

S Y L L A B U S

MASTER OF TECHNOLOGY

TWO YEAR INTERGRATED COURSE

M. Tech. Examination, 2009/2010
Civil (Transportation Engineering)



JODHPUR NATIONAL UNIVERSITY
JODHPUR

JODHPUR NATIONAL UNIVERSITY

Faculty of Engineering & Technology

M. Tech. Programme

GENERAL INFORMATION FOR STUDENTS

[A] ELIGIBILITY FOR ADMISSION

1. (a) Candidates who have passed B.E. in 'Electronics / Electronics & Comm. Engg. / Electronics & Instrumentation Engineering' with at least 55% marks in aggregate from any recognized University or Institute recognized as equivalent may be eligible for admission to "**M.Tech. Programme in Digital Communication**".
(b) Candidates who have passed B.E. in any of the branches 'Computer Science Engineering / Information Technology' with at least 55% marks in aggregate may be eligible for admission to "**M.Tech. in Computer Science & Engineering**."
Candidates who have obtained M.Sc. (Computer Science)/MCA degree with at least 60% aggregate marks from any recognized University or Institute recognized as equivalent may be admitted to "M.Tech.in Computer Science & Engineering." Provided the candidates passes the deficiency papers (additional papers offered by the department).
(c) Candidates who have passed B.E. in 'Civil Engineering/Construction Engineering/Architecture.' with at least 55% marks in aggregate from any recognized University or Institute recognized as equivalent may be eligible for admission to "**M.Tech. Programme in Transportation Engineering / Geotechnical Engineering/Structural Engineering**".
(d) Candidates who have passed B.E. in 'Mechanical Engineering' with at least 55% marks in aggregate from any recognized University or Institute recognized as equivalent may be eligible for admission to "**M.Tech. Programme in Thermal Engineering**".
(e) Candidates who have passed B.E. in 'Electrical Engineering' with at least 55% marks in aggregate from any recognized University or Institute recognized as equivalent may be eligible for admission to "**M.Tech. Programme in Electrical Engineering (Power system)**".
(f) In general, the candidates who have passed B.E. in Computer Science Engineering/Electrical Engineering/ Electronics & Communication Engineering/Information Technology/ Mechanical Engineering/Civil Engineering with at least 55% marks in aggregate from any recognized university or institute recognized as equivalent may be eligible for admission to **M.Tech. Programme in the subject of his B.E./B.Tech.**
2. Candidates who have passed the section 'A' & 'B' examinations of the Institution of Engineers (India) shall be eligible apply for admission to the M.Tech Courses in respective branch of Engineering.
3. On admission, candidate may be required to offer and pass additional courses to make up the deficiency, if any.
4. For the admission to *M.Tech. Programme* candidate shall be screened and/or interviewed by the selection committee constituted under the chairmanship of concerned Head Of the Department.

5. The Faculty reserves the right to admission to any candidate and, the decision of the authorities shall be final in all the cases subject to the approval of Jodhpur National University, Jodhpur.
6. Teachers / Research Scholars / Engineers employed in engineering/scientific organization/self-employed fulfilling the eligibility criteria specified in point 1-4 above may be admitted to the *M.Tech. Programme*.
7. The number of students to be admitted to a particular branch of study shall be decided by the Jodhpur National University in consultation with the Head of the Department concerned.
8. 5% relaxation is provided to candidate belonging to SC/ST category.

[B] DURATION OF THE COURSE

1. The normal duration of *M.Tech. Programme* will be 2 academic years (4 semesters). The maximum period of completion of the programme shall be 5 academic years.
2. In no case a candidate, who has not passed finally after 5 academic years from the date of enrolment, be allowed to continue the course and his/her admission will automatically be cancelled.
 - a. Provided that the Vice-Chancellor in consultation with the Head of the Department may waive this limit of 5 years only in the case of candidates who could not complete their M.Tech. programme at one stretch due to genuine reasons. The reasons for granting exemption shall be recorded in writing. Such extension shall not exceed one year.
3. Candidate shall be required to attend regular lecture classes, complete the prescribed course work including the practicals and sessionals.

[C] EXAMINATION & RESULT

1. There shall be an examination at the end of each semester.
2. The examination shall be conducted by means of written papers, practicals including sessionals, viva-voce as per scheme of examination specified in the syllabus
3. A candidate who has undergone regular course of study for the first semester shall be eligible to appear at the First Semester Examination for the M. Tech. Programme.
4. A candidate appearing at the First Semester Examination for the M. Tech. Programme shall be required to show competent knowledge of the subjects mentioned in the teaching and examination scheme for the respective branch of study.
5. A candidate appearing at the Second Semester Examination for the M. Tech. Degree shall be required to show competent knowledge of the subjects mentioned in the teaching and examination scheme of respective branch of study.
6. A candidate appearing at the Third Semester Examination for the M. Tech. Degree shall be required to show competent knowledge of the subjects mentioned in the teaching and examination scheme of respective branch of study.
7. A candidate who fails in any elective subject may be permitted by the Head of the Department to change the elective subject. He shall be required to undergo a regular course of study for the new elective subject.
8. For a pass, candidate should obtain 40 % marks in each theory paper, 50 % marks in each course work (Laboratory) and 50 % marks in Seminar. Both the theory & sessional marks will be considered independent of each other. Aggregate pass percentage will be 50% in each subject.

9. On satisfactory completion of the course and after passing the final examination, a candidate shall be awarded M.Tech. Degree in the respective specialization, in respective branch.
10. The division shall be awarded to the M.Tech. students as follows:
 - a. The students who obtain in first attempt 75% or more of the aggregate marks in both theory and sessionals and also if the thesis has been adjudged to merit distinction are awarded **Honours**.
 - b. The students who obtain 60% or less than 75% of the aggregate marks in all theory papers including thesis and the sessionals are awarded **First Division**.
 - c. The students who obtain less than 60% of the aggregate marks in all the theory papers and the sessionals but not less than 40% in each theory paper and 50% in the sessionals will be awarded **Second Division**.
11. Examination fees, Re-appear examination fees, Extension of period etc. shall be charged separately as prescribed by the Jodhpur National University, Jodhpur. Separate examination forms are to be submitted with the Jodhpur National University for all the examinations.

[D] SEMINAR / DISSERTATION:

1. Each candidate shall submit for examination a report embodying literature survey along with a critical review of the latest developments / work carried out in a subject related to M.Tech. programme.
2. Four copies of the seminar/dissertation report printed or type written shall be submitted to the Head of the Department along with a certificate of originality of the work recommendation from his/her supervisor.

[E] SCHEME OF STUDY

1. The Medium of instruction and examination shall be **English**
2. Candidate for the M.Tech course shall be instructed & examined as per the Teaching and Examination scheme and course content of respective semester.

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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	
1MTE01	Strategic Management	4	2	-	6	100	50	150	3
1MTE02	Highway Materials	4	2	-	6	100	50	150	3
1MTE03	Traffic Engg. & Field Studies	4	2	-	6	100	50	150	3
1MTE04	Highway Construction	4	2	-	6	100	50	150	3
1MTE05	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	
2MTE01	Pavement Analysis & Design	4	2	-	6	100	50	150	3
2MTE02	Intersection Design and Analysis	4	2	-	6	100	50	150	3
	(Any One from 03)								
2MTE03.1	Pavement Maintenance Management System	4	2	-	6	100	50	150	3
2MTE03.2	Pavement Construction and Management								
2MTE04	Low Cost Roads	4	2		6	100	50	150	3
2MTE05	Materials design & Construction of Pavements (LAB)			6	6	50	50	100	3
	Total	16	8	6	30	450	250	700	15

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III SEMESTER

Subject Code	Subject	Hrs. / Week				Marks			Exam Hrs
		L	T	P	Total	Theory/ practical Exam	Internal Assess- ment	Total	
	(Any One from 01 and 02 Each)								
3MTE01/1.1	Highway Sub-Grade & Foundation Analysis								
3MTE01/1.2	Advanced Foundation Engineering	4	2	-	6	100	50	150	3
3MTE01/1.3	Ground Improvement Techniques								
3MTE01/1.4	Geographic Information System and its Applications								
3MTE02/2.1	Transportation Planning								
3MTE02/2.2	Bridge Engineering								
3MTE02/2.3	Environmental Impact Assessment	4	2	-	6	100	50	150	3
3MTE02/2.4	Transportation Economics & Evaluation								
3MTE03	Seminar	-	-	6	6	100	-	100	3
	Total	8	4	6	18	300	100	400	9

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IV SEMESTER: -

Subject Code	Subject	Hrs. / Week				Marks		
		L	T	P	Total	Theory \ Practical Exam	Internal Assessment	Total
4MTE1	Dissertation	-	-	-	-	200	-	200
	Total	-	-	-	-	200	-	200

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

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TEACHING/EXAMINATION SCHEME & SYLLABUS

I SEMESTER

1MTE 01 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

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TEACHING/EXAMINATION SCHEME & SYLLABUS

1MTE 02 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

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TEACHING/EXAMINATION SCHEME & SYLLABUS

1MTE 03 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

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TEACHING/EXAMINATION SCHEME & SYLLABUS

1MTEO4 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

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TEACHING/EXAMINATION SCHEME & SYLLABUS

1MTE 05 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

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TEACHING/EXAMINATION SCHEME & SYLLABUS

II SEMESTER

2MTE 01 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)

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TEACHING/EXAMINATION SCHEME & SYLLABUS

2MTE 02 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)

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TEACHING/EXAMINATION SCHEME & SYLLABUS

2MTE 3.1 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.

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TEACHING/EXAMINATION SCHEME & SYLLABUS

2MTE 3.2 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.

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TEACHING/EXAMINATION SCHEME & SYLLABUS

2MTE 4 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.

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TEACHING/EXAMINATION SCHEME & SYLLABUS

2MTE 05 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,"

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TEACHING/EXAMINATION SCHEME & SYLLABUS

III SEMESTER

3 MTE 01/1.1 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

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TEACHING/EXAMINATION SCHEME & SYLLABUS

3MTE 01/1.2 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.

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TEACHING/EXAMINATION SCHEME & SYLLABUS

3MTE 01/ 1.3 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.

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TEACHING/EXAMINATION SCHEME & SYLLABUS

3MTE 02/ 2.1 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."

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TEACHING/EXAMINATION SCHEME & SYLLABUS

3MTE 02/2.2 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.

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TEACHING/EXAMINATION SCHEME & SYLLABUS

3MTE 02/ 2.3 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.

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TEACHING/EXAMINATION SCHEME & SYLLABUS

3MTE 02/ 2.4 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.

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TEACHING/EXAMINATION SCHEME & SYLLABUS

3MTE 03 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.

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TEACHING/EXAMINATION SCHEME & SYLLABUS

IV SEMESTER

4MTE 01 DISSERTATION

M.M. :- 200