Shri Vaishnav Vidyapeeth Vishwavidyalaya

Master of Technology (Transportation Engineering)

SEMESTER I

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTCE 2101	BS	SYSTEM MATHEMATICS AND MATHEMATICAL MODELLING	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

Student will be able to understand

1. What a mathematical model is and explain the series of steps involved in a mathematical modeling process.
2. Acquire basic mathematical modeling skills that will enable them carry out simple modeling tasks in transportation engineering.

Course Outcomes:

1. To understand different aspects of system analysis.
2. To understand the formulation of linear programming.
3. To acquire knowledge about network analysis and various methods.
4. To understand the fundamentals of simulation.

Syllabus:

UNIT I

Concept of a system and system analysis; Mathematical modeling; Introduction to mathematical programming techniques viz – non linear programming, geometric programming, quadratic programming, linear programming, dynamic programming, game theory etc; Transportation problems, their formulations and solutions

UNIT II

Linear Programming, formulation, Graphical solution, Simplex method, BIG-M & Two Phase methods, Duality in LP, Revised Simplex

UNIT III

Network analysis; CPM-PERT technique; Project optimality analysis; Updating; Dynamic programming; Stage coach problem and its D.P. solution

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UNIT IV

Measures of central tendency; Central limit theorem; Statistical frequency distributions; Additional and multiplication laws of probability; Baye's theorem; Mathematical expectation; Binomial, Poisson, Normal 't', 'F' & Square distributions; Tolerance limits, confidence limits; Tests of significance; Analysis of variance

UNIT V

Linear and Non-linear Regression Analysis; Testing of Hypothesis; Acceptance Sampling; Fundamentals of Simulation; Introduction to Sensitivity Analysis, its limitations

Text Books:

1. Operations Research: Principles and Practice, 2nd Ed by Ravindran, Phillips, Solberg, John Wiley & Sons, 2007
2. Operations Research: An Introduction by Hamdy A. Taha, Pearson/Prentice Hall, 2007

Reference Books:

1. Probability, Statistics & Decision in Civil Engineering by Benjamin & Cornell Optimization by S.S. Rao, McGraw-Hill, New York.

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTCE 2102	DCS	MATERIAL SCIENCE AND CONCRETE TECHNOLOGY	60	20	20	30	20	2	1	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

To gain the discrete knowledge of concrete and its technology, subject involves theoretical and practical approaches which helps in exploring the different kinds of concrete & its properties, so that students can understand the nature and their significance in the field of transportation Engineering

Course Outcomes:

1. To identify the functional role of ingredients of concrete and apply this knowledge to mix design philosophy
2. To acquire and apply fundamental knowledge in the fresh and hardened properties of concrete
3. To evaluate the effect of the environment on service life performance, properties and failure modes of structural concrete and demonstrate techniques of measuring the Non Destructive Testing of concrete structure
4. To develop an awareness of the utilisation of waste materials as novel innovative materials for use in concrete
5. To design a concrete mix which fulfils the required properties for fresh and hardened concrete

Syllabus:

UNIT I

Structure of solid materials, atoms and bonds, inter-atomic and intermolecular bonds, crystals; Classification of solids; Mechanism of elastic and plastic actions in tension, compression, pure bending and torsion; Elastic and inelastic properties of solids; Dislocations; Strain hardening; Triaxial stress.

UNIT II

Creep: Components of creep fracture; Analysis of creep curves; Method of predicting creep strength; Designing of creep

Fatigue: Fatigue loading, mechanism, factors affecting creep fatigue properties; S.N. diagrams

Hardness: Relation between hardness of different atomic structure measurement of hardness with other mechanical properties

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UNIT III

Concrete Materials: Cement, manufacture, composition, structure, hydrated cement paste, heat of hydration, test for physical properties, different types of cements, and properties of aggregates
Fresh Concrete: Workability, factors affecting, testing, vibration analysis of fresh concrete
Strength of Concrete: Nature of strength, factors affecting, Autogenous heating, maturity of concrete, fatigue strength, impact strength.

UNIT IV

Elasticity Shrinkage and Creep: Modulus of elasticity; Dynamic modulus; Poisons ratio; Early volume changes; Swelling, shrinkage, creep factors influencing creep nature; Rheological models; Effects and design for creep.
Durability of Concrete: Permeability of concrete; Thermal properties of concrete; Resistance of concrete to fire; Resistance to abrasion, electrical properties, acoustic properties, chemical attack.

UNIT V

Testing of Hardened Concrete: Destructive and non destructive testing of concrete; tests on composition of hardened concrete; variation of test results, accelerated testing of concrete
Mix Design: Basic consideration, Factors in choice of mix Proportion; Methods of mix design; I.B.C. Murdock; A.C.I. Method based on Road note No. 4; Design of different types of concrete; Light weight and high density

Text Book:

1. Varshney RS; Concrete Technology; Oxford & IBH publishing co.
2. Gambhir ML; Concrete Technology – TMH
3. Sinha SN; Reinforced Concrete Technology; TMH

References Books:

1. New Building Materials Published by B.M.T.P.C., New Delhi
2. Hand books on Materials & Technology - Published by BMTPC & HUDCO
3. Properties of Concrete - A.M. Neville - Pearson Education

List of Practicals:

1. To determine fineness of cement by dry sieving
2. To determine the normal consistency of a given sample of cement.
3. To determine the initial and final setting time of a given sample of cement.
4. To determine bulking of aggregate.
5. To determine specific gravity of a given sample of fine aggregate.
6. To determine particle size distribution of coarse aggregates by sieving or screening
7. To determine the impact value coarse aggregates.
8. To determine the relative consistency of freshly mixed concrete by the use of Slump test.
9. Determination of compressive strength of concrete specimens
10. Determination of flexural strength of moulded concrete specimens.
11. To assess the likely concrete by using rebound hammer

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTCE 2103	DCS	SOIL MECHANICS IN HIGHWAY ENGINEERING	60	20	20	30	20	2	1	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To gain experience regarding the determination of properties of different types of soils and their behavior.
2. To provide an opportunity to learn how to measure the shear strength of the soil and its importance
3. To impart knowledge about the lateral earth pressure

Course Outcomes:

1. Determine the index properties of the soil
2. To understand classification of soil.
3. Identify the suitability of the soil for different foundations

Syllabus:

UNIT I

Classification of Soils: IS classifications; AASHO classifications; CAA classifications
CBR and Group Index: Laboratory and field determination of CBR value; Effect of soaking; Modulus of sub-grade reaction

UNIT II

Compaction: Theory of compaction, factors affecting compaction, effect of compaction on soil, properties, measurement of field compaction and field methods of compaction and control.

UNIT III

Bearing Capacity: Skemptons's analysis; Plate Load Test; Penetration Tests; General bearing capacity equation; Effect Of water table on bearing capacity
Stability of slopes: Types of slope failure; Bishop's slope stability analysis; Stability number

UNIT IV

Earth Pressures: Classical theories; Effect of submergence and seepage

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UNIT V

Soil Stabilization: Mechanics of stabilization; Mechanical, electrical, cement, lime, bitumen and chemical stabilization

Drainage: Vertical sand drains; Surface and sub-surface drainage for highways; Drainage for hill roads

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Text Book:

1. Singh Alam, Soil Engineering in Theory and Practice, Asia Publishing House.
2. Khanna S.K. and Justo, C.G., Highway Engineering, Khanna Publishers, Delhi
3. Punmia B.C., Soil Mechanics and Foundation Engineering, Laxmi Publications

References Books:

1. Venkat Ramaiah, Soil Mechanics, New Age International Pvt Ltd Publishers
2. IRC-49-1973, Recommended Practice for the Pulverization of B.C. for lime Stabilization
3. IRC-50-1973, Recommended Design for the use of Cement-Modified Soil in Road Constructions.
4. IRC-51-1992, Guideline for the use of Soil Lime Mixing Road Construction.

List of Practicals:

1. Determination of the natural content of the given soil sample.
2. To determine the Density of soil by Core Cutter method
3. To determine the specific gravity of soil fraction passing 4.75 mm I.S sieve by density bottle.
4. To determine the particle size distribution of soil by Sieve Analysis.
5. To determine plastic limit, liquid limit, shrinkage limit of given soil sample.
6. To determine the shearing strength of the soil using the direct shear apparatus.
7. To find shear strength of a given soil specimen by Vane shear test.
8. To determine bearing capacity of soil using CBR Test
9. Demonstration of Plate Load Test SPT & DCPT

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTCE 2104	DCS	TRAFFIC ENGINEERING	60	20	20	0	0	2	1	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

The aim of this course is to teach students about the traffic characteristic, traffic studies, highway capacity studies in traffic engineering.

Course Outcomes:

1. Understand the traffic characteristic.
2. Perceive the knowledge about traffic flow models.
3. Get knowledge about component parking and lighting.
4. Get knowledge about accident studies and highway capacity.

Syllabus:

UNIT I

Traffic Characteristics: Road user; Vehicle speed studies, different traffic surveys and studies.
Non-signalised Intersections: At grade and grade separated intersection; Channelization warrants; Weaving action at intersections; Delay models; Theoretical models for determining weaving capacity; Design of intersection.
Signalized Intersections: Warrants for the use of traffic signals, phasing, signal aspects and the intergreen period; Determination of effective green time; Optimum cycle time and timing diagram; Effect of left and right turning and heterogeneity; P.C.U. concepts; ultimate capacity of whole intersection; Delay calculation and optimum cycle length; QUE lengths at the commencement of green period; Coordination of traffic signals.

UNIT II

Traffic Flow Models: Elements of traffic flow; Fundamental diagram of road traffic; Relationships between the variables; Macroscopic and microscopic flow models based on response; Stimulus approach, hydrodynamic analogy, queuing model.

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UNIT III

Parking: Parking survey, types of parking, parking meters, design of parking places.
Lighting: Lantern arrangements, types of signs and marking and their design.
Accidents: Accident Causes, data collection, analysis of accident data; Collision and condition diagram; Remedial measures for accidents.

UNIT IV

Highway Capacity: Basic, possible and practical capacities; Level of service concept; Factors affecting capacity, level and service; Capacity of freeway, express way, urban streets.

UNIT V

Traffic Management: One way street, two-way; Flow operation; Closing side streets; Exclusive bus lanes; Instruments for volume measurement spot speed measurement; Electronic timer cameras; Radar photography; Vehicle mounted instruments; Measurement of concentration.

Text Book:

1. Louis J. Pignataro, Theory and Practice, Prentice-Hall.
2. Kadiyali L.R., Traffic Engg. And Transport Planning, Khanna Publishers
3. IRC-65-1976, Recommended Practice for Traffic Rotaries.
4. IRC-SP-12-1973, Tentative Recommendation on the Provision of Parking space for urban area.

Reference Books:

1. D.R.Drew, Traffic Flow Theory, McGraw-Hill Book Company
2. Wohl & Martin, Traffic System Analysis for Engineering & Planners, McGraw-Hill Book Company.

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTCE 2105(1)	DCS	ALIGNMENT AND GEOMETRIC DESIGN OF HIGHWAYS	60	20	20	0	0	2	1	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:
Develop an understanding of the principles of geometric design in the context of transportation planning and traffic design.

Course Outcomes:
1. Understand the factors influencing road vehicle performance characteristics and design.
2. Apply basic science principles in estimating stopping and passing sight distance requirements.
3. Design basic horizontal alignment of the highway.
4. Design basic vertical alignment of the highway.

Syllabus:

UNIT I
Principle of Route Selection and Highway Location: Reconnaissance, preliminary and final location surveys; Different studies for route locations; Soil and materials, drainage etc.; Use of aerial photographs and remote sensing in route location; Preparation and presentation of project documents

UNIT II
Highway Financing, Economics and Administration: Financing of highways, revenues and expenditures; Highway financing in India; Economics of Highway improvements; Highway administration and planning in India; Saturation System.

UNIT III
Classification of Highway: Terrain classification, design speed and other factors for geometric design; Uniform and non-uniform acceleration theory.
Cross Sectional Elements: Road lines, building and control lines, roadways, width, shoulders, median and camber
Sight Distances: Analysis of stopping sight distance, intermediate and passing sight distance.

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UNIT IV

Horizontal Alignment: Design Radius; Dynamics and motion of vehicle on a curve; Friction between tyre and road surface; Different curves; Super elevation, widening and transition curves, setting of transition spiral, use of tables.

UNIT V

Vertical Alignment: Gradients, grade compensation, relation between gradient and camber; Design of summit and valley curves; Design criteria for hair pin bend; Design of curves in tight locations; Lateral and vertical clearances, under passes, coordination of horizontal and vertical alignment, set back distances

Text Book:

1 Sharma S.K., Principle Practice and Design of Highway Engineering, S. Chand & Company Ltd.
2 Kadiyali L.R., Highway Engineering, Khanna Publishers

References Books:

1 IRC Special Publication 19-1977, Manual for Survey Investigation and Preparation of Road Project.
2 IRC Special Publication 20-1979, Manual for Route Location, Design Construction and Maintenance of Rural Highways.
3 IRC-73-1980, Geometric Design Standards for Rural Highways.
4 IRC-52-1970, Design Tables for Horizontal Curves for Highways.
5 IRC-52-1973, Recommendation about the Alignment Survey Geometric Design of Hill Roads.

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COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTCE 2105(2)	DCS	BRIDGE ENGINEERING	60	20	20	0	0	2	1	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

At the end of the course, the student will be able to explain the components of bridges and analyze and design bridges.

Course Outcomes:

1. Understand the design theories for super structure and substructure of bridges
2. Design Culvert, R.C.C T Beam Bridge.
3. Understand the behavior of continuous bridges, box girder bridges.
4. Possess the knowledge to design prestressed concrete bridges.

Syllabus:

UNIT I

Introduction: Design of through type steel highway bridges for IRC loading; Design of stringers, cross girders and main girders; Design of deck type steel highway bridges for IRC loading ; Design of main girders

UNIT II

Steel Bridges: Design of Pratt type truss girder highway bridges; Design of top chord, bottom chord, web members; Effect of repeated loading; Design of plate girder railway bridges for railway loading; Wind effects; Design of web and flange plates; Vertical and horizontal stiffeners.

UNIT III

Reinforced Concrete Slab Bridges: Design of solid slab bridges for IRC loading; Design of kerb; Design of tee beam bridges; Design of panel and cantilever for IRC loading

UNIT IV

Reinforced Concrete Girder Bridges: Design of tee beam; Courbon's theory; Pigeaud's curves; Design of balanced cantilever bridges, deck slab, main girder; Design of articulation

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UNIT V

Prestressed Concrete Bridges: Design of prestressed concrete bridges; Preliminary dimensions; Flexural and torsional parameters; Courbon's theory; Distribution coefficient by exact analysis; Design of girder section; Maximum and minimum prestressing forces; Eccentricity; Live load and dead load shear forces; Cable zone in girder; Check for stresses at various section; Check for diagonal tension; Diaphragms; End block; Short term and long term deflections.

Text Book:

1. Bridge engineering by S.Ponnuswamy, TataMcGraw-Hill, 1986.
2. Bridge superstructure by N.Rajagopalan, Narosa Publishing House, 2006.

Reference Books:

1. Victor, D.J., Essentials of Bridge Engineering, Oxford & IBH Publishers Co., New Delhi,1980.

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTCE 2105(3)	DCS	GIS AND REMOTE SENSING IN TRANSPORTATION ENGINEERING	60	20	20	0	0	2	1	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

To collect the knowledge about significance of GIS in transportation engineering in terms of utility and precision of data collection.

Course Outcomes:

1 Understand main concepts that define Geographic Information Systems.
2. Describe the geographic space with concepts and terms commonly used to build operating models in GIS.
3. Use diverse techniques and instruments adequately to measure, locate and find bearings on a map and in a field.
4. Photo-interpret basic environmental and socioeconomic variables using photographs taken in Spain. Know and use GIS and its geo-processes and functions.

Syllabus:

UNIT I

Remote Sensing: Physics of remote sensing; Ideal remote sensing system; Remote sensing satellites and their data products; Sensors and orbital characteristics; Spectral reflectance curves; Resolution and multi concept: FC; Interpretation of remote sensing images.

UNIT II

Digital Image Processing: Satellite image; Characteristics and formats; Image histogram; Introduction to image rectification; Image enhancement; Land use and land cover classification system.

UNIT III

Geographic Information System (GIS): Basic concept of geographic data; GIS and its components; Data acquisition, raster and vector formats; Topography and data models; Spatial modelling; Data output; GIS applications.

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UNIT IV

Global Positioning System (GPS) : Introduction; Satellite navigation system; GPS- space segment; Control segment; User segment; GPS satellite signals; Receivers; Static, kinematic and differential GPS.

UNIT V

Applications in Transportation Engineering: Intelligent transport system; Urban transport planning; Accident studies; Transport system management; Road network planning; Collecting road inventory.

Text Book:

2 A.M. Chandra, S.K. Ghosh, Remote Sensing and Geographical Information System, 1 st Edition, Narosa Publishing house, 2007.
3 M. Anji reddy, Remote Sensing and Geographical Information Systems, 3rd Edition, B.S. Publications, 2006.

Reference Books-

1 Bernhardsen, "Geographic Information Systems, an Introduction", 3 rd Edition, Published by John Wiley Sons, 2006.
2 Lillesand T.M. and Kiefer R.W. "Remote Sensing and Image Interpretation", 5th Edition John Wiley and Sons, 2008.
3 Peter A Burrough, "Principles of Geographical Information Systems", 1 st Edition, Oxford publisher, 1998.