



Shri Shankaracharya Technical Campus,

Shri Shankaracharya Group of Institutions

(An Autonomous Institute affiliated to Chhattisgarh Swami Vivekanand Technical University Bhilai)

SCHEME OF EXAMINATION AND SYLLABUS

M-Tech.2nd Semester (Civil) Specialization in Transportation Engineering

S. No.	Board of Study	Subject Code	Subject	Periods Per Week			Scheme of Examination			Total Marks	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1	Civil Engg.	CE230201	Bridge Engineering	3	1	-	100	20	20	140	4
2	Civil Engg.	CE230202	Transportation System Planning	3	1	-	100	20	20	140	4
3	Civil Engg.	CE230203	Advanced Soil Mechanics in Highway engineering	3	1	-	100	20	20	140	4
4	Civil Engg.	CE230204	Road Safety Engineering	3	1	-	100	20	20	140	4
5	Refer Table – II		Elective II	3	1	-	100	20	20	140	4
6	Civil Engg.	CE230291	Advanced Transportation Lab-II	-	-	3	75		75	150	2
7	Civil Engg.	CE230292	CAD for Transportation Engineering Lab	-	-	3	75		75	150	2
Total				15	5	6	650	100	250	1000	24

L- Lecture

T- Tutorial

P- Practical

ESE- End Semester Exam

CT- Class Test

TA- Teacher's Assessment

Table-II

ELECTIVE- II			
S. No.	Board of Study	Subject Code	Subject
1	Civil Engg.	CE230221	Remote Sensing and GIS and their Application
2	Civil Engg.	CE230222	Traffic Engineering And Management
3	Civil Engg.	CE230223	Ground Improvement Technique
4	Civil Engg.	CE230224	Pavement Management System

Note(1)– 1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a Particular academic session.

Note(2)– Choice of elective course once made for an examination cannot be changed in future examinations.

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M-Tech.^{2nd} Semester (Civil) Specialization in Transportation Engineering

Subject Code	Bridge Engineering	L = 3	T = 1	P = 0	Credits =4
CE230201	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
The objective is to make the student to understand the concept of planning and design of RCC Bridges, Steel Bridges and their Foundations. Design of Bearing for steel and concrete structures are also explained.	On successful completion of the course, the student will be able to: CO1: to understand the basic components of bridges. CO2: to understand the design of RCC bridges. CO3: to understand the design of Steel bridges. CO4: to understand the design of Bridge foundations. CO5: to understand the design of bearings.

UNIT-I: INTRODUCTION

CO-1

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 backfill and on the abutment.

[8Hrs]

UNIT-II: DESIGN OF RCC BRIDGES

CO-2

Design of RC bridges, slab culvert, box culvert, pipe culvert, T-beam bridge, superstructure, 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 pre-stressed concrete T-beam bridge superstructure.

[8Hrs]

UNIT-III: DESIGN OF STEEL BRIDGES

CO-3

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.

[8Hrs]

UNIT-IV: DESIGN OF BRIDGE FOUNDATIONS

CO-4

Foundations, types, general design criteria on design of well and pile foundations for piers and abutments. Pier, abutment and wing walls, types of piers, forces on piers, stability, abutments, bridge code provisions for abutments, wing walls, and design examples.

[8Hrs]

UNIT-V: DESIGN OF BEARINGS

CO-5

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.

[8Hrs]

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CE230201	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Essentials of Bridge Engineering	Victor DJ	-	Oxford & IBH Pub Co.
2	Design of Bridge Structures	T.R. Jagdeesh& M.A. Jayaram	2 nd	PHI learning private LTD. New Delhi
3	Steel Structures design and practice	N Subramanian	27 August 2010	Oxford Publications

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Bridge Engineering	S Poonuswamy	2 nd	Tata McGraw Hill Publications
2	Design of Concrete Bridges	Praveen Nagarajan	-	Wiley (25 June 2020)

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SCHEME OF EXAMINATION AND SYLLABUS

M-Tech.2nd Semester (Civil) Specialization in Transportation Engineering

Subject Code	Transportation System Planning	L = 3	T = 1	P = 0	Credits =4
CE230202	ESE	CT	TA	Total	ESE Duration
	100	20	20	40	3 Hours

Course Objective	Course Outcomes
The objective is to make the student to understand the concept of planning of transport system. Design streets and highways that are safe and efficient to move vehicular traffic, accommodate transit, pedestrians and bicyclists with minimal environmental impacts	On successful completion of the course, the student will be able to: CO1: To understand the status of transport system. CO2: To learn about inventories and simulation modeling. CO3: To understand the four stage modeling process. CO4: To learn about advance travel forecasting. CO5: To able to understand the concept of land use transport.

UNIT-I: TRANSPORTATION SYSTEM STATUS

CO-1

Status of existing Transportation System – Systems Approach to Transport Planning - Interdependence of the Landuse and Traffic – Stages in Transportation Planning – Transport System and Planning Considerations. [8Hrs]

UNIT-II: INVENTORIES AND SIMULATION MODELING

CO-2

Concepts of Zoning, Transportation Surveys, Inventory of Transport and other activities, Travel Forecasting Process, Basics of Systems Simulation Modeling, Application in Travel Forecasting, Critical issues in Travel forecasting. [8Hrs]

UNIT-III: FOUR STAGE MODELING PROCESS

CO-3

Conventional and Four Stage Modeling Process – Trip Generation Models – Trip Distribution Models and Calibration – Methods of Trip Assignment Models –Multi Modal Trip Assignment – Mode Choiceand Modal Split Models. [8Hrs]

UNIT-IV: ADVANCED TRAVEL FORECASTING

CO-4

Advanced Travel Demand Forecasting Methods, Activity Based Modeling, Comparison of Conventional and Activity Based Modeling –Integration of Systems Simulation Modeling and Transportation Network Planning for Sustainability. [8Hrs]

UNIT-V: LAND USE TRANSPORT

CO-5

Accessibility Measures and Basic Theories – Lowry Derivatives Model- Garin Model –Approach and Simulation Modeling in LUT Model - Multimodal Transportation Planning. [8Hrs]

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	100	20	20	40	3 Hours

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Traffic Engineering and Transport planning	Dr. L. R. Kadiyali	Ninth	Khanna Publishers,
2	Transportation Engineering and Planning	Papacostas C.S., Prevedouros,	Third	Prentice Hall of India, New Delhi
3	Transport Planning and Traffic Engineering	O'Flaherty C.A,	First	Elsevier Publications, New Delhi

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Transportation Engineering: An Introduction	John Khisty C, Kent Lall B	Third	Prentice Hall of India, New Delhi
2	"Transportation Planning Hand Book	John D. Edwards (Edr.)	Second	Institute of Transportation Engineers, Prentice Hall Inc., Washington DC, USA

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M-Tech.^{2nd} Semester (Civil) Specialization in Transportation Engineering

Subject Code	Advanced Soil Mechanics in Highway engineering	L = 3	T = 1	P = 0	Credits =4
CE230203	ESE	CT	TA	Total	ESE Duration
	100	20	20	40	3 Hours

Course Objective	Course Outcomes
This course will enable students to: Understand the properties and behavior as a highway material under the application of wheel loads, different properties of soil like shear strength of soil and stability of slopes when used as sub grade soil and embankment fills or cut slopes, permeability characteristics of soils to design proper drainage system and various investigations and design proper drainage system.	After studying this course, students will be able to: CO1: Analyse the wheel load effects on pavement materials CO2: Evaluate and compare the shear strength of soil and stability of slopes when used as pavement component CO3: Evaluate and compare the bearing capacity of soil and to understand about stability of slopes. CO4: Understand the effect of earth pressure, submergence and seepage of soil. CO5: Propose soil stabilization techniques for highway construction using locally available materials.

UNIT-I: CLASSIFICATION OF SOILS

CO-1

IS Classification, AASHTO Classifications, CAA Classifications. Introduction to Geotechnical Investigations, different methods of investigation, trial pits, rotary drilling, percussion drilling, geophysical methods, Introduction to rock engineering, core recovery, Rock quality designation, joint condition, joint orientation Rock Mass Rating, crushing strength, point load index, rock durability test, pressure meter test, percolation tests.

[8Hrs]

UNIT-II: COMPACTION

CO-2

Theory of compaction, factors affecting compaction, effect of compaction on soil, properties, measurement of field compaction and field methods of compaction and control. CBR and group index: Laboratory and field determination of CBR value, effect of soaking, modules of sub-grade reaction.

[8Hrs]

UNIT-III: BEARING CAPACITY

CO-3

Skempton's analysis, Plate Load Test, penetration tests, General bearing capacity equation, effect of watertable on bearing capacity, Stability of slopes: Types of slope failure, Bishop's slope stability analysis, Stability number.

[8Hrs]

UNIT-IV: EARTH PRESSURES

CO-4

Classical theories, effect of submergence and seepage.

[8Hrs]

UNIT-V: SOIL STABILIZATION

CO-5

Mechanics of stabilization, Mechanical, Electrical, cement, lime, Bitumen and Chemical Stabilization,

DRAINAGE: Vertical and sand drains, Surface and sub-surface drainage for highways, Drainage for Hill roads.

[8Hrs]

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CE230203	ESE	CT	TA	Total	ESE Duration
	100	20	20	40	3 Hours

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	“Basic and Applied soil Mechanics”	Gopal Ranjan, ASR Rao	Third	New Age International Publishers.
2	“Soil Mechanics & Foundation Engg”	Dr. B.C. Punmia, Arun Kumar Jain	Sixteenth	Laxmi Publications (P) Ltd,
3	“Soil Mechanics & Foundation Engg” –	K.R. Arora	seventh	Standard Publishers Distributors.

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	“Highway Engineering”	Khanna and Justo	Tenth	Nem Chand
2	Soil Mechanics and Foundation Engineering	S K Garg	fourth	Khanna Publishers

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M-Tech.2nd Semester (Civil) Specialization in Transportation Engineering

Subject Code	Road Safety Engineering	L = 3	T = 1	P = 0	Credits = 4
CE230204	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
The objective is to give exposure about the needs for road safety and identification of various road Factors contributing to road crashes. Exposing students about road crash data collection Procedure and its analysis.	On successful completion of the course, the student will be able to: CO1: To investigate & determine the collective factors & remedies of accident involved. CO2: Understand the importance of multidisciplinary approach to planning for Road safety and rehabilitation. CO3: Interpretation and Analysis of Crash Data. CO4: Understand Stages and Steps of Road Safety Audits. CO5: To design & planning various road geometrics and also able to better planning for Accident prevention.

UNIT-I: INTRODUCTION TO SAFETY

CO-1

Road accidents, Trends, causes, Collision and Condition diagrams, Highway safety, human factors, vehicle factors, [8Hrs]

UNIT-II: ROAD SAFETY MANAGEMENT SYSTEM

CO-2

Multi-causal dynamic systems approach to safety, crash vs accident, road safety improvement strategies, elements of a road safety plan, Safety Data Needs. [8Hrs]

UNIT-III: STATISTICAL INTERPRETATION AND ANALYSIS OF CRASH DATA

CO-3

Before-after methods in crash analysis, Advanced statistical methods, Black Spot Identification & Investigations, Case Studies. [8Hrs]

UNIT-IV: ROAD SAFETY AUDITS

CO-4

Key elements of a road safety audit, Road Safety Audits & Investigations, Crash investigation and analysis, Describe methods for identifying hazardous road locations, Case Studies. [8Hrs]

UNIT-V: CRASH RECONSTRUCTION

CO-5

Describe the basic information that can be obtained from the roadway surface, Understand basic physics related to crash reconstruction, speed for various skid, friction, drag, and acceleration scenarios, variables involved in jump and flip crashes, variables involved in pedestrian crashes, Case Studies. Accident prevention by better planning, Accident prevention by better design of roads, Crash Countermeasures, Highway operation and accident control measures, Highway Safety Measures during construction, Highway geometry and safety. [8Hrs]

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Subject Code	Road Safety Engineering	L = 3	T = 1	P = 0	Credits = 4
CE230204	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	The Traffic Safety Toolbox: A Primer on Traffic Safety ITE, 1999	Institute of Transportation Engineers (ITE)	1 st	Washington, D.C.: Institute of Transportation Engineers, 1999.
2	Safer Roads: A Guide to Road Safety Engineering.	Ogden, K.W.	1 st	Aldershot, England: Ashgate, 2004.

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Observational Before-After Studies in Road Safety	Ezra Hauer	4 th	U.K. : Emerald Group Pub.2008
2	Traffic Collision Investigation	J. Stannard Baker	-	Northwestern University Center for Public Safety, 2002
3	The Handbook of Road Safety Measures.	Rune Elvik and TrulsVaa	2 nd	Elsevier, 2004.

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M-Tech.2nd Semester (Civil) Specialization in Transportation Engineering

Subject Code	Elective-II: Remote Sensing and GIS and their Application	L = 3	T = 1	P = 0	Credits = 4
CE230221	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
This course aims at introducing concept, principles and applications of Remote Sensing (RS), RS Sensors and Geographic Information Systems (GIS). Course also aims to develop the skill of using software and other tools of RS and GIS in students.	On successful completion of the course, the student will be able to: CO1: Understand the principles of aerial and satellite remote sensing. Able to comprehend the energy interactions with earth surface features. CO2: Understand the basic concept of GIS and its applications know different types of data representation in GIS. CO3: Illustrate spatial features in GIS and understand the map projections and coordinates systems. CO4: Apply knowledge of GIS software in various applications i.e. Highway and Railway Alignment etc. CO5: Apply knowledge of GIS and understand the integration of GIS, GPS and Remote Sensing.

UNIT-I: INTRODUCTION TO REMOTE SENSING

CO-1

Definition – Components of Remote Sensing – Energy, Sensor, Interacting Body – Active and Passive Remote Sensing – Platforms – Aerial and Space Platforms – Balloons, Helicopters, Aircraft and Satellites – Electromagnetic Radiation – EMR Spectrum.

[8Hrs]

UNIT-II: INTRODUCTION TO GIS

CO-2

Basic Concept and Components, Hardware, Software, Data Spatial and non-spatial, Geo-referencing- Map-Projection-Types of Projection-Simple Analysis – Data retrieval and querying.

[8Hrs]

UNIT-III: DATA STRUCTURES AND ANALYSIS

CO-3

Database – Raster and Vector data structures – Data storage – Run length, Chain and Block coding – Vector data storage – Topology – GIS Modelling - Raster and Vector data analysis – Buffering and overlaying techniques – Network Analysis – Spatial Analysis.

[8Hrs]

UNIT-IV: BASIC APPLICATIONS IN TRANSPORTATION

CO-4

Highway and Railway Alignment, location of transport terminals and roadside facilities, bus stops – Route optimization – Bus route rationalization – Accident analysis – Applications of Aerial Photography and Satellite Imageries.

[8Hrs]

UNIT-V: ADVANCED APPLICATIONS

CO-5

GIS as an integration technology, Integration of GIS, GPS and Remote Sensing Techniques, Advanced Traveler Information System (ATIS), Automatic Vehicle Location System (AVLS).

[8Hrs]

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CE230221	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	"Principles of GIS for Land Resources Assessment"	Burrough P.A		Oxford Publication, 1994.
2	"Remote Sensing and Image Interpretation"	Anji Reddy	7th	John Wiley and Sons Inc. New York, 1987.

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	"Remote Sensing Applications"	M.G. Srinivas	-	Narosa Publishing House, 2001.
2	Geographical Information System – An Introduction,	Jeffrey Star and John Ester	-	Prentice Hall Inc., Englewood Cliffe, 1990.
3	Basic Readings in GIS	Marble, D.F, Calkins, H.W and Penquest	-	Speed System Ltd., New York, 1984.

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Subject Code	Elective-II: Traffic Engineering and Management	L = 3	T = 1	P = 0	Credits = 4
CE230222	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
The overall aim of the course is to provide fundamental knowledge of traffic flow theory and its application methods for capacity analysis, design, management, operation and selection of control method for road traffic facilities with regard to traffic performance and safety.	On successful completion of the course, the student will be able to: CO1: Understand the fundamental traffic flow theories and identify basic traffic variables and their relationships including speed, density and flow CO2: Analyze a variety of traffic facilities and evaluate capacity and level of service (LOS) CO3: Design signalized intersections including isolated, coordinated and roundabouts. CO4: Assess, evaluate and justify methods of traffic management and control. CO5: Understand the use of advanced simulation methods for the analysis of traffic systems and software tools for the design of traffic control strategies.

UNIT-I: TRAFFIC CHARACTERISTICS

CO-1

Physical, Physiological, Psychological, Environmental Characteristics, Traffic Stream Characteristics, Vehicle Characteristics, Static and Dynamic, Urban Road and Road Characteristics – Geometric Design, An Overview.

[8Hrs]

UNIT-II: SURVEYS AND STUDIES IN TRAFFIC ENGINEERING

CO-2

Conventional and Modern Methods of Traffic Survey and Studies – Volume and Capacity – Headway concepts and applications – Speed and Delay – Origin and Destination, Parking, Accident – Level of Services (LoS).

[8Hrs]

UNIT-III: DESIGN OF TRANSPORT INFRASTRUCTURE

CO-3

Sight Distance, Design of Cycle Tracks, Pedestrian Facilities, Parking Facilities – On Street, Off Street Multi level Street Lighting,

[8Hrs]

UNIT-IV: INTERSECTION DESIGN

CO-4

Design of Intersection– at grade intersection– Uncontrolled, Channelization, Rotary, and Traffic Signal Control, Signal Co-ordination, Grade Separated Intersection, Types and Design,

[8Hrs]

UNIT-V: TRAFFIC OPERATION AND MANAGEMENT

CO-5

Traffic Sign, Road Markings, Traffic Control Aids, Street furniture, Road Arboriculture – Traffic Regulation, Cost Effective Management Measures – Traffic Systems Management and Travel Demand Management - Congestion Management, Traffic Calming and Pricing.

[8Hrs]

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Subject Code	Elective-II: Traffic Engineering and Management	L = 3	T = 1	P = 0	Credits = 4
CE230222	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Traffic Engineering and Transport Planning	Kadiyali, L.R.	Seventh	Khanna Publishers, Delhi, 2002.
2	Traffic and Highway Engineering	Nicholas T.Garber, Lester A Hoel	Revised Second Edition	ITP, California, USA, 1999

ReferenceBooks:

S. No.	Title	Authors	Edition	Publisher
1	Fundamentals of Traffic Engineering	Wolfgang S. Homburger et.al.	15th Edition	Institute of Transportation Studies, University of California, Berkely, 2001
2	An Introduction to Traffic Engineering	Thomas Curinan	Fourth	A Manual for Data Collection and Analysis, Books Cole, UK, 2001

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Subject Code	Elective-II: Ground Improvement Techniques	L = 3	T = 1	P = 0	Credits = 4
CE230223	ESE	CT	TA	Total	ESE Duration
	100	20	20	40	3 Hours

Course Objective	Course Outcomes
This course will enable students to understand the need and methods of ground improvement techniques used in modern days for different types of soils.	After studying this course, students will be able to: CO1: Analyse the need for ground improvement in weak and soft soils with likely modifications to improve their performance. CO2: Decide on suitable dewatering method in soils to improve their performance as highway material. CO3: Apply appropriate soil strengthening techniques by stabilization. CO4: To study about soil reinforcement techniques. CO5: To understand the environmental aspect for ground improvement and case histories.

UNIT-I:

Need of ground improvement; Shallow compaction, Deep compaction,

CO-1

[8Hrs]

UNIT-II:

Preloading, Drainage, Vibro-floatation, Sand drains and geo-synthetic drains,

CO-2

[8Hrs]

UNIT-III:

Mechanical stabilization; Chemical stabilization; Thermal improvement methods,

CO-3

[8Hrs]

UNIT-IV:

Stone columns, Grouting, Geo-synthetics and other soil reinforcement methods,

CO-4

[8Hrs]

UNIT-V:

Soil nailing; Improvement by confinement; Effect of environment on soil properties; Case histories,

CO-5

[8Hrs]

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Ground Improvement Techniques	Purushotham Raj	First	Laxmi Publications, New Delhi
2	Practice and Design of Highway Engineering,	Sharma.S.K., Principles,	second	S.Chand& Co. New Delhi,1985.

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M-Tech.2nd Semester (Civil) Specialization in Transportation Engineering

Subject Code	Elective-II: Ground Improvement Techniques	L = 3	T = 1	P = 0	Credits = 4
CE230223	ESE	CT	TA	Total	ESE Duration
	100	20	20	40	3 Hours

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Principles of Ground Modification,	Hausmann, M.R., Engineering	Second	McGraw – Hill International Editions, 1990
2	, Earth Reinforcement and Soil Structures,	Jones C. J. F. P	Second	Butterworths, London

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Shri Shankaracharya Technical Campus,

Shri Shankaracharya Group of Institutions

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SCHEME OF EXAMINATION AND SYLLABUS

M-Tech.^{2nd} Semester (Civil) Specialization in Transportation Engineering

Subject Code	Elective-II: Pavement Management System	L = 3	T = 1	P = 0	Credits = 4
CE230224	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
This course will enable students to understand the need and methods of pavement management system used in modern days.	After studying this course, students will be able to: CO1: To understand the pavement management process in details. CO2: Student must understand about the evaluation and performance pavements. CO3: To understand the pavement design strategies. CO4: To understand the performance prediction models. CO5: students must understand maintenance and rehabilitation techniques of rigid and flexible pavements.

UNIT- I PAVEMENT MANAGEMENT PROCESS

CO1

Historical background, General nature and applicability of systems methodology, Basic component of pavement management system, Network and project level of PMS, PMS Functions, Planning of pavement investments, [8Hrs]

UNIT – II EVALUATION AND PERFORMANCE

CO2

General concepts of economical and functional evaluation, evaluation of pavement performance, evaluation of structural capacity, pavement distresses, condition surveys, safety evaluation, [8Hrs]

UNIT – III DESIGN STRATEGIES

CO3

Framework for pavement design, design objectives and constraints, basic structural response models, characteristics of physical design inputs, generating alternative pavement design, economic evaluation of alternative design, analysis of alternative design strategies, selection of optimal design strategy. [8Hrs]

UNIT – IV PERFORMANCE PREDICTION MODELS

CO4

Techniques for developing prediction models, AASHO, CRRRI and HDM models, computer applications, identification of alternatives, deterioration modeling, priority programming methods. [8Hrs]

UNIT – V REHABILITATION

CO5

Repair of pavement defects, maintenance of flexible and rigid pavements, bituminous and cement concrete overlays, system analysis. [8Hrs]

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M-Tech.^{2nd} Semester (Civil) Specialization in Transportation Engineering

Subject Code	Elective-II: Pavement Management System	L = 3	T = 1	P = 0	Credits = 4
CE230224	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Modern Pavement Management	Ralph Hass, W. Ronald and John Zaniewski	Second	Krieger Publishing Company
2	Pavement management for airports, roads and parking lots	M.Y. Shahin,	Second	Chapman & Hall, 1994

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Pavement and Surfacing for highways and airports	M. Sargious	Second	Elsevier Science Ltd

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SCHEME OF EXAMINATION AND SYLLABUS

M-Tech.^{2nd} Semester (Civil) Specialization in Transportation Engineering

Subject Code	Advanced Transportation - II Lab	L = 0	T = 0	P = 3	Credits = 2
CE230291	ESE	CT	TA	Total	ESE Duration
	75	-	75	150	3 Hours

Experiments to be performed (Minimum 10 experiments to be performed)

1. Determination of liquid limit, plastic limit, soil classification (dry and wet), maximum dry density and moisture content.
2. CBR test on different types of Soil.
3. Tests on Bitumen: viscosity, ductility and elastic recovery, specific gravity..
4. Tests on Bitumen: measuring apparent viscosity of bitumen using SC-4-27 spindle in a rotational viscometer from 60 to 150 °C in increments of 10°C at different shear rates.
5. Tests on Soils: field density using sand replacement method, nuclear density gauge, rapid moisture meter.
6. Tests on Bituminous Mixes: stripping value of aggregate, determination of Gmm of given bituminous mixtures using large capacity vacuum pycnometer, Marshall mix design.
7. Tests on Bituminous Mixes: bitumen content and gradation using centrifuge extract or and NCAT ignition oven.
8. Tests on Bituminous Mixes: roller compaction and permanent deformation using wheel tracking equipment.
9. Field Evaluation: skid resistance using British pendulum, texture depth using sand patch test, stiffness of unbound pavement layers using Geo Gauge.
10. Field Evaluation: pavement condition rating, unevenness using MERLIN and Dipstick.
11. Field Evaluation: Dynamic Cone Penetrometer, Clegg Impact Test, determination of modulus and rebound deflection using Portable Falling Weight Deflectometer (Loadman).

Equipment/Machines/Instruments/Tools/Software Required:

1. Casagrande's Apparatus.
2. Plastic Limit Apparatus.
3. Hot Air Oven.
4. CBR Apparatus.
5. Ductility Testing Machine..
6. Rotational Rheometer.
7. Sand Replacement Equipment.
8. Nuclear Density Gauge.
9. Rapid Moisture Meter.
10. Vacuum Pycnometer.
11. Marshall Stability Equipment.
12. Centrifuge Extractor.
13. NCAT ignition oven.
14. Wheel Tracking Equipment.
15. British Pendulum.
16. Geo Gauge.

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M-Tech.^{2nd} Semester (Civil) Specialization in Transportation Engineering

Subject Code	Advanced Transportation - II Lab	L = 0	T = 0	P = 3	Credits = 2
CE230291	ESE	CT	TA	Total	ESE Duration
	75	-	75	150	3 Hours

17. MERLIN and Dipstick.
18. Dynamic Cone Penetrometer.
19. Clegg Impact Soil Tester.
20. Portable Falling Weight Deflectometer.

Recommended Books:

1. Highway Engineering – Justo & Khanna (Khanna Publishers)
2. Highway Engineering Manual – Justo & Khanna (Khanna Publishers)
3. Relevant IS, IRC, ASTM Codes.

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SCHEME OF EXAMINATION AND SYLLABUS

M-Tech.2nd Semester (Civil) Specialization in Transportation Engineering

Subject Code	CAD for Transportation Engineering Lab	L = 0	T = 0	P = 10	Credits = 5
CE230292	ESE	CT	TA	Total	ESE Duration
	075	-	75	150	3 Hours

Experiments to be performed (Minimum 10 experiments to be performed)

Formulation and evaluation of the following Transportation Projects-

1. Rotary Design
2. Traffic signal Design
3. Multi level/ Surface level Parking Design
4. Public transport route evaluation
5. Transport Planning for a small area
6. Remote Sensing Packages - ArcGIS, GRAM++,
7. Study of Geo- Concept
8. ERDAS Imagine Computer Aided Drafting- DBMS concepts
9. Engineering Data bases- Data entry & Reports
10. Spread sheet concepts-Worksheet calculations in Civil Eng
11. Regression & Matrix Inversion
12. Study of ENVI

Equipment/Machines/Instruments/Tools/Software Required:

1. Automatic traffic counter.
2. Dopplar radar.
3. Road measurement and data acquisition system.
4. Noise level meter.
5. Five gas analyzer.
6. Lux meter.
7. Total station.
8. Softwares such as TRANSYT, CUBE, ARCGIS, Emme/2, Trans CAD and Geomedia

Recommended Books:

1. Highway Engineering – Justo & Khanna (Khanna Publishers)
2. Highway Engineering Manual – Justo & Khanna (Khanna Publishers)
3. Relevant IS, IRC, ASTM Codes.

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