

SYLLABUS

TRANSPORTATION ENGINEERING

Class	M.TECH.	L	T	P	C
Semester/Year	I/I	3	0	0	3
Subject Name	Transportation Systems Planning				
Subject Code	MCETH20S101				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course objective:

1. The main objective of this course is to give broad insight into the different facets of transportation systems, while providing a solid introduction to transportation demand and cost analyses.
2. Covers the key principles governing transportation planning.
3. Covers the key principles governing transportation investment, operations and maintenance.

Course outcomes: At the end of the course, students will be able to:

CO1: Learn the fundamentals of transportation planning.

CO2: Understand the classical methods of urban transportation planning.

CO3: Acquainted with the transportation land use interaction.

CO4: Plan the rural road network.

CO5: Justify the geometric design standards adopted for low volume Roads.

Unit	Syllabus	Periods
UNIT-I	Introduction to transportation systems, Importance of transportation planning, social and economic impacts of transportation.	8
UNIT-II	Transportation system and its environment; transportation planning process, transportation costs, transportation data and its survey, transportation demand.	9
UNIT-III	Supply of transportation, decision making, sequential transportation systems planning: Trip Production, Trip distribution, modal split and traffic assignment.	11
UNIT-IV	Land use transportation planning, Urban Forms, Mobility and Activity Hierarchy, Lowery's model etc.	13
UNIT-V	Travel demand management measures; Case studies.	14

Texts Books:

1. J. de D. Ortuzar and L.G. Willumsen, Modelling Transport, John Wiley and Sons, 2001.
2. C.J. Khisty and B.K. Lall, Transportation Engineering – An Introduction, Prentice Hall of India Pvt. Ltd., 2002.
3. C. S. Papacostas and P. D. Prevedouros, Transportation Engineering and Planning, Prentice Hall of India Pvt. Ltd., 2001.

References books:

1. Hutchinson, B.G., Principles of Urban Transportation Planning, McGraw Hill, N.Y.
2. Morlok, E.K., Introduction to Transportation Engineering and Planning, McGraw Hill, N.Y.
3. Dickey, John. W., Metropolitan Transportation Planning, McGraw Hill, N.Y.
4. William, W. Hay, an Introduction to Transportation Engineering, John Wiley and Sons.

SYLLABUS

TRANSPORTATION ENGINEERING

Class	M.TECH.	L	T	P	C
Semester/Year	I/I	3	0	0	3
Subject Name	Computational Methods in Transportation Engineering				
Subject Code	MCETH20S102				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives:		
<ol style="list-style-type: none"> To be introduced to systems approach. To learn the fundamentals of simulation and the GPSS language. To be introduced to advanced computational techniques such as GA and ANN. 		
Course Outcomes: At the end of the course, students will be able to:		
CO1: Upon completion of this course, the students should have: a working knowledge of simulation And GPSS programming.		
CO2: A good understanding of GA applications.		
CO3: The ability to apply ANN.		
CO4: Test the hypothesis and assess the error involved in the data analysis.		
CO5: Use software tools like MATLAB, MINITAB etc., for analysis of traffic data and also use curve fitting techniques for predicting the performance trends.		
Unit	Syllabus	Periods
UNIT-I	Introduction -Basic Concepts, Computation Problems and Tools in Transportation Engineering, Software in Transportation Engineering: Computer Architecture, Development Approaches, Applications, and Benchmarking.	8
UNIT-II	Programming Concepts: Programming in Visual C++ using object-oriented programming concepts, Programming in GIS Environment, Data Structures and Complexity Analysis, Expert Systems and their development, Development of computer programs for geometric and pavement design based on OOP Concepts.	9
UNIT-III	Data Collection, Modeling and Database Design for Transportation- Transportation data and their sources, collection process, Database development process, Transportation Data models, Data Modeling using UML, Linear referencing methods, Advanced dynamic segmentation functions, Database Models for Transportation Planning, Pavement Management, Public Transportation, Incident Management, Logistics and Navigation Services etc., Case Studies.	11

UNIT-IV	Geometrical Modelling of Highway Networks- Introduction, Geometric modelling of highways, Road Alignment Models, Designing in 2D using alignments, Designing vertical profiles, modelling the existing terrain using Surfaces, Designing roads corridors in 3D, Geo informatics applications for Geometrical Modelling of roads.	13
UNIT-V	Optimization for Network Flows- Modelling network flows on network, shortest path algorithms, nearest neighbour algorithms, minimum spanning tree algorithms and algorithms for static and dynamic traffic assignment, Vehicle routing problem, Use of evolutionary algorithms for solving flow problems.	14

Text book:

1. Averill M. Law, Simulation Modeling and Analysis, Tata McGraw Hill.
2. Benny Raphael and Ian F.C. Smith, Engineering Informatics: Fundamentals of Computer Aided Engineering, Wiley & son's.

References:

1. Harvey J. Miller and Shih-Lung Shaw, Geographic Information Systems for Transportation: Principles and Applications, Oxford University Press.
2. J. Allison Butler, Designing Geo databases for Transportation, ESRI Press.

SYLLABUS

TRANSPORTATION ENGINEERING

Class	M.TECH.	L	T	P	C
Semester/Year	I/I	3	0	0	3
Subject Name	Railway Track Management System				
Subject Code	MCETH20S103				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course objective:

1. The course will be an introduction to the railway engineering and rail infrastructures and their impacts on the society and on the environment.
2. The course will focus on alignment, track geometry, superstructure and substructure components, switches, Railway planning and capacity.
3. The course will focus on electro technical installations (power supply and signaling control system) together with operation and maintenance of railway.

Course outcome: At the end of the course, students will be able to:

CO1: Fundamental principles for railway engineering.

CO2: Basic track geometry parameters.

CO3: Railway superstructure and substructure components.

CO4: Apply knowledge of mathematics, science, and engineering, Demonstrate knowledge of contemporary issues.

CO5: Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Unit	Syllabus	Periods
UNIT-I	Development and importance of rail transportation. Advanced aspects of traffic surveys and route location.	8
UNIT-II	Modern track Construction and renewal of tracks; Rail-wheel interaction.	9
UNIT-III	High speed track - current status, construction parameters, monitoring, maintenance, other requisites. Track Stresses, Standards and Rehabilitation; Special tracks.	11
UNIT-IV	Maintenance of track - manual, mechanized and Track Management System.	13

UNIT-V	Traffic operations and control; Urban rail transit; Rail terminal design; Integration of rail and road transport.	14
Text books: 1. Agarwal, MM, Railway Engineering, CBS, Delhi. 2. Rangwala, Railway Engineering, Charotar Publishing House.		
References books: 1. J. S. Mundrey, Railway Track Engineering, Tata McGraw Hill Education. 2. S. Chandra & M.M. Agarwal, Railway Engineering, Oxford University Press. 3. Saxena and Arora, Railway Engineering, Dhanpat Rai and Sons, Delhi.		

SYLLABUS

TRANSPORTATION ENGINEERING

Class		M.TECH.	L	T	P	C
Semester/Year		I/I	3	0	0	3
Subject Name		Traffic and Transportation Structures				
Subject Code		MCETH20S104				
Paper	English	English				
	Hindi					
Max. Marks		100				

Course Objectives:

1. To be aware of various methods of collecting traffic data.
2. To understand the basics of highway planning and design, and workout problems in.
3. Design of road geometrics to learn the importance of road safety.

Course Outcomes:

Upon completion of this course, the students should be able to:

CO1: Understand the concept of capacity

CO2: Conduct traffic surveys.

CO3: Design the links and intersections.

CO4: Design the components of a bridge following the specifications For highways.

CO5: Get the knowledge of bridge bearings, their installation and Maintenance aspects to withstand vehicular loads.

Unit	Syllabus	Periods
UNIT-I	Introduction to traffic and transportation structures; Bridges, Flyovers, Tunnels, Retaining Walls, Docks, Harbours, Airport Structures.	8
UNIT-II	Earth Retaining Structures: lateral earth pressure, retaining wall types, analysis of Backfilled walls and in-situ walls, stability of wall and base, settlements due to excavation, strut and anchor systems, diaphragm walls: slurry control, concrete technology, instrumentation for deep excavation.	9
UNIT-III	Construction and Design of Tunnels: Site investigations, Geotechnical consideration, Design of tunnels, Construction and excavation methods of Soft ground tunnels and rock tunnels, Micro tunneling techniques, Ventilation and Safety.	11
UNIT-IV	Design of Harbours and Docks: Harbours: Requirements, Classification, Location and Design Principles – Harbour Layout and Terminal Facilities, Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage, Inland Water Transport.	13
UNIT-V	Travel demand management measures; Case studies.	5

Text books:

1. D.Johnson Victor, “Essentials of bridge Engineering”- Oxford, IBH publishing company.
2. Ponnuswamy, “Bridge Engineering”-McGraw Hill Publication, 1989.
3. Vazirani Ratwani & M.G.Aswani, “Design of Concrete Bridges” - Khanna Publishers, New Delhi.

References:

1. Narsimha Rao, Bridges and Flyovers, International Book House, Delhi
 2. Paul Andersen, Statically Indeterminate Structures, Ronald Press Company, New York.
 3. Ponnuswamy S., Bridge Engineering, Tata McGraw-Hill Publishing Company, 1990.
 4. D. Johnson Victor, Essentials of bridge Engineering, Oxford & IBH Publishing Co. Pvt. Ltd.
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SYLLABUS
TRANSPORTATION ENGINEERING

Class	M.TECH.	L	T	P	C
Semester/Year	I/I	3	0	0	3
Subject Name	Transportation Economics				
Subject Code	MCETH20S105				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives:

1. Providing a solid introduction to transportation demand and cost analysis.
2. Finding specific transportation mode, but will use the various modes to apply the theoretical and analytical concepts presented in the lectures and readings.
3. Key principles governing transportation planning, investment, operations and maintenance. It introduces the macroeconomic concepts central to transportation systems.

Course Outcomes:

On completion of this course, the students will be able to :

CO1: Understanding the issues & challenges in the Transportation Sector.

CO2: To develop skills required for Transport planning & formulation.

CO3: Understand optimization techniques for Transport Planning & Pricing.

CO4: On completion of this course, Students would be able to prepare Highway plans, Land use planning and development models.

CO5: They will be able to carry out economic and financial analysis Of highway projects.

Unit	Syllabus	Periods
UNIT-I	Introduction to transport economics, Economic theory, transport as an economic activity.	8
UNIT-II	Demand forecasting methods, factors influencing transport demand, direct and cross- price, elasticities of demand, factors that cause shifts in demand function. Direct and External costs of transport, concept of generalized costs, social aspects of transport, joint and common costs of infrastructure, short-term and long-term costs of supply, Congestion costs, External costs. Survey, transportation demand.	9
UNIT-III	Pricing of Transport Services, The marginal cost pricing rule, Efficient pricing, cost complexities and cost recovery, Peak-load pricing, Second-best pricing, Transport subsidies, Price discrimination, Congestion pricing.	11

UNIT-IV	Regulation of Supply of Transport Capacity, Command and control type of regulation, fiscal measures such as road pricing and environmental taxation, Safety and economic regulations in the context of transport services provided by public, issues of social, geographical and temporal equity.	13
UNIT-V	Appraisal and Evaluation of Transport Projects: Feasibility and evaluation, cost, impacts and performance levels, evaluation of alternatives, analysis techniques, cost-benefit analysis, social and financial benefits, valuation of time, measures of land value and consumer benefits from transportation projects, prioritization of projects, multi-criteria decision assessment.	14
Text books: 1. Kadiyali L.R. “Traffic Engineering and Transport Planning”-Khanna Publishers, New Delhi. 2. Jotin Chisty.C and Kent Lall B “Transportation Engineering An Introduction” - PHI, New Delhi. 3. Prasanna Chandra “Financial Management” - Tata McGraw, New Delhi.		
References: 1. André De Palma, Robin Lindsey and Emile Quine, Handbook of Transport Economics, Edward Elgar Publication. 2. Patrick McCarthy, Transportation Economics: Theory and Practice, Wiley-Blackwell Publication. 3. Kenneth Small and Erik Verhoef, The Economics of Urban Transportation, Routledge Publication.		

SYLLABUS
TRANSPORTATION ENGINEERING

Class		M.TECH.	L	T	P	C
Semester/Year		I/I	3	0	0	3
Subject Name		Engineering and Entrepreneurship				
Subject Code		MCETH20S106				
Paper	English	English				
	Hindi					
Max. Marks		100				

Course Objectives:

1. Explore the entrepreneurial mindset and culture that has been developing in companies of all sizes and industries.
2. Examine the entrepreneurial process from the generation of creative ideas to exploring feasibility to creation of an enterprise for implementation of the ideas.
3. Experience the dynamics of participating on a business team and the power inherent in a team relative to individual effort.

Course Outcomes: At the end of the course, students will be able to:

CO1: Demonstrate knowledge of various surveying methods. Conducted chain survey. Conduct a compass survey.

CO2: Conduct levelling survey and be able to do RL calculations.

CO3: Demonstrate knowledge of properties of various building Materials.

CO4: For engineers who start companies soon after graduation.

CO5: entrepreneurship education gives them solid experience in product Design and development.

Unit	Syllabus	Periods
UNIT-I	Definition, requirements to be an entrepreneur, Entrepreneur and Manager, growth of entrepreneurship in India, Rural and Urban entrepreneurship.	8
UNIT-II	The Greatest Salesman in the World, The Tao of Warren Buffett, Personal Freedom, Creating Affluence, Creativity, Habits of Highly Effective People, Goals (HW) How to Win Friends & Influence People, Success, Yes! Attitude, Own Your Own Corporation, The Unwritten Laws of Business, Leadership, Developing the Leader qualities,	9
UNIT-III	Types of Enterprises and Ownership Structure: Small Scale, medium scale and large-scale enterprises, role of small enterprises in economic development; proprietorship, partnership, Ltd. companies and co-operatives: their formation, capital structure and source of finance.	11

UNIT-IV	Identification and selection of projects; The ABC's of Writing Winning Business Plans, project report: contents and formulation, concept of project evaluation, methods of project evaluation: internal rate of return method and net present value method.	13
UNIT-V	Management of Enterprises: objectives and functions of management, scientific management, general and strategic management; Get Everyone In Your Boat Rowing in the Right Direction, Negotiation Skills introduction to human resource management: planning, job analysis, Training, recruitment and selection, etc.; marketing and organizational dimension of enterprises;	14

Text books:

1. Business, Harper Collins Publishers, Inc., 2004.
2. Goldberg, David E., and the Entrepreneurial Engineer (New York: John Wiley & Sons, Inc., 2006).
3. Collins, Jim, And Good To Great: Why Some Companies Make the Leap... and Others Don't (New York: Harper Business, HarperCollins Publishers, Inc., 2001).
4. Clason, George S., The Richest Man in Babylon (New York: Signet, 1998).

References:

1. K. Uchino, Entrepreneurship for Engineers, CRC Press.
2. Ram Chandran, 'Entrepreneurial Development', Tata McGraw Hill, New Delhi.
3. Vasant Desai, 'Project Management and Entrepreneurship', Himalayan Publishing House, Mumbai, 2002.
4. Boylan, Bob, Get Everyone in Your Boat Rowing in the Same Direction (New York: Barnes and Noble Books, 1995).
5. Chopra, Deepak, M.D. Creating Affluence: Wealth Consciousness in the Field of All Possibilities (California: New World Library, 1993).

SYLLABUS

TRANSPORTATION ENGINEERING

Class	M.TECH.	L	T	P	C
Semester/Year	I/I	3	0	0	3
Subject Name	Geotechnical Explorations				
Subject Code	MCETH20S107				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives:

1. The objective of this course is to introduce the students to the principles and practices of geotechnical exploration.
2. Foundation engineering, and ground improvement methods, to Foundation Engineering.
3. So that they apply these principles to plan and execute soil exploration programmes, design foundations.

Course Outcome: Upon completion of the Environmental Engineering course, the students are able to:

- CO1:** Identify different soil exploration methods and plan such Methods.
CO2: Identify different types of foundations and their relevance in Various field situations, And explain their behaviours.
CO3: Explain different design methods for different foundations, and Design different types of Foundations.
CO4: Analyze the wheel load effects on pavement materials.
CO5: Design surface runoff and sub-surface drainage system as per field Conditions.

Unit	Syllabus	Periods
UNIT-I	Engineering properties of soil: Relevant theoretical concepts for determination of engineering properties of soils, Need and importance of site investigation, Methods of site exploration, Procuring and handling of disturbed and un-disturbed samples.	8
UNIT-II	Subsurface exploration: Subsurface exploration, planning, drilling and sampling techniques. Demonstration of drilling equipment.	9
UNIT-III	Test for Shear Strength Determination: Soil testing techniques to determine the shear strength properties of soil by direct shear test, unconfined compression test, vane shear test, and triaxial tests. Determination of total and effective stress parameters. Determination of compaction and consolidation characteristics. Demonstration of shear strength tests in laboratory.	11

UNIT-IV	In-situ tests: In-situ field testing and laboratory investigation of soil, including advanced equipment, instrumentation, data acquisition, and measurement techniques: SPT, CPT, DCPT, Pressure meter, Dilatometer, Permeability, etc.	13
UNIT-V	Data Interpretation: Data interpretations for determination of engineering properties of soils and their application to geotechnical design. Preparation of site-investigation reports. Demonstration of tests.	14
Text books: <ol style="list-style-type: none"> 1. “Soil Mechanics & Foundation Engg”, Dr. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications (P) Ltd, 16th edition. 2. “Highway Engg”, S.K. Khanna, C.E.G. Justo, 5th edition, Khanna S. K. Publisher, Nem Chand & Bros. 3. “Soil Mechanics & Foundation Engg” – K.R. Arora Standard Publishers Distributors. 		
References books: <ol style="list-style-type: none"> 1. Soil Testing and Exploration- Alam Singh, Asia Publishing House. 2. Soil Testing for Engineers- T.W. Lambe, pub. John Wiley & Sons. 3. Gopal Ranjan and A.S.R. Rao: Basic and Applied Soil Mechanics, pub. New Age International Publishers. 4. Purushotama Raj: Geotechnical Engineering, Pearson Education Publication. 5. V. N. S. Murthy: Geotechnical Engineering, CRC press publication. 		

SYLLABUS

TRANSPORTATION ENGINEERING

Class	M.TECH.	L	T	P	C
Semester/Year	I/I	3	0	0	3
Subject Name	Highways Geometric Design				
Subject Code	MCETH20S108				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives:

1. To develop an understanding of the principles of geometric design in the context of transportation planning and traffic design.
2. To understand the design criteria for geometric design of highways.
3. To develop the capability to design highways.

Course Outcomes: At the end of the course, students will be able to:

CO1: Ability to apply knowledge of math, science, and engineering

CO2: Ability to design and conduct experiments, as well as interpret data

CO3: Ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

CO4: Plan surveys, and prepare survey forms.

CO5: Design both flexible and rigid pavements for low volume roads.

Unit	Syllabus	Periods
UNIT-I	Highway functional classification, Single lane, two lane, four lane, six lane highways, expressways, freeways, Topography and physical features, traffic, impact of vehicular characteristics on road geometrics, speed and safety,	10
UNIT-II	Traffic characteristics, highway capacity, HCM, USA, access control, safety, environment.	8
UNIT-III	Elements of design, sight distance, Horizontal curve design, maximum curvature, super elevation rates, transition curves, attainment of super elevation, pavement widening, sight distance on horizontal curves and side friction, Gradients, compensation of grade at curves, design of climbing lanes, shape of vertical curves, design of summit and valley curves, design of speed breaker, combination of horizontal and vertical alignment.	11
UNIT-IV	Intersection and roundabouts and their capacity analysis, major and minor interchanges,	13

UNIT-V	Geometric Design of Entrance and exit ramps, acceleration lanes.	8
<p>Text books:</p> <ol style="list-style-type: none"> 1. Veeraragavan, S.K Khanna and C.E.G. Justo, Highway Engineering, Nem Chand & Brothers, 2014. 2. Bruton, M. J., Introduction to Transportation Planning, UCL press, London, UK, 1992. 3. William, W. Hay, an Introduction to Transportation Engineering, John Wiley and Sons. 		
<p>References books:</p> <ol style="list-style-type: none"> 1. Highway Capacity Manual, 4th Edition, Transportation Research Board, Washington DC, 2000. 2. A Policy on Geometric Design of Highways and Streets, 4th Edition, American Association of State Highway and Traffic Officials, Washington, DC, 2001. 3. Roess, R.P., Prassas, E. and McShane, W.R., Traffic Engineering, Pearson Publication, 2004. 4. IRC:52-1981, Recommendations About the Alignment Survey and geometric Design of Hill Roads (First Revision) 5. IRC: 73-1980, Geometric Design Standards for Rural (Non-Urban) Highways. 6. IRC: 86-1983, Geometric Design Standard for Urban Roads in Plains. 		

SYLLABUS
TRANSPORTATION ENGINEERING

Class		M.TECH.	L	T	P	C
Semester/Year		I/I	0	0	4	2
Subject Name		Traffic Engineering and Field Studies Lab				
Subject Code		MCETH20S109				
Paper	English	English				
	Hindi					
Max. Marks		50				

Course Objectives:

1. To organize traffic surveys and collect wide variety of traffic data, subjecting them to analysis and interpretation.
2. To conduct various standard tests on soil, aggregate and bitumen.

Course Outcomes:

Upon completion of this course, the students should be able to:

CO1: Conduct the traffic surveys, roadside and household interviews.

CO2: Perform laboratory test on subgrade soil, aggregates and bitumen.

CO3: Carry out mix design for the CC pavement, GSB, DBM, SDBC, BC, etc.

CO4: Acquired the expertise to conduct various tests on soil, aggregates, cement and concrete.

Syllabus
Periods

Traffic Studies –I (Speed Studies) - Space mean speed, time mean speed, speed data-collection Methods, analysis and interpretations.

- i) Spot Speed Studies by Enoscope / Radar Gun.

Traffic Studies –II (Volume Studies) - Definitions, data collection, data analysis and Representation.

- i) Traffic Volume Studies at Mid-Block Section of Roads.
- ii) Traffic Volume Studies at Intersection.
- iii) Video Graphic Technique for volume/speed studies.

Traffic Studies –III (General Traffic Engineering Studies)- Definitions, purpose, survey Methods, Data collection and result Presentation.

- i) Origin and Destination survey.
- ii) Parking Studies.
- iii) Gap Acceptance Study for Vehicles.
- iv) Speed and Delay Studies.

Traffic Studies –IV (Software and scanning systems applications) Purpose, Working and Application.

- i) Roadway Data Collection Using Mobile Mapping System.
- ii) Accident Data Collection using terrestrial scanners.
- iii) GIS Based Transport Planning using Trans CAD.
- iv) Highway Geometric Design using MxRoad/ CAD Software.

8

Texts Books:

1. Dickey, John. W., Metropolitan Transportation Planning, McGraw Hill, N.Y.
2. William, W. Hay, An Introduction to Transportation Engineering, John Wiley and Sons.

References books:

1. Hutchinson, B.G., Principles of Urban Transportation Planning, McGraw Hill, N.Y.
2. Morlok, E.K., Introduction to Transportation Engineering and Planning, McGraw Hill, N.Y.

SYLLABUS

TRANSPORTATION ENGINEERING

Class	M.TECH.	L	T	P	C
Semester/Year	I/I	0	0	4	2
Subject Name	Numerical Analysis Lab				
Subject Code	MCETH20S110				
Paper	English	English			
	Hindi				
Max. Marks	50				

Course Objectives:

1. To learn the different numerical techniques.
2. To be introduced to the fundamentals of probability.
3. To know the concepts of sampling and regression.

Course Outcomes:

At the end of the course, students will be able to:

- CO1:** Find Roots of non-linear equations by Bisection method and Newton's method.
CO2: Do curve fitting by least square approximations.
CO3: Solve the system of Linear Equations using Gauss - Elimination/ Gauss - Seidal Iteration.
CO4: To Integrate Numerically Using Trapezoidal and Simpson's Rules.
CO5: To Find Numerical Solution of Ordinary Differential Equations by Euler's Method, Runge - Kutta Method.

Syllabus

Periods

1. Find the Roots of Non-Linear Equation Using Bisection Method.
2. Find the Roots of Non-Linear Equation Using Newton's Method.
3. Curve Fitting by Least Square Approximations.
4. Solve the System of Linear Equations Using Gauss – Elimination Method.
5. Solve the System of Linear Equations Using Gauss –Seidel Iteration Method.
6. Solve the System of Linear Equations Using Gauss – Jordan Method.
7. Integrate numerically using Trapezoidal Rule.
8. Integrate numerically using Simpson's Rules.
9. Numerical Solution of Ordinary Differential Equations by Euler's Method.
10. Numerical Solution of Ordinary Differential Equations by Runge-Kutta Method.

8

References books:

1. Numerical methods by B. S. Grewal khanna publication.
2. Numerical method: E. Balagurusamy T.M.H. Tata McGraw Hill Education, New Delhi.

SYLLABUS

TRANSPORTATION ENGINEERING

Class	M.TECH.	L	T	P	C
Semester/Year	I/I	2	0	0	2
Subject Name	Research Methodology and IPR				
Subject Code	MCETH20S111				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course objectives:

1. To explain the functions of the literature review in research and writing a review.
2. To explain various research designs and their characteristics.
3. Methods of data collections.

Course Outcomes:

At the end of this course, students will be able to:

CO1: Understand research problem formulation.

CO2: Analyze research related information.

CO3: Follow research ethics.

CO4: Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, Concept, and creativity.

CO5: Understanding that when IPR would take such important place in growth of individuals & Nation, it is needless to emphasis the need of information about Intellectual Property Right to be Promoted among Students in general & engineering in particular.

Unit	Syllabus	Periods
UNIT-I	Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.	8
UNIT-II	Effective literature studies approaches, analysis plagiarism, Research ethics,	9
UNIT-III	Effective technical writing, how to write report, Paper. Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.	11
UNIT-IV	Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International	13

	cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.	
UNIT-V	Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.	14
Text books:		
<ol style="list-style-type: none"> 1. Asimov, "Introduction to Design", Prentice Hall, 1962. 2. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016. 3. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008 		
References:		
<ol style="list-style-type: none"> 1. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007. 2. Mayall, "Industrial Design", McGraw Hill, 1992. 3. Niebel, "Product Design", McGraw Hill, 1974. 		

SYLLABUS

TRANSPORTATION ENGINEERING

Class	M.TECH.	L	T	P	C
Semester/Year	I/I	2	0	0	0
Subject Name	English for Research Paper Writing				
Subject Code	MCETH20S112				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course objectives:

Students will be able to:

1. Understand that how to improve your writing skills and level of readability.
2. Learn about what to write in each section.
3. Understand the skills needed when writing a Title Ensure the good quality of paper at very first time submission.

Course outcomes:

At the end of this course, students will be able to:

CO1: Understand that how to improve your writing skills and level of Readability.

CO2: Learn about what to write in each section Understand the skills needed when writing a Title Ensure the good quality of paper at Very first-time submission.

CO4: Being Concise and Removing Redundancy, Avoiding Ambiguity.

CO5: Discussion, skills are needed when writing the Conclusions.

Unit	Syllabus	Periods
Unit I	Planning and Preparation, Word Order, breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.	8
Unit II	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction. Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.	10
Unit III	Key skills needed when writing a Title, key skills needed when writing an Abstract, key skills needed when writing an Introduction.	8
Unit IV	Skills needed when writing a Review of the Literature, skills needed when writing the Methods, skills needed when writing the Results, skills needed when writing the Discussion.	10

Unit V	Skills are needed when writing the Conclusions, useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.	8
<p>Text books:</p> <ol style="list-style-type: none"> 1. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman’s book. 2. Adrian Wall work, English for Writing Research Papers, Dordrecht Heidelberg London, 2011. 		
<p>References:</p> <ol style="list-style-type: none"> 1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books). 2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press. 		

SEMESTER - II

SYLLABUS

TRANSPORTATION ENGINEERING

Class	M.TECH.	L	T	P	C
Semester/Year	II/I	3	0	0	3
Subject Name	Pavement Design				
Subject Code	MCETH20S201				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives:

1. To study the behaviour of pavements under various loads.
2. To design the flexible and rigid pavements using different Empirical, semi-empirical and theoretical approaches.
3. To understand the concept of Pavement Management System, pavement failures and its evaluation.

Course outcomes:

At the end of this course, students will be able to:

CO1: Analyze behaviour of pavements under various loads.

CO2: Design the flexible and rigid pavements using different Empirical, semi-empirical and theoretical approaches.

CO3: Understand the concept of Pavement Management System, pavement Failures and its evaluation.

CO4: Get the knowledge of factors affecting pavement design and Performance.

CO5: Evaluate the strength of soil sub grade soil and identify the factors that Affect the behavior of soil.

Unit	Syllabus	Periods
UNIT-I	Type of pavements, road pavement and airport pavements, design factors.	8
UNIT-II	Materials of construction, sub grade soils, stone aggregates, bituminous material and cement concrete their suitability and effects.	9
UNIT-III	Stresses in Flexible Pavements: Analysis for stresses in homogeneous masses and layered systems, deflections, shear failures, equivalent wheel and axle loads. Design of flexible pavements empirical, semi empirical and theoretical methods, practical approach.	11
UNIT-IV	Design of Flexible Pavements: Loading characteristics static, impact and repeated loads, effects of dual wheels and tandem axles, area of contact and tyre pressure, modulus or California Bearing Ratio (CBR) for different layers, equivalent single wheel load, equivalent stress and equivalent deflection criterion, equivalent wheel load factors, climatic and environmental factors, CBR adopted in various countries, U.S. navy method.	13

	triaxial method, Mcleod method, Boussinesq's and Burmister's analysis and design method, triaxial method, design of flexible pavements, IRC method for flexible pavement design.	
UNIT-V	Analysis and Design of Rigid Pavements: Wheel load stresses, liquid and elastic soil sub grade, Westergaard's analysis, Bradbury's approach, Arlington test, Pickett's corner load theory and related charts, Westergaard's and Tomlinson's analysis of warping stresses, combination of stresses due to different causes, effect of temperature variation on rigid pavements, Prestressed concrete slabs-general details, design of tie bars and dowel bars IRC method for the design of rigid pavements.	14

Text books:

1. Yoder and Witzak, "Principles of Pavement Design"- John Wiley and sons Inc (second edition) 1975.
2. Yang, "Design of functional pavements"- McGraw Hill Book Co.
3. Huang, "Pavement Analysis"- Elsevier Publications.

References:

1. Yoder and White jack, Pavement Design, John Wiley & Sons.
2. Flaherty, O. Highways - Location Design, Construction and Maintenance of Pavements, Taylor and Francis.
3. S.K. Khanna and C.E.G. Justo, Highways Engineering, Nem Chand and Bros.
4. IRC: 37-2001, "Guidelines for the Design of Flexible Pavements (Second Revision)".
5. IRC: 58-2001, "Guidelines for the Design of Plain Jointed Rigid Pavements for Highways (Second Revision)".

SYLLABUS

TRANSPORTATION ENGINEERING

Class		M.TECH.	L	T	P	C
Semester/Year		II/I	3	0	0	3
Subject Name		Advanced Concrete Technology				
Subject Code		MCETH20S202				
Paper	English	English				
	Hindi					
Max. Marks		100				

Course Objectives:

The main objectives of the course are:

1. To familiarize the students with latest trends in concrete technology.
2. To impart knowledge to design various types of concrete mixes.
3. To understand the effects of various parameters.

Course outcomes: At the end of this course, students will be able to:

- CO1:** Identify Quality Control tests on concrete making materials.
CO2: Understand the behavior of fresh and hardened concrete.
CO3: Design concrete mixes as per IS and ACI codes.
CO4: Understand the durability requirements of concrete.
CO5: Understand the durability requirements of concrete.

Unit	Syllabus	Periods
UNIT-I	Introduction, different types of cementitious materials, energy efficient cement burning technologies. Admixtures and Construction Chemicals: Benefits of admixtures, type of admixtures, plasticizers, action of plasticizers, super- plasticizers, classification of super plasticizers, effect of super-plasticizers, doses of super plasticizers, super plasticizers-cement compatibility, waterproofing admixture, antibacterial and similar admixtures.	8
UNIT-II	Strength of Concrete: Factors affecting the strength, curing of concrete, autogenous healing, strength in tension, failure in compression, failure under multiaxial stress, micro cracking, aggregate cement paste interface, effect of age on strength of concrete, relationship between compressive and tensile strength, bond between concrete and reinforcement, failure strength of concrete, impact strength, electrical and acoustic properties of concrete, temperature effects in concrete.	9
UNIT-III	Durability of Concrete: Causes of inadequate durability, transportation mechanism in concrete, diffusion, absorption, water permeability of	11

	concrete, air and vapour permeability, carbonation, acid attack on concrete, sulphate attack on concrete, efflorescence, effect of sea water on concrete, alkali-silica reaction, type of cracking, action of frost, air entrainment, effect of de-icing agent, chloride attack, threshold content of chloride ions, influence of blended cement on corrosion, other factors affecting corrosion of reinforcement, test for penetrability of concrete to chlorides, stopping corrosion.	
UNIT-IV	Special Concrete and Concreting Techniques: Introduction, light weight concrete, ultra-light weight concrete, vacuum concrete, mass concrete, roller compacted concrete, concrete with different cementitious materials like fly ash, gbs, silica fume, rice husk ash, shotcrete or guniting, ferrocement, fiber reinforced concrete, polymer concrete composites, sulphur concrete, jet cement concrete, gap graded concrete, high performance concrete, self-compacting concrete, foamed concrete.	13
UNIT-V	Non-destructive testing of hardened concrete: Rebound hammers test, pull-out test, ultrasonic pulse velocity test, resonant frequency method.	14

Text books:

1. M. S. Shetty, Concrete Technology, theory and Practice, S. Chand.
2. M. L. Gambhir, Concrete Technology, Theory and Practice, McGraw Hill.
3. P.K. Mehta & Paulo J. M. Monterio, Concrete, Tata McGraw Hill.

References:

1. M. Neville, Properties of Concrete, Pearson education.
2. J. Kroop and H.K. Hilsdorf, Performance Criteria for Concrete Durability, E & F N Spon, London.
3. A. Petzold & M. Rohrs, Concrete for High Temperature, Maclaren and sons, London.
4. Edward G Nawy, Concrete Construction Engineering Hand Book, CRC Press, New York.

SYLLABUS

TRANSPORTATION ENGINEERING

Class	M.TECH.	L	T	P	C
Semester/Year	II/I	3	0	0	3
Subject Name	Advanced Soil Mechanics				
Subject Code	MCETH20S203				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives: The main objectives of the course are: 1. To impart knowledge of engineering properties of various types of soils. 2. To impart knowledge of latest trends in soil engineering.		
Course outcomes: At the end of this course, students will be able to: CO 1: Calculate and analyze the stresses on soil and be able to draw The stress paths. CO 2: Analyze the effect of flow of fluids through soils. CO 3: Evaluate the compressibility of soils. CO 4: Obtain and analyze the shear strength of soil. CO 5: Design proper drainage system by knowing the permeability Characteristics of soils.		
Unit	Syllabus	Periods
UNIT-I	Structure and composition of soil & clay minerals, effect of clay minerals on engineering properties, mechanics of expansive soil.	8
UNIT-II	Plane stress and plane strain problems as applied to geotechnical engineering.	9
UNIT-III	Concentrated and distributed line loads: Boussinesq's equation and Westergaards's solution. Vertical pressure line and strip loads and loaded circular and rectangular areas. Limitations of elastic formulae for soils.	11
UNIT-IV	Concept of elastic and plastic equilibrium, general states of plastic equilibrium. Dubrova's lateral earth pressure theories, Brinch-Hansens theory.	13
UNIT-V	Shear strength of cohesion less and cohesive soils, effective stress principle.	14

Text books:

1. "Basic and Applied soil Mechanics", Gopal Ranjan, ASR Rao, New Age International Publishers.
2. "Soil Mechanics & Foundation Engg", Dr.B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications (P) Ltd, 16th edition.
3. "Highway Engineering", S.K. Khanna, C.E.G. Justo, 5th edition.

References:

1. Advance Geotechnical Engg. -Alam Singh, pub. CBS Publishers and Distributors.
2. Theoretical Soil Mechanics- M. E. Harr, pub. Tata McGraw Hill.
3. Theoretical Soil Mechanics -Jumikis, R.E. Krieger Publication.
4. Theoretical Soil Mechanics -Terzaghi, John Wiley & Sons.

SYLLABUS
TRANSPORTATION ENGINEERING

Class	M.TECH.	L	T	P	C
Semester/Year	II/I	3	0	0	3
Subject Name	Intersection Design				
Subject Code	MCETH20S204				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives:

1. Understand General design considerations: function, objectives and capacity.
2. Understand Alignment and profile.
3. Understand Sight distance: sight triangles and skew.

Course outcomes:

At the end of this course, students will be able to:

CO1: Acquire and apply knowledge of traffic, its components, and factors affecting road traffic in intersection design.

CO2: Understand traffic movements and design islands, intersections and road lightings.

CO3: Evaluate level of service and capacity of roadways and intersections.

CO4: Propose and design suitable traffic regulatory system such as signs, Signals, markings, etc.

CO5: Analyze and design intersections at-grade and grade separated types for smooth and safe movement of vehicles.

Unit	Syllabus	Periods
UNIT-I	Introduction, Types of Intersections, Elements of Intersection, Driver Behaviour at Intersection: Traffic Conflicts, Traffic Priority, Planning steps and Feasibility Assessment.	8
UNIT-II	Design of At-Grade Intersections: Layout, Design Principle: Alignment, Profile and Curves, Channelization, Capacity Determination, Sight Distance Requirements.	9
UNIT-III	Design of Grade Separated Intersections: Classification, Characteristics of grade separated structures. Design of Acceleration Lanes, Deceleration Lanes, Overpass Underpass.	11
UNIT-IV	Intersection Control: General Concepts, Conflicts, Types of Intersection Control, Signal Design, Freeway Ramps.	13

UNIT-V	Capacity Analysis of Unsignalized and signalized Intersections: LOS, Factors effecting Capacity, HCM and UK Method of Capacity Analysis.	14
<p>Text books:</p> <ol style="list-style-type: none"> 1. Kadiyali L.R. "Traffic Engineering and Transportation Planning"- Khanna Publication, New Delhi. 2. Khanna and Justo, "Highway Engineering"- Nem Chand and Bros., Roorkee. 		
<p>References:</p> <ol style="list-style-type: none"> 1. N.J. Garber and L.A. Hoel, Traffic and Highway Engineering, Cengage Learning. 2. M. Rogers, Highway Engineering, Wiley and sons, 2010 Edition. 3. IRC: SP:41-1994, IRC SP:31-1992, IRC 43-1994, Indian Roads Congress. 		

SYLLABUS

TRANSPORTATION ENGINEERING

Class	M.TECH.	L	T	P	C
Semester/Year	II/I	3	0	0	3
Subject Name	Planning, Design and Construction of Rural Roads				
Subject Code	MCETH20S205				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives:

1. To introduce the concept of planning.
2. Geometric design and pavement design.
3. Construction and management of Rural Roads.

Course outcomes:

At the end of this course, students will be able to:

CO 1: Remember significance of low-cost roads.

CO 2: Analyze the problem associated with planning of low volume roads; Prepare master plan of rural road network.

CO3: Conduct surveys for rural road alignment and remember Specifications of various geometric features of road.

CO4: Select and analyze different materials and equipment required for Rural road construction and design various drainage structures.

CO5: Cross drainage works giving due importance to maintenance activities.

Unit	Syllabus	Periods
UNIT-I	Planning of Rural Roads: Classification of roads, brief introduction to earlier 20-year plans, system's approach, NATPAC model, gravity model, CRR model, Accessibility Based Rural Network Planning model, concept of link efficiency, optimal road network planning approach.	8
UNIT-II	Geometric Design: Geometric design standards for rural roads with special reference to PMGSY, hill road standards.	9
UNIT-III	Pavement Design: Various pavement design methods for rural roads including flexible and rigid pavements using IRC: SP-20, IRC-72, IRC-37, IRC: SP-62, CRR nomograms, Type and causes of road failures and their remedial measures.	11
UNIT-IV	Materials and Mix design methods: Conventional materials, marginal and waste materials including fly ash, Granular Blast Furnace Slag (GBFS), Blast Furnace Slag (BFS), Steel Making Slag (SMS), bagasse and Crum Rubber Modified Binder (CRMB), etc. Mix Design Methods: CRR	13

	method, triangular chart method, Fuller’s method, Rothfuch method, PI based method.	
UNIT-V	Construction: Low-cost techniques for rural road construction, tractor bound technology, special considerations for hill areas; Case studies of waste material utilization in rural roads	14
<p>Text books:</p> <ol style="list-style-type: none"> 1. Khanna, S.K. and Justo, C.E.G., “Highway Engineering”, Nem Chand & Bros.2004. 2. Kadiyali, L.R., “Traffic Engineering and Transport Planning”, Khanna Publishers.1999. 3. “Quality Assurance Handbook for Rural Roads”, NRRDA. 		
<p>References:</p> <ol style="list-style-type: none"> 1. “Rural Roads Manual”, SP-20, IRC, 2002. 2. . “Document on Rural Road Development”, Vol. I & II, CRRI, 1990. 3. “PMGSY Operation Manual”, NRRDA, 2005. 4. “Specifications for Rural Roads”, MoRD, IRC, 2004. 		

SYLLABUS

TRANSPORTATION ENGINEERING

Class	M.TECH.	L	T	P	C
Semester/Year	II/I	3	0	0	3
Subject Name	Road Safety				
Subject Code	MCETH20S206				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives:

1. Apply, organize and articulate, with precision and without supervision.
2. Advanced driving instruction, coaching and evaluation techniques.
3. Demonstrate mastery in real life examples.

Course outcomes:

At the end of this course, students will be able to:

CO1: Acquire knowledge statistical methods and computer Application of accident analysis.

CO2: Analyze the factors affecting the construction of new roads.

CO3: Analyze the factors affecting the reconstruction of existing Roads.

CO4: Analyze the factors affecting the operation condition of road.

CO5: Remember the process of road safety audit and the measures Of improving road safety.

Unit	Syllabus	Periods
UNIT-I	Introduction, factors contributing to road accidents, Accident rates for different types of exposure, Risk Factors for accident involvement, risk factors for injury severity, Human Factors in Road Safety: Driver Control Theory, Driver capacities and age effects, Driving style, Driver temporary impairments, control studies, Self-Report Instruments and Methods.	13
UNIT-II	Road accident recording: Road accident collection and record system, Post accident reconstruction.	9
UNIT-III	Accident investigation and analysis, Analysis of accident data and mathematical formulation, identification of hazardous road way sections and black spot. Spatial analysis of accident data using GIS.	11
UNIT-IV	IRC method for recording accident, use of GIS in recording and management of accident data.	6
UNIT-V	Road Safety Audits: Basic Concepts, Methods and Applications.	10

Text books:

1. Rune Elvik, Alena Høye, TrulsVaa and Michael Sørensen, Handbook of Road Safety Manual, Emerald Group Publishing Limited.
2. D. Shinar, Traffic Safety and Human Behaviour, Elsevier Publication.

References:

1. B.E. Porter, Handbook of Traffic Psychology, Elsevier.
2. MoRTH “Specifications for Roads and Bridge Works”- 2001, fourth revision, Indian Roads Congress.
3. MoRTH “Manual for Construction and Supervision of Bituminous Works”- 2001, Indian Roads Congress.
4. MoRTH “Manual for Maintenance of Roads”- 1989, Indian Roads Congress.

SYLLABUS

TRANSPORTATION ENGINEERING

Class	M.TECH.	L	T	P	C
Semester/Year	II/I	3	0	0	3
Subject Name	Traffic Flow theory				
Subject Code	MCETH20S207				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives:		
<ol style="list-style-type: none"> 1. Understand the difference between macroscopic and microscopic Models. 2. Characterize the statistical distributions of principal traffic Flow parameters. 3. Model and characterize congestion using shock wave and Queuing theories. 		
Course outcomes:		
At the end of this course, students will be able to:		
CO1: Apply the flow theories to field situations such as toll booths, Diversion measures etc.		
CO2: Understand various car following theories.		
CO3: Apply the concepts of vehicle arrivals to field situations such as Exit ramps, entry ramps etc. by queuing theory.		
CO4: Appreciate the application of GIS techniques in traffic engineering.		
CO5: Understand Traffic characteristics at Unsignalized intersections.		
Unit	Syllabus	Periods
UNIT-I	Traffic stream characteristics: Introduction to traffic engineering: Road user characteristics, human and vehicle characteristics; Fundamental parameters and relations of traffic flow: speed, density, volume, travel time, headway, spacing, time-space diagram, time mean speed, space mean speed and their relation, relation between speeds, flow, density, fundamental diagrams.	8
UNIT-II	Traffic stream models: Green shield's model, Greenberg's logarithmic model, Underwood's exponential model, pipe's generalized model, multi-regime models; Concepts and derivation, illustration, Calibration of Greenshild's model.	9
UNIT-III	Microscopic traffic flow modelling: Car-following models; Vehicle arrival models: Poisson distribution, headway modeling, Microscopic traffic simulations.	11
UNIT-IV	Advanced Flow Theories: Shock waves in traffic streams: Types, Propagation; Gap Acceptance, Queuing Theory: Concepts and Applications.	13

UNIT-V	Uninterrupted Flow: Characteristics of uninterrupted traffic, capacity and LOS of Uninterrupted facilities.	14
Text books: <ol style="list-style-type: none"> 1. Agarwal, B.L, “Basic Statistics”- 3rd edition, New Age Publication, New Delhi. 2. L.R Kadiyali, “Traffic Engineering”- Khanna Publishers New Delhi. 3. Medhi, “Introduction to statistics”- New Age Publication, New Delhi. 		
References: <ol style="list-style-type: none"> 1. Traffic Engineering and Transport Planning – L.R. Kadiyali, Khanna Publishers. 2. Traffic Flow Theory and Control, Drew, D.R. McGraw Hill Book Co. 		

SYLLABUS

TRANSPORTATION ENGINEERING

Class		M.TECH.	L	T	P	C
Semester/Year		II/I	3	0	0	3
Subject Name		Urban Mass Transit Systems				
Subject Code		MCETH20S208				
Paper	English	English				
	Hindi					
Max. Marks		100				

Course objective:

1. To cover concepts of Transportation planning, various modes, transit systems and their suitability.
2. To give idea of modeling in planning, to develop the methodology of travel.
3. Demand modeling for Urban Transportation Systems.
4. To provide knowledge of Land use planning and transportation Interaction.

Course outcomes:

At the end of this course, students will be able to:

- CO1:** Comprehend the urban travel demand and independent variables.
CO2: Analyze the traffic surveys and trip generation's modules.
CO3: Assess, analyze and study the trip distribution factors and mode choice analysis.
CO4: Evaluate the traffic assignment methods and plans.
CO5: Understand the mass transit systems and study about advance transit Systems.

Unit	Syllabus	Periods
UNIT-I	Introduction to public transportation, evolution and role of urban public transportation modes, systems and services. Technological characteristics and their impacts on capacity, service quality, and cost, Mass Rapid Transit Systems (MRTS) in India.	8
UNIT-II	Transit Data Collection and Performance Analysis: Current practice and new methods for data collection and analysis, Frequency and Headway Determination, Performance Monitoring.	9
UNIT-III	Vehicle Scheduling: Timetable Generation, vehicle and crew scheduling techniques.	11
UNIT-IV	Economics and Financial Aspects: Effects of pricing policy and service quality on ridership, methods for estimating costs, organizational models for delivering public transportation service including finance and operations, Fare policy and technology.	13

UNIT-V	Marketing and operations management.	14
Text books:		
<ol style="list-style-type: none">1. George E. Gray and Lester A. Hoel, 'Public Transportation', Prentice Hall, New Jersey.2. John W. Dickey, 'Metropolitan Transportation Planning', Tata McGraw - Hill Publishing Co.3. New Delhi. Vukan R. Vuchic, 'Urban Public Transportation Systems and Technology', Prentice Hall Inc., New Jersey.		
References:		
<ol style="list-style-type: none">1. A. Ceder, Public Transit Planning and Operation, Elsevier and BH.2. K. A. Small and E. T. Verhoef, the Economics of Urban Transportation, Routledge.3. V. R. Vuchic, Urban Transit: Operations, Planning and Economics, Wiley.		

SYLLABUS

TRANSPORTATION ENGINEERING

Class	M.TECH.	L	T	P	C
Semester/Year	II/I	0	0	4	2
Subject Name	Highway Material Characterization and Pavement Test Lab				
Subject Code	MCETH20S209				
Paper	English	English			
	Hindi				
Max. Marks	50				

Course objective:

1. Select the most appropriate materials for highway construction based on material characteristics, engineering properties, design requirements, cost, availability, and expected service life.
2. Utilize quality assurance principles in order to make effective material acceptance decisions that conform to accepted plans and specifications.
3. Analyze and interpret field and laboratory test results to identify and address issues with materials.

Course outcomes:

At the end of this course, students will be able to:

CO1: Characterize the pavement materials.

CO2: Perform quality control tests on pavements and pavement materials.

CO3: Conduct test on Aggregate & bitumen.

List of experiments	Periods
<ol style="list-style-type: none"> 1. Review tests on aggregates. 2. Review test on bitumen. 3. Marshall's Method of Bituminous Mix Design. 4. Estimation of soil CBR for road purpose. 5. Estimation of soil CBR by Dynamic Cone Penetration (DPT) Test. 6. Pavement Evaluation using Benkelmen Beam. 7. Bitumen Content Estimation using Ele Content Tester. 8. Road unevenness evaluation using Bump Integrator. 9. Pavement Surface Roughness Estimation using Friction Tester. 10. Plate load test. 	8

SYLLABUS

TRANSPORTATION ENGINEERING

Class	M.TECH.	L	T	P	C
Semester/Year	II/I	0	0	4	2
Subject Name	GIS Lab				
Subject Code	MCETH20S210				
Paper	English	English			
	Hindi				
Max. Marks	50				

Course Objectives:

1. Students will learn how to use GIS for spatial decision making.
2. Understand the limitations and pitfalls of using GIS in spatial analysis.
3. The course includes the theory and methods involved in spatial.
4. Analysis, GIS modeling, spatial interpolation, and geo statistical analysis.

Course outcomes:

At the end of this course, students will be able to:

- CO1:** Understand the basics of advanced tools such as Remote sensing, GIS and GPS.
CO2: Highlight their applications in the field of Civil engineering.
CO3: Learn various Remote Sensing/GIS/GPS equipment & processing packages.

List of experiments	Periods
<ol style="list-style-type: none"> 1. Demo on various GIS software and their salient features. 2. Scanning and digitization (on screen). 3. Registration of various maps and digitization and editing of features. 4. Database creation and management. 5. Buffer and overlay analysis. 6. Map preparation and composition. 7. Spatial and Mathematical operations. 8. Area and query-based analysis. 9. Customized application in GIS. 10. Web publishing of GIS layers. 11. 3D GIS. 12. Demo on various GIS based application. 	8

SYLLABUS

TRANSPORTATION ENGINEERING

Class	M.TECH.	L	T	P	C
Semester/Year	II/I	0	0	4	2
Subject Name	Mini Project				
Subject Code	MCETH20S211				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course objective:

1. The students will be able to understand and apply the knowledge of management functions like planning, scheduling, executing and controlling to construction projects.
2. The students will be able to implement the safety aspects during the execution of civil engineering project.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Identify structural engineering problems reviewing available Literature.

CO2: Study different techniques used to analyze complex structural Systems.

CO3: Work on the solutions given and present solution by using his/her Technique applying engineering principles.

Content

Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution.

Continuous assessment of Mini Project at Mid-Sem and End-Sem will be monitored by the departmental committee.

Periods

8

SYLLABUS

TRANSPORTATION ENGINEERING

Class	M.TECH.	L	T	P	C
Semester/Year	II/I	2	0	0	0
Subject Name	Stress Management by Yoga				
Subject Code	MCETH20S212				
Paper	English	English			
	Hindi				
Max. Marks	00				

Course Objectives:

1. To achieve overall health of body and mind.
2. To overcome stress.

Course Outcomes:

Students will be able to:

CO1: Develop healthy mind in a healthy body thus improving social health.

CO2: Improve efficiency.

	Syllabus	Periods
	<ol style="list-style-type: none"> 1. Definitions of Eight parts of yog. (Ashtanga). 2. Yam and Niyam. Do's and Don'ts's inlife. Ahinsa, satya, astheya, bramhacharya and aparigraha, Shaucha, santosh, tapa, swadhyay, ishwarpranidhan. 3. AsanandPranayam Various yog poses and their benefits for mind &body, Regularization of breathing techniques and its effects-Types of Pranayama. 	8
	<p>Texts books:</p> <ol style="list-style-type: none"> 1. Yogic Asanas for Group Training - Part-I": Janardan Swami Yogabhyasi Mandal, Nagpur. 	
	<p>References books:</p> <ol style="list-style-type: none"> 1. Yogic Asanas for Group Training - Part-I": Janardan Swami Yogabhyasi Mandal, Nagpur. 2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata. 	