. Conceptual approach for addressing socio-economic impacts, traffic and transportation system impacts, visual impacts, scoring methodologies for visual impact analysis

Decision Methods for Evaluation of Alternative: Conceptual basis for trade-off analysis, weighting of decision factors, scaling, rating or ranking of alternatives, development of decision matrix. Public participation in environmental decision making: Regulatory requirements, advantages and disadvantages, environmental impact assessment process, objectives of public participation, selection of public participation techniques, techniques for conflict management and dispute resolution, verbal communication in EIA studies.

Suggested Books :

1. CANTER, L.W., Environmental impact assessment, McGraw-Hill, 1997
2. Betty Bowers Marriott, Environmental Impact Assessment: A Practical Guide, McGraw-Hill Professional, 1997.
3. Peter Morris & Riki Therivel, Methods of Environmental Impact Assessment, Routledge, 2001.
4. Denver Tolliver, Highway Impact Assessment, Greenwood Publishing Group, 1993.
5. R. K. Jain, L. V. Urban, G. S. Stacey, H. E. Balbach, Environmental Assessment, McGraw-Hill Professional, 2001.

Jodhpur National University

M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 302.4 TRANSPORTATION ECONOMICS & EVALUATION

(4-2-0)

EXAM HRS:-3

M.M.:-100+50 =150

Principles of Economics: Supply and demand models, Consumer's surplus and social surplus criteria, framework for social accounting: accounting rate of interest, social opportunity cost, rate of interest, social time preference rate of interest, accounting prices of goods and services, measuring input costs, applications of social accounting framework.

Transport Costs and Benefits: Fixed and variable cost, cost of improvement, maintenance cost, cost estimating methods, accounting for inflation, external costs, Direct benefits: reduced vehicle operation costs, value of travel time savings, value of increased comfort and convenience, cost of accident reduction, reduction in maintenance cost.

Economic Analysis: Generation and screening of project alternatives, different methods of economic analysis: annual cost and benefit ratio methods, discounted cash flow methods, shadow pricing techniques, determination of IRR and NPV, examples of economic analysis, application of economic theory in traffic assignment problem.

Project Evaluation: Framework of evaluation, transport planning evaluation at urban and regional levels, Other evaluation procedures – achievement matrices, factor profiles, plan ranking, environmental evaluation, safety evaluation, project financing.

Suggested Books :

1. Winfrey R, Highway Economic Analysis, International Textbook Company.
2. Kenneth J. Button, Transport Economics, Elgar
3. David A. Hensher, Ann M. Brewer, Transport : An Economics and Management Perspective, Oxford University Press
4. Emile Quinet, Roger Vickerman, Principles Of Transport Economics, Edward Elgar Pub
5. Road User Cost Study, Central Road Research Institute
6. Dickey J.W, Project Appraisal for Developing Countries, JohnWiley
7. Ian G. Heggie, Transportation Engineering Economics, McGraw Hill.

Jodhpur National University
M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 303 SEMINAR (ON ANY CONTEMPORARY TOPIC)

(0- 0- 6)

M.M.:- 100

In this course, the traffic engineering, pavement engineering or transportation systems concepts on specific contemporary topic will be studied and tools for preparing reports will be used by students to prepare report. Reporting, writing and presentation skill development in engineering and technology is the main objective.

Jodhpur National University
M.Tech. Programme, CIVIL (Transportation Engineering)

TEACHING/EXAMINATION SCHEME & SYLLABUS

IV SEMESTER

MCE 401 DISSERTATION

M.M. :- 200