# SHRI VENKATESHWARA UNIVERSITY

# Syllabus

## M.TECH (Highway Engineering)

## PART-TIME

**(Two Years Post Graduation Programme)**

**(w.e.f. 2019-20)**

## SCHOOL OF ENGINEERING & TECHNOLOGY

# Evaluation for M.Tech (Highway Engineering Part time)

| SEMESTER-I | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Subject Codes** | **Subject** | **Periods** | | | **Evaluation Scheme** | | | | **End Semester** | | Total | Credit |
| | | | L | T | P | CT | TA | Total | PS | TE | PE | | |
| 1 | WHE-101 | Urban Transportation Planning | 3 | 0 | 0 | 20 | 10 | 30 | | 70 | | 100 | 3 |
| 2 | WHE-011 | Advanced Pavement Materials | 3 | 0 | 0 | 20 | 10 | 30 | | 70 | | 100 | 3 |
| 3 | WHE-111 | Traffic Measurements Lab | 0 | 0 | 4 | | | | 25 | | 25 | 50 | 2 |
| 4 | AUD-101 | English for Research Paper Writing | 2 | 0 | 0 | | | | | | | | 0 |
| | | Total | | | | | | | | | | 250 | 8 |

**DETAILED SYLLABUS**

**M.Tech. (Highway Engineering) I Semester**

**WHE-101: URBAN TRANSPORTATION PLANNING**

**Course Type: Core; Instruction: L-T-P-C: 3-0-0-3 Course Outcomes:** *At the end of the course, students will be able to*

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|---|---|
| CO1 | Distinguish various Urban Forms and Structures and Identify urban transportation problems |
| CO2 | Estimate urban travel demand. |
| CO3 | Plan urban transport networks. |
| CO4 | Develop land use transportation models |
| CO5 | Identify urban transport corridors and Prepare urban transportation plans. |

**Detailed Syllabus:**

**Urban Forms and Structures:**

Urbanisation and Migration, Findings of Commission on Urbanisation, Urban forms: Garden City, Linear city, Radburn, Urban Neighborhood, Precinct, MARS, Le Corbusier, Collin Buchanan, etc. Urban structures: Centripetal type, Grid type, linear type and directional grid type, Evolution of spatial structure.

**Urban Transportation Problems and Policy:**

Urban transportation Issues, Travel Characteristics, Evolution of Planning Process, Supply and Demand – Systems approach; NUTP, Recommendations of 12$^{th}$ FYP and NTDP

**Travel demand:**

Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

**Data collection and inventories:**

Collection of data – Organisation of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

**Trip Generation and Distribution:**

UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates; Trip Distribution: Growth Factor Methods, Gravity Models, Opportunity Models, Time Function Iteration Models.

**Mode Split and Traffic Assignment:**

Mode Choice Behaviour, Competing Modes, Mode Split Curves, Models and Probabilistic Approaches; Traffic Assignment: Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment, Diversion Curves.

**Land Use – Transportation Models:**

Concentric urban land use model, Sector land use model, multiple nuclei land use model, hybrid land use models, Cellular automata models, and land rent theory; Urban regions. Land use – Transportation Interactions; Classification of LUT Models, Economic Base Mechanism, Allocation Mechanism and Spatial Allocation and Employment Relationships, Garin Lowry Models.

**Corridor Identification - Plan preparation and evaluation:**

Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis; TOD; Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities; Pivot Point Analysis, Environmental and Energy Analysis.

**READING:**


1. Bruton, M. J., An Introduction to Transportation Planning (The Living Environment), UCL Press, London, UK, 2000.
2. C. Jotin Khisty and B. Kent Lall, Transportation Engineering: An Introduction, 3$^{rd}$ Edition, Prentice Hall of India Pvt. Ltd., 2003.
3. C.S. Papacostas and Panos D. Prevedouros, Transportation Engineering and Planning, Prentice Hall of India

Pvt. Ltd., 2001.
4. Hutchinson, B.G., Principles of Urban Transport Systems Planning, McGraw Hill, 1974.
5. Institute of Transportation Engineers (Michael D. Meyer Editor), Transportation Planning Handbook, Fourth Edition, John Wiley & Sons, Inc., New Jersey, 2016.
6. Juan de Dios Ortuzar and Luis G. Willumsen, *Modelling Transport, 4th Edition*, John Wiley and Sons, New York 2011.
7. Michael D. Meyer and Eric J. Miller, Urban Transportation Planning: A decision oriented Approach, Second Edition, McGraw Hill, 2001.

**WHE-111: TRAFFIC MEASUREMENTS LABORATORY**
**Course Type: Core; Instruction: L-T-P-C: 0-0-4-2**

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

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|---|---|
| CO1 | Conduct traffic studies for estimating traffic flow characteristics. |
| CO2 | Determine the capacity and level of service of a highway element. |
| CO3 | Estimate parking requirements and inventory analysis. |
| CO4 | Design traffic signal systems. |
| CO5 | Determine causative analysis of delays. |

**Detailed Syllabus:**
**Volume studies:**
Direction, Duration and Classification of Traffic Volume at Mid-Block Section and Intersections, Manual, and Mechanical Methods, Headway Distributions

**Speed studies:**
Spot Speed Studies - Radar Speed Meters

**Journey time and delay studies:**
Travel Time and Delay Studies by Floating Car Method

**Gap acceptance studies:**
Study of Gaps, Lags, Critical Gaps at Intersections

**Intersection delay studies:**
Delay Measurement at Uncontrolled Intersections and Signalised Intersections

**Parking surveys:**
Parking Inventory and Turnover Studies

**Measurement of driver characteristics:**
Reaction Testing, Action Judgement Testing, Driver Vision Testing, Discriminative Reaction Testing, Evaluation of driver Knowledge – Traffic Rules – Road Signs & Markings – Traffic Signs and Motor Vehicle Act Relevant clauses

**Highway Capacity Estimation:**
Videographic method, Dynamic PCU

**READING:**

1. C. Jotin Khisty and, B. Kent Lall, Transportation Engineering: An Introduction, Prentice Hall; 3rd Edition, 2002.
2. Currin, Introduction to Traffic Engineering: Manual F/data Collect & Analysis, CL Engineering, 2nd Edition, 2012.
3. L.R. Kadiyali, Traffic Engineering and Transportation Planning, Khanna Publishers, 2011.
4. Pignataro LJ. Traffic Engineering: Theory and Practice; Prentice hall, Inc, 1973
5. Roger P. Roess, Elena S. Prassas and William R. McShane, Traffic Engineering, Prentice Hall, 4th Edition, 2010.

**WHE-011: ADVANCED PAVEMENT MATERIALS**
**Course Type: Elective; Instruction: L-T-P-C: 3-0-0-3**

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

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|---|---|
| CO1 | Determine the proportions of ingredients required for the mix design of both asphalt mixtures and cement concrete. |
| CO2 | Characterize the pavement materials including soil, aggregate, asphalt, cement, asphalt mixtures, cement concrete. |
| CO3 | Select appropriate asphalt binder for construction of a flexible pavement depending upon the traffic and climatic conditions. |
| CO4 | Choose appropriate stabilization technique for pavement applications. |

**Detailed Syllabus:**

1 **General**:

Materials used in pavement construction. Conventional and nonconventional materials.

**2 Aggregate:**

Physical and mechanical properties of aggregates. Blending of aggregate.
Alternate materials for conventional aggregates including natural, manufactured, industrial by-products, and waste materials.

**3 Bituminous Binders:**

Types of bituminous binders including unmodified bitumen, modified bitumen (crumb rubber modified bitumen, polymer modified bitumen), bitumen emulsion, and cutback bitumen.

Tests on bitumen, physical properties, specifications for paving bitumen. Rheology of bituminous binders: Newtonian and non-Newtonian fluids. Grading of bitumen: penetration, viscosity, and performance grading.
Introduction to linear viscoelasticity: creep and recovery; stress relaxation; mechanical models to describe viscoelastic response including Maxwell element, Voigt-Kelvin element, standard linear solid element, Burger's element.
Dynamic response to sinusoidal loading of viscoelastic materials, energy storage and dissipation. Time-temperature superposition, construction of master curves.
Check for linear scaling and superposition of separate responses.

**4 Bituminous Mixes:**

Design of bituminous mixes using Marshall method, and SUPERPAVE method. Types of bituminous mixes including hot mixes, cold mixes, warm mixes and applications.
Permanent deformation, dynamic modulus, fatigue of bituminous mixes, moisture induced damage in bituminous mixes.

**1 Cement and Cement Concrete:**

Cement: chemical composition, types, physical properties, admixtures. Physical properties of cement concrete related to pavement applications. Design of cement concrete mixes for pavements.
Special types of cement concrete: polymer concrete composites, sulphur concrete composites, fibre reinforced concrete, ferrocement, roller compacted concrete, and high strength concrete.

**2. Granular Materials:**

Basic soil properties relevant to pavement applications.
Resilient modulus of granular materials, modulus of subgrade reaction.

7 **Stabilization:**

Soil stabilization: use of lime, cement, bitumen, and other commercial stabilizers. Applications of geosynthetics in pavements.

**READING:**


1. **Asphalt Institute.** *Asphalt Mix Design Methods, Manual Series No. 2 (MS-2),* Seventh Edition, Asphalt Institute, Kentucky, USA, 2014.
2. **Huang, Y.H.** *Pavement Analysis and Design,* Pearson Prentice Hall, New Jersey, USA, 2004.

3. **IRC: 44-2008** *Guidelines for Cement Concrete Mix Design for Pavements*, the Indian Roads Congress, New Delhi, India, 2008.
4. **Kandhal, P.S.** *Bituminous Road Construction in India*, PHI Learning Pvt. Ltd., New Delhi, India, 2016.
5. **Mallick, R.B.** and **T. El-Korchi** *Pavement Engineering – Principles and Practice*, CRC Press, Taylor and Francis Group, Florida, USA, 2009.
6. **Ministry of Road Transport and Highways.** *Specifications for Road and Bridge Works*, Fifth Edition, Indian Roads Congress, New Delhi, India, 2013.
7. **Papagiannakis, A.T.** and **E.A. Masad** *Pavement Design and Materials*, John Wiley and Sons, New Jersey, USA, 2008.
8. **Richard M. Christensen,** *Theory of Viscoelasticity, Second Edition*, Dover Publications, Inc, New York, USA, 1982.
9. **Sherwood, P.T.** *Alternative materials in road construction*, Thomas Telford, New York, USA, 1997.

**AUDIT 1 : ENGLISH FOR RESEARCH PAPER WRITING AUD -101**

**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

**SYLLABUS CONTENTS**

- Planning and Preparation, Word Order, Breaking up long sentences, Structuring
- Paragraphsand Sentences, Being Conciseand Removing Redundancy, Avoiding Ambiguity and Vagueness.
- Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising,
- Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.
- Review of the Literature, Methods, Results,Discussion, Conclusions.
- The Final Check. key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, 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

**Suggested Studies:**

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
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011