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)

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	WHE-201	Pavement Analysis and Design	3	0	0	20	10	30		70		100	3
2	WHE-022	Traffic Control and Management	3	0	0	20	10	30		70		100	3
3	WHE-211	Computational Lab	0	0	4				25		25	50	2
4	AUD-102	Disaster Management	2	0	0								0
		Total										250	8

(SEMESTER-II)

M.Tech. (Highway Engineering) II Semester
WHE-201: PAVEMENT ANALYSIS AND 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	Analyze the stresses and strains in a flexible pavement using multi-layered elastic theory, and the KENLAYER program.
CO2	Analyze stresses and strains in a rigid pavement using Westergaard's theory, and the KENSLABS program.
CO3	Design a flexible pavement using IRC, Asphalt Institute, and AASHTO methods.
CO4	Design a rigid pavement using IRC and AASHTO methods.

Detailed Syllabus:
1. **Pavement Types and Materials:**
Types and component parts of pavements; highway and airport pavements. Basic characteristics of materials used in pavements.

2. **Stresses in Flexible Pavements**: Layered system concepts.
Stress solution for one, two and three layered systems. Fundamental design concepts.
Stress analysis in flexible pavements using KENLAYER.

3. **Stresses in Rigid Pavements:**
Westergaard's theory and assumptions.
Stresses due to curling, stresses and deflections due to loading, frictional stresses. Stresses in dowel bars and tie bars.
Stress analysis in rigid pavements using KENSLABS.

4. **Factors Affecting Pavement Design:**
Variables considered in pavement design.
Classification of axle types, standard and legal axle loads, tyre pressure, contact pressure, ESWL, EWLF and EAL concepts.
Traffic analysis: ADT, AADT, truck factor, growth factor, lane distribution factor, directional distribution factor and vehicle damage factor.

5. **Design of Flexible Pavements:**
IRC method of flexible pavement design.
Asphalt Institute's methods with HMA and other base combinations. AASHTO method of flexible pavement design.
Design of flexible pavement shoulders.

6. **Design of Rigid Pavements**:
IRC method of plain jointed and continuously reinforced rigid pavement design. AASHTO method of rigid pavement design.
Design of rigid pavement shoulders.
7. **Design of Pavement Drainage**
Detrimental effects of water, methods for controlling water in pavements. Drainage materials: aggregates, geotextiles, pipes.
Estimation of inflow, determination of drainage capacity.

READING:
1) **Asphalt Institute.** *Thickness Design – Asphalt Pavements for Highways and Streets Manual Series No. 1 (MS-1)*, Asphalt Institute, Kentucky, USA, 1999.
2) **Das, A.** *Analysis of Pavement Structures*, CRC Press, Taylor and Francis Group, Florida, USA, 2015.
3) **Huang, Y.H.** *Pavement Analysis and Design*, Second Edition, Dorling Kindersley (India) Pvt. Ltd., New Delhi, India, 2008.
4) **IRC: 37-2012** *Guidelines for the Design of Flexible Pavements*, The Indian Roads Congress, New Delhi, India, 2012.
5) **IRC:58-2015** *Guidelines for the Design of Plain Jointed Rigid Pavements for Highways*, The Indian Roads Congress, New Delhi, India, 2015.
6) **Mallick, R.B.** and **T. El-Korchi** *Pavement Engineering – Principles and Practice*, CRC Press, Taylor and Francis Group, Florida, USA, 2009.
7) **MEPDG-1.** *Mechanistic-Empirical Pavement Design Guide - A Manual of Practice*, Interim Edition, American Association of State Highway and Transportation Officials, Washington, D.C., USA, 2008.
8) **Papagiannakis, A.T.** and **E.A. Masad** *Pavement Design and Materials*, John Wiley and Sons, New Jersey, USA, 2008.
Yoder, E.J. and **M.W. Witczak** *Principles of Pavement Design*, Second Edition, John Wiley and Sons, New York, USA, 1975.

WHE-211: COMPUTATIONAL LABORATORY
Course Type: Core: Instruction: L-T-P-C: 0-0-4-2

Pre Requisite Courses: Nil

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

CO1	Understand the data types, sampling and choice of method to evaluate.
CO2	Perform data analysis and interpretation using programming tools and packages.
CO3	Perform statistical significance tests and derive conclusions from the results.
CO4	Construct statistical relationships and carryout validation from actual data.

Mapping of the Course Outcomes with Program Outcomes:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2			1					1
CO2	3	2		1	1	1				1
CO3	3	2		2	1	1				1
CO4	2	3	3	2	1	1	1		1	1

Note: 1: Slightly 2: Moderately 3: Substantially

Detailed Syllabus:
Data presentation
Exercise for measuring central tendency, dispersion and shape of data, graphical representation, plots and pattern, interpretation of results, and histograms by using MS office tools and other statistical packages.

Data sampling and description
Sampling exercises, data storing, handling, cleaning, and descriptive analysis exercises by using MS assess, excel and statistical tools.

Data Analysis and statistical inference
Exercise for fitting probabilistic distributions, correlation analysis, simple linear and multiple linear regressions, nonlinear regression, parametric and non-parametric tests, test of significance, paired and unpaired sample tests and evaluation, analysis of variance, univariate and multivariate analysis, time series analysis, data analysis with MS excel and statistical package.

Basics of Programming for data analysis:
R programming for statistical analysis and probability studies, applications of C++ /Java, Codeskulptor, python etc.

READING:
1. Bovas A., N. Nair U., *Quality Improvement through Statistical Method*, Springer Science & Business Media, 01-Aug-1998.
2. Clifford S., E. S. Park, Laurence R. R*., Transportation Statistics and Microsimulation*, CRC Press, Taylor and Francis group, 2011.
3. Dewhurst, Stephen C., *C++ Common Knowledge: Essential Intermediate Programming*, Addison-Wesley, 2005.
4. John C., *Software for Data Analysis: Programming with R*, Stanford University, Springer, 2008.
John G., *Introduction to Computation and Programming Using Python*, MIT, Press book, 2013.

WHE-022: TRAFFIC CONTROL AND MANAGEMENT
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	Understand the traffic regulations and control policies.
CO2	Design and suggest speed control measures for all types of roads.
CO3	Design traffic control systems for urban and rural roads.
CO4	Develop traffic management strategies at local level road network.

Detailed Syllabus:

Traffic control and regulations:
Traffic control and its necessity, types, emerging technologies, benefits, strategies, legislation related to traffic control, highway and urban road traffic acts, traffic control warrants, traffic control aids, road signs and signals for traffic control, placement of signs.

Speed control measures:
Free speed and speed limits, road works speed limit, highway speed control, speed control in residential areas, counter measures; speed humps, speed cushions, speed tables, raised intersection, center Island, surface treatments and markings, in-roadway warning lights, community awareness and education, speed enforcement, signs for speed control, case studies.

Urban and interurban traffic control:
Control variables, mid block and intersection traffic controls studies, arterial roads and network controls, traffic at isolated intersections and control, signals and controllers, basic signal design, bicycle and pedestrian considerations, vulnerable and disable road users work zone and school zone traffic control, control systems, special controls, measure of effectiveness, public transport priorities, signal coordination, interurban highways, high speed corridors, design of rural highways and control systems, high speed expressways, access control, design example and case studies.

Traffic management and strategies
Traffic management concepts, traffic monitoring, incident detecting and advising road users, traffic system and management centers, communication and information systems, methods of information disseminations, traffic segregation, diversions and one-way street, traffic operational management, exclusive lanes, integrated traffic management, ITS strategies for advanced traffic management, design examples.

Area Traffic Control:
Local level traffic planning and management, residential neighbourhood, street lighting equipment, maintenance and installation issues land use developments and traffic system, computer applications and traffic simulation, case studies.

READING:
1. Hamada Alshaer *Demanding Traffic Control and Management in Next Generation Networks,* Lap Lambert academic publishing, 2010
2. Institute of Transportation Engineers, Anurag Pande and Brian Wolshon, Traffic Engineering Handbook, Seventh Edition, John Wiley & Sons, New Jersey, 2016.
3. John E. Tyworth and Joseph L. Cavinato, Traffic Management: Planning, Operations and Control, Addison-Wesley Pub. Co., 1987
4. Laurence Olivo, Traffic Management, Emond Montgomery Publications, 2007
5. Michael Welzl, *Network Congestion Control: Managing Internet Traffic* Publisher: John Wiley & Sons, 2005

6. Myer Kutz, Editor, Handbook of Transportation Engineering Volume I & II, 2nd Edition, McGraw- Hill Professional, 2011

AUDIT 2: DISASTER MANAGEMENT AUD 102

Course Objectives: -Students will be able to:
1. learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. critically understand the strengths and weaknesses of disaster management approaches,
planning and programming in different countries, particularly their home country or the countries they work in.

SYLLABUS CONTENTS

Introduction
Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.
Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem.
Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.
Disaster Prone Areas In India
Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics
Disaster Preparedness And Management
Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.
Risk Assessment
Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.
Disaster Mitigation
Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

SUGGESTED READINGS:
1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi