



Shri Rawatpura Sarkar University, Raipur, Chhattisgarh

Faculty of Engineering

Shri Rawatpura Sarkar University, Raipur



Examination Scheme & Syllabus

for

M.Tech.(Highway Engineering)

Semester-III

Outcome Based Education (OBE) and Choice Based Credit System

(CBCS)

(Effective from the Session: 2022-23)



Shri Rawatpura Sarkar University, Raipur, Chhattisgarh

Faculty of Engineering

Two Years M.Tech. Programme

Scheme of Teaching and Examination

M.Tech. Third Semester Highway Engineering

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2022-2023)

S.No.	Course Code	Course Title	Hours / Week			Credits	Maximum Marks			Sem End Exam Duration (Hrs)
			L	T	P		Continuous Evaluation	Sem End Exam	Total	
1	MENHE301T	Traffic Management And Design	3	1	-	4	30	70	100	3
2	MENHE302T	Elective-III	3	1	-	4	30	70	100	3
3	MENHE303P	Technical Paper Writing And Seminar	-	-	4	2	100	-	100	-
4	MENHE304P	Pre-dissertation (Literature Review/ Problem Formulation/ Synopsis)	-	-	20	10	140	60	200	-
Total Contact Hr Per Week: 32			Total Credit: 20			Grand Total Marks:			500	

L: Lecture T: Tutorial P: Practical

Elective-III

S.NO.	Course Title
1	Pavement Management System
2	Environmental Impact Assessment of Transportation Projects
3	Road Safety Engineering



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Course Title	Traffic Management And Design				
Course Code	MENHE301T				
Course Credits	L	T	P	TC	
	3	1	-	4	
Prerequisites	Transportation Engineering-I & II				
Course Objectives	<p>This course will enable students to:</p> <ul style="list-style-type: none"> • Apply the principles of a systems approach to the analysis of risk factors for road traffic injuries. • Discuss the key risk factors for road traffic injuries. • Understand the role of ITS in Dynamic Traffic Management 				
Course Contents	<p>UNIT-I Traffic Impact: Transportation noise: standards, measurements and mitigation strategies. Parking Studies: Statistics and analysis. Fuel Consumption and vehicle operating cost. Vehicular emission and Air quality modelling. Environmental impact assessment</p> <p>UNIT-II Traffic safety: Accident studies, Accident data analysis, Statistical methods for data analysis, Road safety principles and practice, Identification of hazardous locations.</p> <p>UNIT-III Capacity and LOS analysis: Two Lane Highways, Urban Streets, Multilane Highways, Transit systems, Pedestrians and bicycles.</p> <p>UNIT-IV Design of Traffic Facilities: Transit route selection and design, Pedestrians and bicycles facilities, Intersection, roundabout configuration and design, Interchange design, Freeway Operations and design.</p> <p>UNIT-V Traffic Management: Traffic Management Strategies, Traffic Management Techniques, Work zone traffic management, Traffic calming, Congestion studies and Road pricing.</p>				
Course Outcomes	<p>After the completion of course:</p> <ul style="list-style-type: none"> • Explain the factors for road traffic injuries. • Analyze and provide solutions for traffic calming and parking management. • Evaluate the risk factors for road traffic injuries. • Understand the role of ITS in Dynamic Traffic Management. • Apply methods for reducing traffic impacts on communities such as traffic calming strategies, accident reductions and parking management. 				



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Text Books	<ol style="list-style-type: none">1. Fundamentals of Transportation Engineering, C. S. Papacostas and P. D. Prevedouros. Prentice-Hall, New Delhi, 2009.2. Transportation Engineering: An Introduction, C. Jotin Khisty, B. Kent Lall Prentice Hall, 2003.
Reference Books	<ol style="list-style-type: none">1. Traffic and Highway Engineering, N. J. Garber, L. A. Hoel, Cengage Learning, 2008.2. Traffic Engineering and Transportation Planning, L. R Kadiyali. Khanna Publishers, New Delhi, 2008.3. Highway Capacity Manual. Transportation Research Board. National Research Council, Washington, D.C., 2010.4. Principles of Highway Engineering and Traffic Analysis, F. L. Mannering, S. S. Washburn and W. P. Kilareski, Wiley India, 2011.5. Fundamentals of Intelligent Transportation systems planning. M A Chowdhary and A Sadek. Artech House Inc., US, 2003.



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Course Title	Pavement Management System				
Course Code	MENHE302T (Elective-III)				
Course Credits	L	T	P	TC	
	3	1	-	4	
Prerequisites	Transportation Engineering-I & II				
Course Objectives	<p>This course will enable students to:</p> <ul style="list-style-type: none"> • Discuss the need of PMS in planning and maintaining the flexible pavements. • Discuss the performance of pavements, causes of failure, rating methods. • Formulate the development and application of models for pavement management. 				
Course Contents	<p>UNIT-I Introduction: Definition -Components of Pavement Management Systems, Essential features. Pavement Management Levels and functions: Ideal PMS- Network and Project levels of PMS Influence Levels- PMS Functions- Function of Pavement evaluation.</p> <p>UNIT-II Pavement Performance: Serviceability Concept- Development of Serviceability Index-PSI-RCI Roughness- Roughness Components- Evaluation-Equipment- Universal Roughness standard- Techniques-IRI – Application of Roughness Data in Network level and Project Level. Evaluation of Pavement Structural capacity:- Basics- NDT and Analysis— Condition Surveys- Distress-Destructive Structural Analysis- Application in Network and Project Levels-Methods and Equipment- Combined Measures of Pavement Quality-Concept-Methods of developing a combined index-limitations.</p> <p>UNIT-III Evaluation of Pavement Distress and Functional Aspects – Principles- Condition survey- Survey Methodology-Types of Distress-Examples-Equipment-Indexes-Applications of Distress data- Pavement Safety-Components – Evaluation-Basic Concepts of Skid resistance-Methods of measuring skid resistance- Effect of Time ,Traffic and Climate on Skid resistance. Establishing Criteria – Need- Characteristics- effect of changing criteria-examples-Prediction models for pavement deterioration-Need-measures to be predicted-requirements-Basic types of Prediction Models- HDM and other deterioration models. Rehabilitation and Maintenance: Identification of Alternatives-Deterioration Modeling- Priority Programming Methods.</p>				



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	<p>UNIT-IV Expert Systems and Pavement Management: Role of computers in pavement management, applications of expert systems for managing pavements, expert system for pavement evaluation and rehabilitation, knowledge-based expert systems, case studies.</p> <p>UNIT-V Implementation of Pavement Management Systems.-Introduction-major steps-Maintenance Management.</p>
<p>Course Outcomes</p>	<p>After the completion of course:</p> <ul style="list-style-type: none"> • Identify the factors influencing performance of pavements • Carry out structural and functional evaluation of pavements • Explain the use of models for pavement management • Develop a framework for efficient pavement management system. • Discuss the need of application of methods of prioritization and application of innovative methods.
<p>Text Books</p>	<ol style="list-style-type: none"> 1. Pavement Management System' by Ralph Haas and Ronald W. Hudson, McGraw Hill Book Co. 1978 2. Modern Pavement Management by Haas, R.W.R.Hidson and J.P.Zaniewski. Krieger Publishing Company. Malabar, Florida, 1994.
<p>Reference Books</p>	<ol style="list-style-type: none"> 1. Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation, and Renovation by Hudson, W. R., R. Haas and W. Uddin McGraw Hill, Newyork, 1997. 2. Proceedings of North American Conference on Managing Pavement 3. Proceedings of International Conference on Structural Design of Asphalt Pavements NCHRP, TRR and TRB Special Reports. 4. Pavement Analysis and Design by Huang, Yang H. Prentice-Hall, Inc Englewood Cliffs, New Jersey 1993



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Course Title	Environmental Impact Assessment of Transportation Project				
Course Code	MENHE302T (Elective-III)				
Course Credits	L	T	P	TC	
	3	1	-	4	
Prerequisites	Transportation Engineering-I & II				
Course Objectives	<p>This course will enable students to:</p> <ul style="list-style-type: none"> • Explain the concepts of environmental impact assessment and apply in the projects. • List and define various indicators such as terrestrial subsystems, Indicators aquatic subsystems, Socio-economic and able to Select various indicators for EIA studies. • Explain the impacts of transportation related components on environment • Explain and illustrate the methodologies for environmental impact assessment 				
Course Contents	<p>UNIT-I Introduction: Environment and its interaction with human activities Environmental imbalances -Attributes, Impacts, Indicators and Measurements - Concept of Environmental Impact Assessment (EIA), Environmental Impact Statement, Objectives of EIA, Advantages and Limitations of EIA</p> <p>UNIT-II Environmental Indicators - Indicators for climate - Indicators for terrestrial subsystems - Indicators for aquatic subsystems - Selection of indicators - Socio-economic indicators – Basic information - Indicators for economy - Social indicators - Indicators for health and nutrition -Cultural indicators - Selection of indicators.</p> <p>UNIT-III Environmental Impact Assessment For Transportation Projects: Basic Concepts, Objectives, Transportation Related Environmental Impacts – Vehicular Impacts – Safety & Capacity Impacts– Roadway Impacts – Construction Impacts, Environmental Impact Assessment – Environmental Impact Statement, Environment Audit, Typical case studies</p> <p>UNIT-IV Environmental Issues in Industrial Development: On-site and Off-site impacts during various stages of industrial development, Long term climatic changes, Greenhouse effect, Industrial effluents and their impact on natural cycle, Environmental impact of Highways, Mining and Energy development</p> <p>UNIT-V Methodologies for Carrying Environmental Impact Assessment: Overview of Methodologies, Adhoc Checklist, Matrix, Network, Overlays, Benefit Cost Analysis, Choosing a Methodology, Review Criteria.</p>				



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Course Outcomes	<p>After the completion of course:</p> <ul style="list-style-type: none">• Describe the environmental imbalances, indicators and explain the concept of EIA• Identify and describe elements to be affected by the proposed developments and/or likely to cause adverse impacts to the proposed project, including natural and man-made environment;• Identify the negative impacts and propose the provision of infrastructure or mitigation measures• Assess the impacts of various development on environment• Summarise the methodologies for carrying out environmental impact assessment
Text Books	<ol style="list-style-type: none">1. Environmental Impact Analysis, Jain, R.K., Urban, L.V., Stracy, G.S., (1991), Van Nostrand Reinhold Co., New York2. (1996), Environmental Impact Assessment, Rau J.G. and Wooten, D.C., McGraw Hill Pub. Co., New York3. Environmental Impact Assessment, Canter, L.W., (1997), McGraw Hill Pub. Co., New York
Reference Books	<ol style="list-style-type: none">1. Environmental Factors in Urban Planning, Grand Jean, E. Gilgen A. Taylor and Francis Limited, London, 1976.2. UNESCO, (1987), "Methodological Guidelines for the Integrated Environmental Evaluation of Water Resources Development", UNESCO/UNEP, Paris



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Course Title	Road Safety Engineering				
Course Code	MENHE302T (Elective-III)				
Course Credits	L	T	P	TC	
	3	1	-	4	
Prerequisites	Transportation Engineering-I&II				
Course Objectives	<p>This course will enable students to:</p> <ul style="list-style-type: none"> • Analyze the effect of driver characteristics, roadway characteristics, and climatic factors on highway safety. • Plan and design a road safety improvement program. • Analyze accident data and suggest safety measures. • Conduct road safety audit. • Interpret accident data using statistical analysis. 				
Course Contents	<p>UNIT-I Introduction to safety: Road accidents, Trends, causes, Collision and Condition diagrams, Highway safety, human factors, Vehicle factors Road Safety Management System: Multicausal dynamic systems approach to safety, crash vs accident, road safety improvement strategies, elements of a road safety plan, Safety Data Needs.</p> <p>UNIT-II Statistical Interpretation and Analysis of Crash Data: Before-after methods in crash analysis Advanced statistical methods, Black Spot Identification & Investigations, Case Studies.</p> <p>UNIT-III Road Safety Audits: Key elements of a road safety audit, Road Safety Audits & Investigations, Crash investigation and analysis, Describe methods for identifying hazardous road locations, Case Studies.</p> <p>UNIT-IV Crash Reconstruction: 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.</p> <p>UNIT-V Mitigation Measures: 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.</p>				



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Course Outcomes	<p>After the completion of course:</p> <ul style="list-style-type: none">• Analyze the effect of driver characteristics, roadway characteristics, and climatic factors on highway safety.• Plan and design a road safety improvement program.• Analyze accident data and suggest safety measures.• Conduct road safety audit.• Interpret accident data using statistical analysis.
Text Books	<ol style="list-style-type: none">1. Observational Before-After Studies in Road Safety by Ezra Hauer, Pergamon Press, 1997 (reprinted 2002).2. Institute of Transportation Engineers (ITE), the Traffic Safety Toolbox: A Primer on Traffic Safety, ITE, 1999.
Reference Books	<ol style="list-style-type: none">1. Traffic Collision Investigation by J. Stannard Baker, Northwestern University Center for2. Public Safety, 20023. Traffic Control and Road Accident Prevention by Popkess C.A. Chapman and Hall, 19974. The Handbook of Road Safety Measures by Rune Elvik and Truls V, Elsevier, 2004.5. Statistical and Econometric Methods for Transportation Data Analysis by Simon Washington, Matthew K, and Fred Mannering, Chapman & Hall/CRC Press, 2003



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Course Title	Technical Paper Writing And Seminar				
Course Code	MENHE303P				
Course Credits	L	T	P	TC	
	-	-	2	1	
Prerequisites	Nil				
Course Objectives	<p>This course will enable students to:</p> <ul style="list-style-type: none"> • Describe the research process. • Outline the elements of a thesis/dissertation. • Select a research topic of importance to the profession. • Effectively work with their academic advisor and graduate committee. • Develop and follow an appropriate timeline for completion of the thesis/dissertation. • Identify an appropriate theory base for their research. • Develop a conceptual model relevant to their research. 				
Course Contents	<ul style="list-style-type: none"> • Each student will select a topic in the area of Transportation engineering and related area in the state of art area & technical development. • The topic will be decided by the Student, Guide and Departmental research committee. • Each student will make seminar presentation with audio/video aids, for the duration of 45 minutes and seminar work shall be in form of report to be submitted by the students at the end of the semester. • This report copies must be duly signed by guide and Head of Department. Attendance of all students for all seminars is compulsory. • Define the statement of research problem • Literature survey, familiarity with research journals • Broad knowledge off the available techniques to solve the problems • Technical writing skills • Presentation skills 				
Course Outcomes	<p>After the completion of course:</p> <ul style="list-style-type: none"> • Acceptable with minor or no revisions (no further approval required) • Acceptable with major revisions in content or format not acceptable 				



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Reference Books	<ol style="list-style-type: none">1. Student will learn to survey the relevant literature such as books, national/international referred journals and contact resource persons for the selected topic of research.2. Roberts, C. M. (2010). The dissertation journey. Thousand Oaks, CA: Corwin.
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Course Title	Pre-Dissertation (Literature Review/ Problem Formulation/ Synopsis)				
Course Code	MENHE304P				
Course Credits	L	T	P	TC	
	-	-	20	10	
Prerequisites	Nil				
Course Objectives	<p>This course will enable students to:</p> <ul style="list-style-type: none"> • Demonstrate the skills for good presentation and technical report writing skills. • Apply engineering and management principles while executing the project. 				
Course Contents	<ul style="list-style-type: none"> • Each student will select a topic in the area of Transportation engineering and related area in the state of art area & technical development. • Every student will carry out dissertation under the supervision of a Supervisor. • The topic shall be approved by a committee constituted by the Head of the concerned department. • Every student will be required to present two seminar talks, First at the beginning of the Dissertation (Phase-I)to present the scope of the work and to finalize the topic, and second towards the end of the semester, presenting the work carried out by him/her in the semester. • The committee constituted will screen both the presentations and work. • Define the statement of research problem • Literature survey, familiarity with research journals • Broad knowledge off the available techniques to solve the problems • Technical writing skills • Presentation skills 				
Course Outcomes	<p>After the completion of course:</p> <ul style="list-style-type: none"> • Student will learn to survey the relevant literature such as books, national/international referred journals and contact resource persons for the selected topic of research. • Students will be able to use different experimental techniques. • Students will be able to use different software/computational/analytical tools. • Students will be able to design and develop an experimental set up/equipment/test rig. • Students will be able to conduct tests on existing set ups/equipments and draw 				



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	<p>logical conclusions from the results after analyzing them.</p> <ul style="list-style-type: none">• Students will be able to either work in a research environment or in an industrial environment.
Reference Books	<ol style="list-style-type: none">1. Student will learn to survey the relevant literature such as books, national/international referred journals and contact resource persons for the selected topic of research.2. Roberts, C. M. (2010). The dissertation journey. Thousand Oaks, CA: Corwin.