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-III													
Sl. No.	**Subject Codes**	**Subject**	**Periods**			**Evaluation Scheme**				**End Semester**		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	WHE-301	Traffic Systems Design	3	0	0	20	10	30		70		100	3
2	WHE-032	Intelligent Transportation Systems	3	0	0	20	10	30		70		100	3
3	WHE-311	Pavement Materials and Evaluation Lab	0	0	4				25		25	50	2
4	MLC-301	Research Methodology and IPR	2	0	0	20	10	30		70		100	2
		Total										350	10

DETAILED SYLLABUS

M.Tech. (Highway Engineering) III Semester

Research Methodology and IPR MLC 301 3 0 0

Course Outcomes:

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

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- 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.

Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

Unit 1: INTRODUCTION 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
Unit 2: Effective literature studies approaches, analysis Plagiarism, and Research ethics
Unit 3: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee
UNIT 4: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development.International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.
Unit 5: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.
Unit 6: New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

References:

- Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
- Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
- Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
- Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007.
- Mayall, "Industrial Design", McGraw Hill, 1992.
- Niebel, "Product Design", McGraw Hill, 1974.
- Asimov, "Introduction to Design", Prentice Hall, 1962.
- Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.

T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand,

WHE-301: TRAFFIC SYSTEM DESIGN

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*

CO1	Design the geometric elements for better traffic system.
CO2	Analyze and design uncontrolled and signalized intersection with collected data.
CO3	Design and improve the bicyclists and pedestrians traffic flow facilities.
CO4	Analyze and design appropriate parking layouts and facilities.
CO5	Examine and design better street lighting systems.

Detailed Syllabus:

Geometric design of traffic flow systems:

Elements of geometric design, cross sectional elements, sight distance considerations, factor affecting geometric design, highway alignment and topography, design of horizontal alignment, tangents and curves, layouts and radius, design of vertical alignment, tangent grades, vertical curvature, design controls and criteria, mobility and accessibility, landscaping, design of freeway and multilane highways, expressways design requirements, weaving segments and configurations, auxiliary lanes and its elements, speed change lanes, and design practice.

Design of at grade intersections:

At grade intersections types and their suitability, factors affecting design, data requirement, parameters selection, intersection controls, estimation of conflict points, uncontrolled intercession analysis, capacity of rotary, roundabouts and design methodologies, Design of signalized intersection, warrants for signalization, saturation flow rate and capacity, estimation of amber time, design of all aspects of signal timings, LOS studies, estimation of queue length and control delay, signal coordination, channelization and its objectives, channelizing devices, design considerations, typical channelizing examples.

Design of traffic Interchanges and its elements:

Necessities of interchanges, classification and types of common interchanges, layouts of interchange, interchange warrants, interchange design elements, spacing and design speed, design of ramps, ramp configurations, weaving at interchange, design examples.

Design of traffic system for bicycle and pedestrians:

Bicycle flow characteristics, performance measures, LOS criteria and capacity, interrupted and uninterrupted bicycle paths, design of bikeways, shared off-street and on-street paths, urban street bicycle path, control delay and LOS, pedestrian flow behavior, factor affecting behavior, fundamental traffic flow relations, pedestrians space requirement, performance measures, pedestrian demand analysis, design of pedestrians facility at uncontrolled and signalized junctions, side walk and cross walk design, street corner analysis, pedestrian signals, and design examples.

Design of parking facilities:

Parking and influencing factors, type of parking system, parking angles and aisle width, on- street parking design, design parameters, parking surveys and demand estimation, various parking layouts and vehicle circulation, design of off street parking facilities, types and layouts, design examples.

Street lighting:

Definitions and background, pavement luminance and its measurement, illumination level, Veiling Luminance, longitudinal uniformity, utilization factor, depreciation factor, maintenance factor, traffic criteria and warranting conditions, and design practice.

READING:

C. Jotin Khisty and B. Kent Lall, Transportation Engineering: An Introduction, Third Edition, Prentice Hall; 2002.

Coleman A. O 'Flaherty, Transport Planning and Traffic Engineering, Butterworth- heinemann, 2009.

Fred L. Mannering, Scott S. Washburn, Kilareski Walter P., Principles Of Highway Engineering And Traffic Analysis, Wiley India Pvt Ltd., 4th Edition, 2011.

Institute of Transportation Engineers, Anurag Pande and Brian Wolshon, Traffic Engineering Handbook, Seventh Edition, John Wiley & Sons, New Jersey, 2016.

L.R. Kadiyali, Traffic Engineering and Transportation Planning, Khanna Publishers, 2011.

Louis J. Pignataro and Edmund J. Cantilli, Traffic Engineering: Theory and Practice; Prentice hall, Inc.1973 (Digitised in 2007)

Mike Slinn, Paul Matthews, Peter Guest, Traffic Engineering Design: Principles and Practice, Butterworth-heinemann, 2nd Edition, 2005.
Nicholas J. Garber, and Lester A. Hoel, Principles of Traffic and Highway Engineering, Cengage Learning India, 2nd Edition, 2010.
Richard J. Salter and N.B Hounsell, Highway Traffic Analysis and Design, Third Edition, Macmillan, 1996.
Roger P. Roess, Elena S. Prassas and William R. McShane, Traffic Engineering, Prentice Hall, 4th Edition,

WHE-311: PAVEMENT MATERIALS AND EVALUATION LABORATORY
Course Type: Core; Instruction: L-T-P-C: 0-0-3-2

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

CO1	Characterize the pavement materials including soil, aggregate, bitumen, and bituminous mixes in the laboratory.
CO2	Perform quality control tests on pavements and pavement materials.
CO3	Measure the functional response characteristics of in-service pavements.
CO4	Measure the structural response characteristics of in-service pavements.

Detailed Syllabus:

1 **Tests on Soils:** liquid limit, plastic limit, soil classification (dry and wet), maximum dry density and moisture content.
2 **Tests on Soils:** CBR.
3 **Tests on Aggregate:** aggregate gradation, shape tests, specific gravity, water absorption.
4 **Tests on Aggregate:** Los Angeles abrasion value, aggregate impact value, soundness test.
5 **Tests on Bitumen:** penetration, absolute and kinematic viscosity, flash and fire point, ductility and elastic recovery, softening point, specific gravity.
6 **Tests on Bitumen:** measuring apparent viscosity of bitumen using SC-4-27 spindle in a rotational viscometer from 60 to 150 □C in increments of 10 □C at different shear rates, short- term aging of bitumen.
7 **Field Tests:** field density using sand replacement method, rapid moisture meter.
8 **Tests on Bituminous Mixes:** stripping value of aggregate, determination of Gmm of given bituminous mixtures using CoreLok system, Marshall mix design.
9 **Tests on Bituminous Mixes:** bitumen content and gradation using centrifuge extractor and NCAT ignition oven, determination of tensile strength ratio for a given bitumen mix.
10 **Tests on Bituminous Mixes:** roller compaction and permanent deformation using wheel tracking equipment.
11 **Field Evaluation:** skid resistance using British pendulum, texture depth using sand patch test, stiffness of unbound pavement layers using GeoGauge.
12 **Field Evaluation:** pavement condition rating, unevenness using MERLIN.
13 **Field Evaluation:** Dynamic Cone Penetrometer, Clegg Impact Test, determination of modulus and rebound deflection using Portable Falling Weight Deflectometer.
14 **Field Evaluation:** overlay design using Benkelman beam.

READING:

1. **Khanna, S.K., Justo, C.E.G.** and **A. Veeraragavan** *Highway Materials and Pavement Testing*, 5th Edition, Nem Chand and Bros, Roorkee, India, 2009.
2. **Yang H. Huang,** *Pavement Analysis and Design*, Second Edition, Pearson Prentice Hall, New Jersey, USA, 2004

Relevant IS, IRC, ASTM Codes.

WHE-032: INTELLIGENT TRANSPORTATION SYSTEMS
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*

CO1	Identify and differentiate ITS user services and its components.
CO2	Select and provide appropriate ITS technology to solve real-life traffic problems.
CO3	Manage the traffic congestion by acquisition of big data using advanced devises.
CO4	Design and implement the suitable ITS and services for effective transportation.

Detailed Syllabus:

ITS Background and Telemetric systems:
Definitions, features and objectives of ITS, History of ITS and its development over the world, telemetric concept, transport telemetric, telemetric structure, ITS taxonomy, ITS application areas, uses, and application overview.

ITS User Services:
infrastructure based services; Arterial management and integration, freeway/highway management, crash prevention and safety, road weather management, roadway operation and maintenance, transit management, emergency management, Electronic payment and pricing, traveller information, COV, etc., Intelligent vehicle based services; collision notification and avoidance system, driver assistance system, and examples.

ITS components, tools and strategies:
Components of user services; advanced traffic management system, advanced traveler information system, advanced vehicle control system, commercial vehicle operational management, advanced public transportation system, electronic payment system, advanced rural transportations, security and safety systems, urban traffic control, scoot and scat systems, benefits and limitations.

Design and implementation:
Design components; data acquisition methods, equipment and used technology, radar and sensor, detectors, vehicle identifiers, and GPS, Communication tools; DSRC, CALM, traveler information tools, data handling, processing and management; TCM, and its working, worldwide ITS implementation and challenges, case studies.

ITS Standards and future scope:
ITS standards, development process, legal issues, financial issues, Mainstreaming ITS; integration and up gradation; Future of ITS, case studies.

READING:

1. AUSTROADS, The Implication of Intelligent Transport Systems for Road Safety, Austroads Incorporated, 1999.
2. Bob Williams, Intelligent Transport Systems Standards, Artech House Publishers, 2008.

1. Chowdhury, M. A. and Sadek, A, Fundamentals of Intelligent Transportation Systems Planning, Artech House, 2003.
2. E. Bekiaris and Y.J. Nakanishi, Economic Impacts of Intelligent Transportation Systems: Innovations and Case Studies, Elsevier/JAI, 2004.
3. IET Intelligent Transport Systems and 15th International IEEE Conference on Intelligent Transportation Systems (ITSC), 16-19 September, 2012. (http://digital- library.theiet.org/content/journals/iet-its)
4. J.M. Sussman, *Perspectives on Intelligent Transportation Systems* (ITS), Springer, 2005
5. L. Vlacic, M. Parent, F. Harashima, Intelligent Vehicle Technologies – Theory and Applications, Butterworth-Heinemann, 2010.