AMR/TE/BOS/2024-25/MOM/1 Date: 25-09-2024

DEPARTMENT OF TRANSPORTATION ENGINEERING

MINUTES OF MEETING - BOARD OF STUDIES (BOS)

The Meeting of the Board of Studies of Transportation Engineering in civil engineering department was held on 25rd September 2024 at 03.45 PM through online (Zoom Meeting Platform). The following members were attended the online meeting.

S.No	Name of the Member	Designation/occupation	category	Signature
1	Dr. K. Sreekar Chand	Head of the Department	Chairman	
2	Dr. M.Swaroopa Rani	Professor, CE Department, UCEK, JNTUK Kakinada	University Nominee	
3	Dr. D. Srinivas	Associate Professor & HOD, Department of Architecture, School of planning and Architecture, Vijayawada	Subject experts outside parent university	
4	Dr. T. Chandra Sekhar Rao	Professor & HOD ,Bapatla Engineering College – ANU		
5	Mr.N .Dilip Kumar	Deputy Project Manager in Projects, DCE infra India Private Limited	Industrialist	
6	Mr.K.Ramu	Asst.Professor	Faculty Member	
7	Mrs. P. Madhuri Swaraj	Govt. Employee State Govt. of Andhra Pradesh	Alumni Member	

COURSES (TE)		
I Year – I SEM		
S.No.	**Title**	**Credits**
1	Advanced Highway Engineering	3
2	Advanced Traffic Engineering	3
3	Ground Improvement Technique	3
4	GIS for Transportation	3
5	Research Methodology and IPR	2
6	**Highway Aggregates Lab**	2
7	Bituminous Testing Lab	2
I SEM - TOTAL CREDITS		**18**

COURSES (TE)		
I Year – II SEM		
S.No.	**Title**	**Credits**
1	Pavement Analysis and Design	3
2	Transportation Planning	3
3	Environmental Impact Assessment	3
4	Highway Safety Engineering	3
5	Advanced Transportation Engineering Lab	2
6	Transportation Simulation Lab	2
7	Mini Project with Seminar	2
II SEM - TOTAL CREDITS		**18**

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1. The syllabus for Advanced Highway Engineering **(Annexure -1)**, Advanced Traffic Engineering **(Annexure -2)** , Ground Improvement Technique **(Annexure -3)**, GIS for Transportation **(Annexure -4)**, Research Methodology and IPR **(Annexure -5),** Highway Aggregates Lab**(Annexure -6),** Bituminous Testing Lab**(Annexure -7),** Pavement Analysis and Design **(Annexure -8),** Transportation Planning **(Annexure -9),** Environmental Impact Assessment **(Annexure -10),** Highway Safety Engineering **(Annexure -11),** Advanced Transportation Engineering Lab **(Annexure -12),** Transportation Simulation Lab **(Annexure -13),** and has been approved by the Board of Studies.

The following points were suggested for future possible implementations:

Prescribed Textbooks:

Advised to add recent prescribed textbooks or updated editions for the course.

References:

More references are recommended to be added for various topics.

Research Methodology and IPR:

The Board of studies has suggested to increase the lecture from 2 to 3 from the benefit of students and to maintain the credits.

Information Sharing:

All the updated information should be shared at least 15 days before the next Board of Studies (BOS) meeting.

The BOS chairman concluded the session and informed that the suggested points will be implemented and mail the same for approval and requested the experts to approve and ended with Vote of Thanks.

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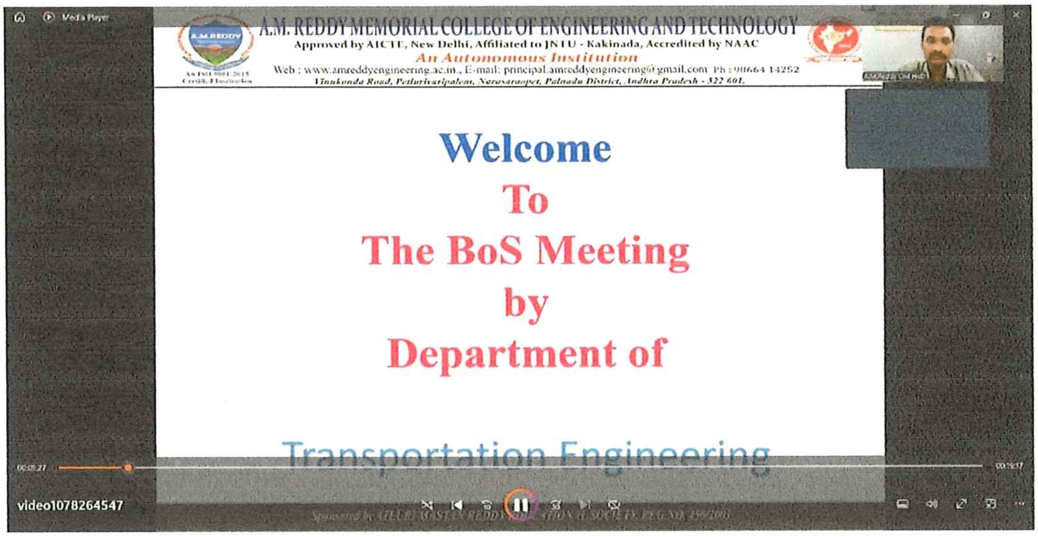

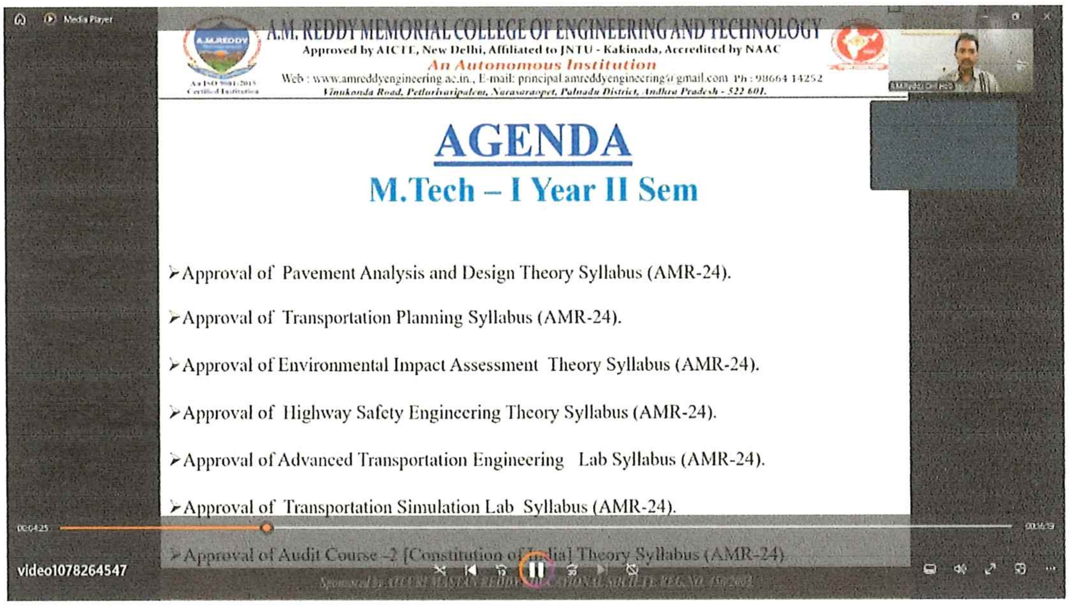

Chairman

BoS – Dept. of CE

HEAD OF THE DEPARTMENT
CIVIL ENGINEERING
A M REDDY MEMORIAL COLLEGE OF ENGG & TECH
PETLURIVARIPALEM
Narasaraopet, Md., Guntur (Dt.).

Copy to:

1. **Principal**
2. **IQAC**

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ANNEXURE -1

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Advanced Highway Engineering

UNIT –I

Geometric Design of Highways: Functional classification of Highway system; Design controls-Topography, Driver characteristics, Vehicle characteristics. Traffic, Capacity and Level of Service, Design speed. Objectives of Geometric Design. Road Margins - design specifications; Pavement surface characteristics - Skid Resistance, measurement of skid resistance; Road roughness, measurement of Road roughness; Camber design and standards.

UNIT - II

Horizontal and Vertical Alignment: Sight Distance - SSD, OSD and ISD. Horizontal curves, Super elevation; computing of super elevation; attainment of super elevation; Extra widening on curves; Transition curves - Objectives and Design. Gradients - Types of Gradients, Design Standards; Summit Curves, Valley curves and Design criteria. Combination of Vertical and Horizontal curves - Grade Compensation. Importance of Sight Distances for Horizontal and Vertical curves.

UNIT- III

Design of Intersections: Types of Intersections; Design Principles for Intersections; Design At-grade Intersections – Channelization, Objectives; Traffic Islands and Design standards Rotary Intersection - Concept, Advantages and Disadvantages; Grade separated Interchanges - Types, warrants and Design standards as per IRC.

UNIT-IV

Traffic Signs and Road Markings: Types of Road Signs; Guidelines for the provision of Road Signs; Caution Signs, Regulatory signs. Information signs - Design standards. Road markings - Objectives of Road markings; Types of Road Marking, Role of Road markings in Road Safety and Traffic Regulation; Specification for Road Marking Highway Appurtenances-Delineators, Traffic Impact Attenuators, Safety Barriers.

UNIT – V

Pedestrian Elements: Requirements of Pedestrians; Pedestrian facilities on Urban Roads; Cycle Tracks - Guidelines and Design standards; Bus bays-Types and Guide lines-Design of On street and Off street parking facilities - Guidelines for lay out Design. Design of Subways and foot over bridges

Suggested Reading

1. Principles and Practice of Highway Engineering, L.R.Kadiyali and N.B.Lal, Khanna Publications.
2. Text Book of Highway Engineering, R. Srinivasa Kumar, Universities Press, 2011. 3. Highway Engineering, C.E.G.Justo and S.K.Khanna, Nem Chand and Brothers 4. IRC Codes for signs, Markings and Mixed Traffic Control in Urban Areas.

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ANNEXURE -2

AMR- 24

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Advanced Traffic Engineering

UNIT-I

Basic Aspects of Traffic Engineering: Aim of traffic engineering, traffic stream components and characteristics, road user characteristics, vehicle characteristics, acceleration characteristics, measures of quality, measures of separation, relationship among traffic parameters and empirical relationships, mechanics of traffic flow, macroscopic approach, microscopic-approach and human factors approach, discrete distributions, binomial distribution, Poisson's distribution, exponential distribution, exponential distribution, normal distribution.

UNIT-II

Traffic Studies, Measurement and Analysis: Volume studies, speed studies, travel forecasting principles and techniques, design hourly volumes and speed, origin and destination studies, presentation of data and analysis, testing of hypothesis relating to improvements.

UNIT-III

Travel Time amid Delay Studies: Various uses, travel time and delay studies, various methods, data collection and analysis, density studies and headways, gap acceptance studies, intersection delay studies, traffic flow theory, queuing theory and simulation models.

UNIT-IV

Capacity Analysis of Traffic Facilities: Uninterrupted facilities, interrupted facilities, Level of Service, quality of service as per HCM, factors affecting LOS, computation of capacity and LOS, Measure of effectiveness, highway capacity and performance characteristics, intersection design.

UNIT-V

Traffic Control, Design and Regulation:

Traffic signals, types, principles of phasing, tune diagram, signalized intersection, saturation flow, saturation headway, capacity of lane group, concept of critical lane group, signal timing, phase plan, phase diagram, splitting of phase, clearance interval, pedestrian requirement, guidelines for protected movements, signal co-ordination, emerging themes, inter-modalism, access management, congestion management, environmental impact assessment.

Suggested Reading

1. Introduction to Traffic Engineering, R. Srinivasa Kumar, Universities Press, 2018.
Highway Capacity Manual, Transportation Research Board, National Research Council,
2. Washington, D.C., 2010.
3. Daganzo, C.R, Fundamentals of Transportation and Traffic Operations, Pergamon, Elsevier Science Inc., New York, 1997.
4. Salter, R.J., Traffic Engineering: Worked Examples, Macmillan, London, 1989.
Pignataro, L.J., Traffic Engineering: Theory and Practice, Prentice Hall, Englewood lifts, 1973.
5. Wohl, M. and Martin, B.V, Traffic System Analysis for Engineers and Planners, McGraw Hill, New York, 1983.

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ANNEXURE – 3

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AMR – 24

Ground Improvement Technique

UNIT- I

Introduction – Need for Engineering Ground – Classifications of Ground Modification Techniques – Suitability, Feasibility and Desirability. Densification of cohesionless soils – deep Compaction – Vibroflobation – Vibro Composer method Blasting – Densification at Ground. - Vibrocompaction - Heavy Tamping, Stability of foundation trenches and surrounding structures through soil Nailing.

UNIT-II

Stabilisation- Mechanical Stabilisation, Lime Stabilisation, CementStabilisation, Bitumen Stabilisation, Thermal Stabilisation and ChemicalStabilisation.

UNIT:-III

Dewatering and Grouting: - Dewatering methods – open sumps and ditches – gravity flow wells – Vacuum dewatering – Electro – kinetic dewatering – electrosmosis - Overview of grouting - Suspension grouts – Solution grouts – Methods of grouting – Grouting applications– Dams, Tunnels, Shafts and drifts, excavations.

UNIT-IV

Improvement of Cohesive soils – Preloading Soil Replacement – Radial Consolidation – Vertical and Radial Consolidation - Vertical Drains – Sand Drains – Effect of Smear – Sandwicks – Band drains – Dynamic Compaction.

UNIT-V

Stone Columns – Methods of installation of Stone Columns – Load shared by stone columns and the stabilized ground – uses of stone columns Lime columns and granular trenches – Installation – Improvements expected on Soil behavior. In situ ground reinforcement– ground anchors – types – Components and applications – uplift capability.

REFERENCE:

1. Construction and Geotechnical Methods in Foundation Engineering By R.M. Koerner, McGraw – Hill Book Co.
2. Current Practices in Geotechnical Engineering Vol.1, Alam Singh and Joshi, International Book Traders, Delhi, & Geo-Environ Academia.
3. Foundation Analysis and Design (1V Ed.) By J.E. Bowles, McGraw – Hill Book Co.,
4. Ground Improvement Techniques by P. Purushotham Raj, Laxmi Publications (P) Ltd., New Delhi.
5. Ground Improvement – Edited by M.P. Moseley, Blackie Academic & Professional.
6. Soil Mechanics for Road Engineers, H.M.S.O, Londan.
7. Ground Improvement Techniques by Bergado et al.

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ANNEXURE – 4

AMR – 24

GIS for Transportation

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UNIT-I

Introduction to GIS: Introduction, GIS over view, use of GIS in decision making, Data processing, Components of GIS, The GIS and the organization.

UNIT-II

Data Input and Output: Data input - Key board entry, Remotely and sensed data, existing digital data, census related data sets, Data output - Hard copy and soft, copy devices.

UNIT-III

Data Quality and Data Management: Components of data quality - Micro level, Macro level components, Sources of error, A note about data accuracy. The data base approach, 3 classic data models, Nature of geographic data, Spatial data models, Databases for GIS.

UNIT-IV

GIS Analysis, Functions and Implementation: Organizing geographic data for analysis, Maintenance and analysis of the spatial data and non-spatial attribute data and its integration output formatting. Awareness, Developing system requirements, Evaluation of alternative systems, System justification and Development of an implementation plan, System acquisition and start up, Operation of the system.

UNIT-V

Application of GIS in Transportation Engineering : Intelligent information system for road accessibility study, GIS data base design for physical facility planning, Decision support systems for land use planning. GIS applications in environment impact assessment, GIS based Highway alignment, GIS based road network planning, GIS based traffic congestion analysis and accident investigation.

REFERENCES:

GIS A Management, Perspenfi Stan Aronoff, WDL Publisher.

ANNEXURE – 5
AMR -24
Research Methodology and IPR

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UNIT – I

Research methodology: Objectives and motivation of research - Types of research - Research approaches - Significance of research - Research methods verses methodology - Research and scientific method - Importance of research methodology - Research process - Criteria of good research - Problems encountered by researchers in India - Benefits to the society in general. Defining the research problem: Definition of research problem - Problem formulation - Necessity of defining the problem - Technique involved in defining a problem.

UNIT – II

Literature survey: Importance of literature survey - Sources of information - Assessment of quality of journals and articles - Information through internet. Literature review: Need of review - Guidelines for review - Record of research review.

UNIT – III

Research design: Meaning of research design - Need of research design - Feature of a good design - Important concepts related to research design - Different research designs - Basic principles of experimental design - Developing a research plan - Design of experimental set-up - Use of standards and codes.

UNIT – IV

Data collection: Collection of primary data - Secondary data - Data organization - Methods of data grouping - Diagrammatic representation of data - Graphic representation of data - Sample design - Need for sampling - Some important sampling definitions - Estimation of population - Role of statistics for data analysis - Parametric vs. non parametric methods - Descriptive statistics - Measures of central tendency and dispersion - Hypothesis testing - Use of statistical softwares. Data Analysis: Deterministic and random data - Uncertainty analysis - Tests for significance - Chi-square - Student's t-test - Regression modeling - Direct and interaction effects – ANOVA - F-test - Time series analysis - Autocorrelation and autoregressive modeling.

UNIT – V

Research report writing: Format of the research report – Synopsis – Dissertation - Thesis - Its differentiation – References – Bibliography – Webliography - Technical paper writing - Journal report writing - Making presentation - Use of visual aids. Research proposal preparation: Writing a research proposal and research report - Writing research grant proposal.

References:

1.C.R Kothari, "Research Methodology, Methods & Technique", New Age International Publishers, New Delhi, 2004.

2.R. Ganesan, "Research Methodology for Engineers", MJP Publishers, Chennai, 2011.

3.RatanKhananabis and SuvasisSaha, "Research Methodology", Universities Press, Hyderabad, 2015.

4.Y.P. Agarwal, "Statistical Methods: Concepts, Application and Computation", Sterling Publishing Pvt.

5.Vijay Upagade and AravindShende, "Research Methodology", S. Chand & Company Ltd., New Delhi, 2009.

6.G. Nageswara Rao, "Research Methodology and Quantitative methods", BS Publications, Hyderabad, 2012.

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ANNEXURE – 6

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AMR – 24

Highway Aggregates Lab

1. Aggregate tests.
2. Tests on sub grade soils.
3. Soil stabilization tests.
4. California Bearing Ratio Test
5. Soil Classification & Grain size analysis.
6. Mini project based on field and laboratory studies and data collected.

Note: All tests as per IS, ASTM, AASHTO, TRL, IRC procedures/specifications and guidelines

ANNEXURE – 7

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AMR – 24

Bituminous Testing Lab

1. Bitumen and Tar Tests as per IS code provisions.
2. Benkelman beam test
3. Stone Polishing Value test
4. International Roughness Index test
5. Mix design for Bituminous mixes
6. Falling Weight Deflecto meter.
7. Mini project based on field and laboratory studies and data collected.

Note: All tests as per IS, ASTM, AASHTO, TRL, IRC procedures/specifications and guidelines

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ANNEXURE – 8
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Pavement Analysis and Design

UNIT-I

Pavement Types, Wheel Loads and Design Factors Definition of Pavement Types, Comparison of Highway pavements, Wheel Loads, Tyre pressure, Contact pressure, Design Factors: Traffic and Loading, Environment, Materials, Failure criteria, Reliability.

UNIT-II

Stresses in Pavements : Layered System Concepts: One Layer System: Boussinesq Theory. Two Layer Theory: Burmister's Theory. Three Layer System. Stresses in Rigid Pavements. Relative Stiffness of Slabs, Modulus of Subgrade Reaction, Stresses due to Warping, Stresses due to Friction, Stresses due to Load, IRC Recommendations.

UNIT-III

Pavement Design: IRC Method of Flexible Pavement Design, AASHTO Method of Flexible Pavement Design, IRC Method for Rigid Pavements, use of Geosynthatics in pavements.

UNIT-IV

Pavement Inventories : Serviceability Concepts, Visual Rating, Pavement Serviceability Index, Roughness Measurements, Measurement of Distress Modes Cracking, Rutting, Rebound Deflection using Benkleman Beam Deflection Method, Load Man Concept, Skid Resistance Measurement.

UNIT-V

Pavement Evaluation: Functional Pavement Performance Evaluation: AASHTO Method, Psycho Physical and Psycho Metric Scaling Techniques, Deduct Value Method. Beam Deflection Method, Pavement Distress Rating Technique. Design of Overlays by Benkelmen Beam Deflection Methods as per IRC – 81 - 1997 – pavements on problematic soils.

REFERENCES:

1. Yoder and Witzorack, "Principles of Pavement Design", John Willey and Sons.
2. Yang, H. Huang, "Pavement Analysis and Design", Prentice Hall Publication, Englewood Cliffs, New Jersy.
3. Sargious, M.A. Pavements and Surfacings for Highways and Airports – Applied science Publishers limited.
4. Ralps Hass and Hudson, W.R. " Pavement Management System" Mc-Graw Hill Book Company.
5. IRC codes of practice.

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ANNEXURE – 9
AMR – 24

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Transportation Planning

UNIT-I

Urban Transportation Problem Travel Demand: Urban Issues, Travel Characteristics, Evolution of Planning Process, Supply and Demand– Systems approach. 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.

UNIT-II

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.

UNIT-III

Four Stage Demand Forecasting : 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.

UNIT-IV

Mode Choice 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.

UNIT-V

Plan Preparation And Evaluation: Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis.

REFERENCES:

1. Introduction to Transportation Planning – M.J.Bruton; Hutchinson of London Ltd.
2. Introduction to Urban System Planning - B.G.Hutchinson; McGraw Hill.
3. Traffic Engineering and Transport Planning - Kadiyali L.R., Khanna Publishers
4. Lecture notes on UTP - Prof. S. Raghavachari ,R.E.C.Warangal.

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ANNEXURE – 10
AMR – 24

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Environmental Impact Assessment

UNIT-I

Introduction: Environment and its interaction with human activities – Environmental imbalances - Attributes, Impacts, 'Indicators and Measurements - Concept of Environmental Impact Assessment (EIA),Environmental Impact Statement, Objectives of EIA, Advantages and Limitations

UNIT-II

Environmental Indicators - Indicators for climate - Indicators for terrestrial subsystems - Indicators for aquatic subsystems - Selection of indicators - Socia-economic indicators - Basic information - Indicators for economy - Social indicators - Indicators for health and nutrition - Cultural indicators - Selection of indicators.

UNIT-III

Environmental issues in water resource development - Land use - Soil erosion C1nd their short and long term effects - Disturbance and long term impacts - Changes in quantity and quality of flow - Sedimentation Environmental impact assessment of waterresource development structures – Gase studies, Water Quality Impact Assessment - Attributes, Water Quality, Impact Assessment of Water. Resources Projects, Data Requirements of Water Quality Impact Assessment for Dams, Impacts of Dams on Environment, Case Studies.

UNIT-IV

Environmental Issues in Industrial Development: On-site and Off-site impacts during various stages of industrial development, Long term climatic changes, Green house effect, Industrial effluents and their impact on natural cycle, Environmental impact of Highways, Mining'and Energy development

UNIT-V

Methodologies for Carrying Environmental Impact Assessment: Overview of Methodologies Adhoc,Checklist, Matrix, Network, Overlays, Benefit Cost Analysis, Choosing A Methodology, Review Criteria.

REFERENCES:

1. Jain, R.K., Urban, L.V., Stracy, G.S., (1991), "Environmental Impact Analysis", Van Nostrand Reinhold Co., New York
2. Rau, J.G. and Wooten, D.C., (1996), "Environmental Impact Assessment", McGraw Hill Pub.Co.,New York
3. UNESCO, (1987), "Methodological Guidelines for the Integrated Environmental Evaluation of Water Resources Development", UNESCO/UNEP, Paris
4. Canter, L.W., (1997), "Environmental Impact Assessment", McGraw Hill Pub. Co., New York.

ANNEXURE – 11
AMR – 24

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Highway Safety Engineering

UNIT I

Introduction to safety: Road accidents, Trends, causes, Collision diagrams; Highway safety; Human factors and road user limitations; Speed and its effect on road safety; Vehicle factors; Highway safety in India.Multi-causal dynamic systems approach to safety; Crash Vs Accident; Road safety improvement strategies; Elements of a road safety plan, Safety data Needs; Safe vehicle design.

UNIT II

Statistical Interpretation and Analysis of Crash Data: Statistical Before-after methods in crash analysis, Recording of crash data; Accident Investigation and Analysis; testing Investigations, Case Studies.

UNIT III

Road Safety Audits: and the role of chance; Black Spot Identification and Key elements of a road safety audit, Road Safety Audits & Investigations, Work zone safety audit; Crash investigation and analysis, Methods for identifying hazardous road locations, Case Studies.

UNIT IV

Crash Reconstruction: Describe the basic information that can be obtained from the roadway surface, Understand basic physics related to crash reconstruction, speed for various skid, friction, drag, and acceleration scenarios, variables involved in jump and flip crashes, variables involved in pedestrian crashes, Case Studies.

UNIT V

Mitigation Measures: Accident prevention by better planning, Accident prevention by better design of roads, Crash Countermeasures, Highway operation and accident control measures, Highway Safety Measures during construction, Highway geometry and safety; Safety in urban areas; Public transport and safety; Road safety policy making, Stakeholders involvement; Road safety law.

References:

1. AthelstanPopkess, Traffic Control and Road Accident Prevention, Chapman and Hall, 1997 (Digitized 2008)
2. Ezra Hauer, Observational Before-After Studies in Road Safety, Pergamon Press, 1997 (reprinted 2002).
3. GeetamTiwari and Dinesh Mohan, Transport Planning and Traffic Safety: Making Cities, Roads, and Vehicles Safer, CRC Press, 2016.
4. Institute of Transportation Engineers (ITE), The Traffic Safety Toolbox: A Primer on Traffic Safety, ITE, 1999.
5. J. Stannard Baker, Traffic Collision Investigation, Northwestern University Center for Public Safety, 2002.

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ANNEXURE – 12
AMR – 24

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Advanced Transportation Engineering Lab

1. Volume Studies – Straight Roads and at Intersections
2. Speed Studies - Spot Speed Studies by Stop Watch, Enosocpe and Radar Speed Meter
3. Journey Time and Delay Studies - Floating Car Method
4. Parking Surveys and Parking Turnover Studies
5. Study of Gaps and Lags – Critical Gaps and Lags at Intersections
6. Delay Measurement at Signalised and Unsignalised Intersections
7. Traffic Diversion Analysis using diversion curves.
8. Videography Survey.
9. Road safety Audit.
10. Mini Project based on above studies.

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ANNEXURE – 13
AMR – 24

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Transportation Simulation Lab

1. Driver testing Experiments.
2. Intersection designs.
3. Signal Design.
4. Origin and Destination Studies.
5. Computer Software: Principles of TRIPS, CUBE, Demo Versions, Case studies.
6. Traffic Simulation studies using VISSIM.
7. Cellular applications.
8. Accident Studies.