

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**M. Tech in TRANSPORTATION ENGINEERING**  
**Effective from Academic Year 2019 - 20 admitted batch**
**R19 COURSE STRUCTURE AND SYLLABUS**
**I YEAR I – SEMESTER**

| Course Code                | Course Title                                                                         | L         | T        | P        | Credits   |
|----------------------------|--------------------------------------------------------------------------------------|-----------|----------|----------|-----------|
| Professional Core - I      | Urban Policy & Planning                                                              | 3         | 0        | 0        | 3         |
| Professional Core - II     | Pavement Material Characterization                                                   | 3         | 0        | 0        | 3         |
| Professional Elective - I  | 1. Traffic Engineering<br>2. Road Safety Engineering<br>3. Modeling & Simulation     | 3         | 0        | 0        | 3         |
| Professional Elective - II | 1. Remote sensing & GIS<br>2. Advanced Concrete Technology<br>3. Airport Engineering | 3         | 0        | 0        | 3         |
| Lab - I                    | Highway Material Characterization Lab                                                | 0         | 0        | 4        | 2         |
| Lab - II                   | Traffic Characterization Lab                                                         | 0         | 0        | 4        | 2         |
| MC                         | Research Methodology & IPR                                                           | 2         | 0        | 0        | 2         |
| Audit - I                  | Audit Course- I                                                                      | 2         | 0        | 0        | 0         |
| <b>Total Credits</b>       |                                                                                      | <b>16</b> | <b>0</b> | <b>8</b> | <b>18</b> |

**I YEAR II – SEMESTER**

| Course Code                 | Course Title                                                                                                 | L         | T        | P         | Credits   |
|-----------------------------|--------------------------------------------------------------------------------------------------------------|-----------|----------|-----------|-----------|
| Professional Core - III     | Traffic Analysis                                                                                             | 3         | 0        | 0         | 3         |
| Professional Core - IV      | Land use & Transportation Modelling                                                                          | 3         | 0        | 0         | 3         |
| Professional Elective - III | 1. Highway Project Formulation & Economics<br>2. Environmental Impact Assessment<br>3. Engineering of Ground | 3         | 0        | 0         | 3         |
| Professional Elective - IV  | 1. Highway Infrastructure Design<br>2. Rural Roads<br>3. Transportation Systems Management                   | 3         | 0        | 0         | 3         |
| Lab - III                   | Pavement Evaluation & Performance Lab                                                                        | 0         | 0        | 4         | 2         |
| Lab - IV                    | Traffic & Transportation Planning Studio Lab                                                                 | 0         | 0        | 4         | 2         |
|                             | Mini project with Seminar                                                                                    | 0         | 0        | 4         | 2         |
| Audit - II                  | Audit Course- II                                                                                             | 2         | 0        | 0         | 0         |
| <b>Total Credits</b>        |                                                                                                              | <b>14</b> | <b>0</b> | <b>12</b> | <b>18</b> |

**Audit Course 1 & 2:**

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by yoga
8. Personality Development Through Life Enlightenment Skills

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M.TECH.- I YEAR- I SEMESTER**  
**TRANSPORTATION ENGINEERING**

**URBAN POLICY AND PLANNING (PC – I)**

**Course Objectives:**

1. The course introduces students to the fundamentals of Urban transportation planning.
2. It familiarizes students with contemporary transportation planning issues and methods of analysis.
3. Relationships between transportation and urban land use systems and new tools to address environmental and quality of life impacts of transportation are presented.

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

1. Identify Urban transportation problems and understand the principles of planning.
2. Organize and conduct various types of surveys.
3. Apply travel demand estimation techniques.
4. Plan sustainable urban mobility and evaluate alternate improvements.
5. Identify design issues in metropolitan cities.

**UNIT - I:**

**Introduction:** Role of transportation in the Economic development of Nations, Overview of transport modes, growth trends, National Transport Policy of India – Case studies, Transportation planning in the developing world; and comparative International transportation policies; Fundamentals of transportation, Principles of planning, evaluation, selection, adoption, financing, and implementation of alternative urban transportation systems; formulation of community goals and objectives, inventory of existing conditions; transportation modeling trip generation, distribution, modal choice, assignment

**UNIT - II:**

**Data Collection And Inventories:** Collection of data – Organization 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:**

**Travel Demand issues:** Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Detailed approach on 4 step travel demand estimation; Sequential and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

**UNIT - IV:**

**Demand and Supply planning :** Planning for sustainable urban mobility, positive and negative externalities in urban transport, congestion pricing, parking policy, demand management, Urban travel and transportation system characteristics - a systems perspective, Data management and use in decision making, Demand analysis, Urban activity analysis, Supply analysis; 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

**UNIT - V:**

**Metropolitan Cities:** Design issues in urban mobility, integrating land use and transport planning; Overview of urbanization process, city structure and urban activity and infrastructure systems,

Economic and social significance of urban infrastructure systems; Transport's Role in tackling Social Inclusion, Economic Impacts of Transport Policy

**REFERENCE BOOKS:**

1. Introduction to Transportation Planning – M.J. Bruton; Hutchinson of London Ltd.
2. Introduction to Urban System Planning - B.G. Hutchinson; Mc Graw Hill.
3. Traffic Engineering and Transport Planning - Kadiyali L.R., Khanna Publishers
4. Lecture notes on UTP - Prof. S. Raghavachari , R.E.C. Warangal.
5. Metropolitan transportation planning – John W. Dickey, Tata Mc Graw Hill, New Delhi, 1975.

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**M.TECH.- I YEAR- I SEMESTER**  
**TRANSPORTATION ENGINEERING**

**PAVEMENT MATERIAL CHARACTERIZATION (PC – II)**

**Course Objectives:**

1. The main objective of this course is to provide students with a thorough understanding of the important factors in pavement design and analysis.
2. The focus will be on practices of pavement design of highway agencies.

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

1. Determine the proportions of ingredients required for the mix design of both asphalt mixtures and cement concrete.
2. Characterize the pavement materials including soil, aggregate, cement, asphalt mixtures, cement concrete.
3. Select appropriate asphalt binder for construction of a flexible pavement depending upon the traffic and climatic conditions.
4. Choose appropriate stabilization technique for pavement.
5. Understand the basic of cement & cement concrete mix characterization.

**UNIT - I**

**Subgrade Soil Characterization:** Properties of subgrade layers; different types of soils, Mechanical response of soil; Soil Classification; Index and other basic properties of soil; A critical look at the different laboratory and in-situ procedures for evaluating the mechanical properties of soils viz. SPT, DCPT, CPT, CBR, Plate Load test & resilient modulus; Suitability of different type of soil for the construction of highway embankments and pavement layers; Field compaction and control. Dynamic properties of soil: FWD test.

**UNIT - II**

**Introduction to Soil Stabilization:** Physical and Chemical modification: Stabilization with admixtures like cement, lime, calcium chloride, fly ash and bitumen. Grouting: Categories of grouting, Art of grouting, Grout materials, Grouting techniques and control. Introduction to Ground improvement techniques; Introduction to Geo textiles and synthetics applications.

**UNIT - III**

**Aggregate Characterization:** Origin, Classification, Types of aggregates; Sampling of aggregates; Mechanical and shape properties of aggregates, Aggregate texture and skid resistance, polishing of aggregates; Proportioning and Blending of aggregates: Super pave gradation, Fuller and Thompson's Equation, 0.45 power maximum density graph; Use of locally available materials in lieu of aggregates.

**UNIT - IV**

**Bitumen and Bituminous Concrete Mix Characterization:** Bitumen sources and manufacturing, Chemistry of bitumen, bitumen structure, Rheology of bitumen, Elastic modulus, Dynamic modulus, visco-elastic and fatigue properties, creep test, stiffness modulus of bitumen mixes using shell nomographs; Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties. Modified bitumen: Crumb Rubber Modified bitumen, Natural rubber modified bitumen, polymer modified bitumen; Introduction to emulsified bitumen and its characterization; Long term and short term ageing and its effect on bitumen performance, Tests to simulate ageing of bitumen viz. RTFOT and PAV.

Desirable properties of bituminous mixes, Design of bituminous mixes: Modified Marshall's specifications, Hubbard Field method of mix design, Hveem's method of mix design; Introduction to super pave mix design procedure

#### UNIT - V

**Cement and Cement Concrete Mix Characterization:** Types of cements and basic cement properties, Special cements; Quality tests on cement; Tests on cement concrete including compressive strength, flexural strength, modulus of elasticity and fatigue properties; Introduction to advanced concretes like self compacted concrete, Light weight concrete, Roller Compacted Concrete for pavement application; IS method of cement concrete mix design with case studies; Role of different admixtures in cement concrete performance; Joint fillers for Jointed Plain Cement Concrete Pavements and their characterization; Nano technology applications in cement concrete.

#### REFERENCE BOOKS:

1. Atkins, N. Harold, Highway Materials, Soils and Concretes, Fourth Edition, 2002, Prentice-Hall.
2. Kerbs Robert D. and Richard D. Walker, Highway Materials, McGraw-Hill, 1971.
3. Relevant IRC and IS Codes of Practices (Separate List will be given).
4. Read, J. And Whiteoak, D., "*The Shell Bitumen Handbook*", Fifth edition, Shell Bitumen, Thomas Telford Publishing, London 2003
5. Relevant IRC and IS codes

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**M.TECH.- I YEAR- I SEMESTER**  
**TRANSPORTATION ENGINEERING**

**TRAFFIC ENGINEERING (PE - I)**

**Course Objectives:**

1. This module focuses on traffic, its properties, measurement, simulation and control. It deals with traffic flow variables and their measurement. Survey methods and data analysis techniques required by traffic engineers are presented.
2. Introduction to highway capacity & level of service is dealt.
3. Parking analysis, traffic safety, traffic signal control, regulation, signal design is discussed.
4. Detrimental effects of traffic on environment, Air and Noise pollution are discussed.

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

1. Understand Basic traffic Characteristics
2. Understand the importance of capacity and LOS
3. Analyze design issues related to parking & traffic signal
4. To know the good understanding of Traffic Control, Regulation Signal Coordination:
5. Understand the detrimental effect of traffic on environment.

**UNIT - I**

**Traffic Characteristics Measurement And Analysis:** Basic traffic Characteristics - Speed, Volume and Concentration. Relationship between Flow, Speed and Concentration. Traffic Measurement and Analysis - Volume Studies - Objectives, Methods; Speed studies – Objectives, Definition of Spot Speed, time mean speed and space mean speed; Methods of conducting speed studies; Presentation of speed study data; Head ways and Gaps; Critical Gap; Gap acceptance studies.

**UNIT - II**

**Highway Capacity And Level Of Service:** Basic definitions related to capacity; Level of service concept; Factors affecting capacity and level of service; Computation of capacity and level of service for two lane highways, Multilane highways and freeways.

**UNIT - III**

**Parking Analysis and Traffic Safety:** Types of parking facilities – On-street parking and Off-street Parking facilities; Parking studies and analysis- Parking Inventory Study, Parking Usage Study By Patrolling, Questionnaire Survey, Cordon Surveys; Evaluation of parking parameters; Parking accumulation, Parking Load, Parking Turnover, Parking Index, Parking Volume. Traffic Safety - Accident studies and analysis; Causes of accidents - The Road, The vehicle, The road user and the Environment; Engineering, Enforcement and Education measures for the prevention of accidents.

**UNIT - IV**

**Traffic Control, Regulation Signal Coordination:** Traffic Signals –Types of Signals; Principles of Phasing; Timing Diagram; Design of Isolated Traffic Signal by Webster method, Warrants for signalization. Signal Coordination - Signal Co-ordination methods, Simultaneous, Alternate, Simple progression and Flexible progression Systems.

**UNIT - V**

**Traffic and Environment:** Detrimental effects of Traffic on Environment, Air pollution; Noise Pollution; Measures to curtail environmental degradation due to traffic. Sustainable Transportation: Sustainable modes, Transit Oriented Development, ITS based benefits for Environment.

**REFERENCE BOOKS:**

1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers.
2. Traffic Engineering - Theory & Practice - Louis J. Pignataro, Prentice Hall Publication.
3. Principles of Highways Engineering and Traffic Analysis - Fred Mannering & Walter Kilareski, John Wiley & Sons Publication.
4. Transportation Engineering - An Introduction - C. Jotin Khisty, Prentice Hall Publication
5. Fundamentals of Transportation Engineering - C.S. Papacostas, Prentice Hall India.
6. I.T.E. Traffic Engineering Hand Book.

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**TRANSPORTATION ENGINEERING**

**ROAD SAFETY ENGINEERING (PE - I)**

**Course Objectives:**

1. This course discusses the fundamentals of traffic engineering & some of the statistical methods to analyze the traffic safety.
2. The accident investigation and risk involved with measures to identify the causes are dealt.
3. The various traffic management systems for safety & safety improvement strategies are dealt.

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

1. To understand fundamentals of traffic engineering.
2. To investigate & determine the collective factors & remedies of accidents involved.
3. To design & plan road geometrics to improve safety.
4. Role of Urban infrastructure design in safety.
5. To conduct road safety audits.

**UNIT - I**

Fundamentals of Traffic Engineering - Basic Characteristics of Motor-Vehicle Traffic, Highway Capacity, Applications of Traffic Control Devices, Traffic Design of Parking Facilities, Traffic Engineering Studies; Statistical Methods in Traffic Safety Analysis – Regression Methods, Poisson Distribution, Chi- Squared Distribution, Statistical Comparisons.

**UNIT - II**

Accident Investigations and Risk Management, Collection and Analysis of Accident Data, Condition and Collision Diagram, Causes and Remedies, Traffic Management Measures and Their Influence on Accident Prevention, Assessment of Road Safety, Methods to Identify and Prioritize Hazardous Locations and Elements, Determine Possible Causes of Crashes, Crash Reduction Capabilities and Countermeasures, Effectiveness of Safety Design Features, Accident Reconstruction

**UNIT - III**

Road Safety in Planning And Geometric Design: Vehicle And Human Characteristics, Road Design and Road Equipments, Redesigning Junctions, Cross Section Improvements, Reconstruction and Rehabilitation of Roads, Road Maintenance, Traffic Control, Vehicle Design and Protective Devices, Post Accident Care

**UNIT - IV**

Role of Urban infrastructure design in safety: Geometric Design of Roads; Design of Horizontal and Vertical Elements, Junctions, At Grade and Grade Separated Intersections, Road Safety in Urban Transport, Sustainable Modes and their Safety.

**UNIT - V**

Traffic Management Systems for Safety, Road Safety Audits and Tools for Safety Management Systems, Road Safety Audit Process, Approach to Safety, Road Safety Improvement Strategies, ITS and Safety.

**REFERENCES BOOKS:**

1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers
2. Fundamentals of Transportation Engineering - C.S.Papacostas, Prentice Hall India.
3. Transportation Engineering – An Introduction, C.Jotin khisty, B. Kent Lall
4. Fundamentals of Traffic Engineering, Richardo G Sigua
5. Handbook of Road Safety measures, second Edition, Rune Elvik, Alena Hoyer, Truls Vaa, Michael Sorenson
6. Road Safety by NCHRP

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**TRANSPORTATION ENGINEERING**

**MODELLING & SIMULATION (PE - I)**

**Course Objectives:**

- The objectives of the course is to introduction concepts of modelling and sensitivity
- Simulation and its application are dealt.

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

- The assumptive approach and the minimization and maximization interfaces.
- The objectives and functions of sensitivity analysis.
- The concepts of locational and area modelling.
- Methods of simulation
- Applications of modelling and simulation.

**UNIT - I**

**Modelling in Transportation:** - Conceptualization, Assumptive approach, constraint, sensitization, limitations, interface, optimization, equalization, Minimization and Maximization interface in relation to transportation issues.

**UNIT - II**

**Sensitivity analysis:** - Changes in constraints, Maximization problems, Minimization problems, change in objectives function, sensitivity analysis.

**UNIT - III**

**Modelling frames for transportation:** - Location modelling in common areas, time modelling in reference to transportation, area modelling in reference land use. Fractal interface for smart city modeling, 3<sup>rd</sup> dimension modelling interface to infrastructure, link stabilization of mobility.

**UNIT - IV**

**Simulation:** - Conceptual leads, simulation methods, steps in simulation, simulation of traffic characteristics, case examples

**UNIT - V**

**Application of Modelling & Simulation;** - Traffic signal sensitization, traffic signal synchronization, Highway infrastructure modelling, deterioration of pavement modelling, supportive infrastructure modelling on optimal location.

**REFERENCES BOOKS:**

1. Fundamental of Traffic Engineering- M Shine & Rogers.
2. Traffic Flow Fundamental by AD may, prentice hall.
3. Principles of Highways Engineering and Traffic Analysis - Fred Mannering & Walter Kilareski, John Wiley & Sons Publication.
4. Mathematical programming Mik Wisniewski, Tony Dacre McGraw-Hill

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**TRANSPORTATION ENGINEERING**

**REMOTE SENSING AND GIS (PE - II)**

**UNIT- I**

Introduction: Energy-electromagnetic radiation, radiation principles, electromagnetic spectrum, ideal remote sensing system, energy interaction with atmosphere, atmospheric windows, Energy interaction with earth surface feature, spectral signature, Multi concept of remote sensing.

**UNIT- II**

Sensor System: Various types of platforms, different types of sensors, Indian remote sensing systems, data acquisition, spatial, spectral & radiometric resolution, thermal sensors, fundamentals of microwave remote sensing.

**UNIT- III**

Digital Image Processing: Operations involved in Digital Image Processing, source of image acquisition, data preprocessing – atmospheric, radiometric, geometric. Histograms, density slicing, grey level mapping, contrast stretching, filtering, principal component analysis, basic pattern recognition concepts, and discrimination functions. Data Products And Interpretation: Various data products, characteristics, principles of interpretation, ground control points, ground truth.

**UNIT- IV**

Geographic Information Systems: Definition, functions of GIS, types of data – spatial, non-spatial, point, line, polygon, vector and raster. Database, digitizer, scanner, spatial analysis, overlay, query. Sample analysis, modeling in GIS, DEM, DTM, path analysis. Introduction to GIS packages.

**UNIT- V**

Application of Remote Sensing and GIS to Water Resources Land Use Land Cover mapping, determination of crop characteristics, ground water, pollutant mapping, snow mapping, rainfall measurement, weather monitoring, soil erosion, soil classification, water shed prioritization, solid waste collection, water supply.

**REFERENCES:**

1. Meijerink M J, HAM de Brouwer, C M Mannaerts, C R Velenzuela, (1994), "Introduction to the Use of Geographical Information Systems for Practical Hydrology", ITC publication no. 23, UNESCO, Paris
2. Lillesand T M and R W Keifer (1994), "Remote Sensing and Image Interpretation", John Wiley & Sons, N York
3. Swain P H and S M Davis (1987), "Remote Sensing – The Quantitative Approach", McGraw-Hill Pub. Co. N York
4. Agarwal C S and P K Garg (2000), "Textbook on Remote Sensing in Natural Resources Monitoring and Management", Wheeler Publishing, Allahabad.

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**M.TECH.- I YEAR- I SEMESTER**  
**TRANSPORTATION ENGINEERING**

**ADVANCED CONCRETE TECHNOLOGY (PE - II)**

**Course Objectives:** This course will provide the students with

1. State-of-the art knowledge on durable and sustainable cement and concrete, on the various mineral additions and chemical admixtures to enhance the workability, strength, durability and sustainability of concrete,
2. It will empower them in the decision-making process regarding the various concrete products, construction procedures and performance test methods that will improve the durability and sustainability of concrete civil infrastructure.
3. This course will empower students to become technical leaders in the concrete. The materials science aspects of concrete production will be explored in the context of various performance criteria with emphasis on durability and sustainability.

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

1. Identify Quality Control tests on concrete making materials
2. Understand the behavior of fresh and hardened concrete
3. Understand the high strength concrete properties
4. Understand the properties and need of special concrete
5. Design form work

**UNIT - I**

**Concrete Making Materials:** Cement – Bogus Compounds – Hydration Process – Types of Cement – Aggregates – Gradation Charts – Combined Aggregate – Alkali Silica Reaction – Admixtures – Chemical and Mineral Admixtures.

**UNIT - II**

**Fresh and Hardened Concrete:** Fresh Concrete – workability tests on Concrete – Setting Times of Fresh Concrete – Segregation and bleeding.

Hardened Concrete: Abrams Law, Gel space ratios, Maturity concept – Stress strain behavior – Creep and Shrinkage – Durability Tests on Concrete – Non-Destructive Testing of Concrete.

**UNIT - III**

High Strength Concrete – Microstructure – Manufacturing and Properties – Design of HSC Using Erintroy Shaklok method – Ultra High Strength Concrete.

High Performance Concrete – Requirements and Properties of High-Performance Concrete – Design Considerations

**UNIT - IV**

**Special Concretes:** Self Compacting concrete, Polymer Concrete, Fibre Reinforced Concrete – Reactive Powder Concrete – Requirements and Guidelines – Advantages and Applications.

Concrete Mix Design: Quality Control – Quality Assurance – Quality Audit - Mix Design Method – BIS Method – DOE Method – Light Weight Concrete, Self Compacting Concrete.

**UNIT - V**

Form work – materials – structural requests – form work systems – connections – specifications – design of form work – shores – removal for forms - shores – reshoring – failure of form work.

**REFERENCES BOOKS:**

1. Special Structural concretes by Rafat Siddique, Galgotia Publications 2000.
2. Design of Concrete Mixes by N. Krishna Raju, CBS Publications, 2000.
3. Concrete: Micro Structure by P.K. Mehta, ICI, Chennai.
4. Properties of Concrete by A.M. Neville, ELBS publications Oct 1996.
5. Concrete Technology by A.R. Santhakumar, Oxford University Press Oct 2006.
6. Concrete Technology by M.S. Shetty, S. Chand & Co 2009.

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**TRANSPORTATION ENGINEERING**

**AIRPORT ENGINEERING (PE - II)**

**Course Objectives:**

1. The module introduces the Airport planning issues along with the designing of Runway.
2. The visual aids required from Airport Traffic operating are dealt with the necessary inputs required for efficient drainage system has significance in maintenance the airport.

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

1. Understand the regional planning concepts for an airport.
2. Design the runway length after considering the correction required for basic runway length.
3. Understand the Structural Design of Airport Pavements.
4. Understand the visual aids required for safe landing and takeoff operation of airport.
5. Analyze and design the Airport drainage.

**UNIT - I**

**Airport Planning:** General- Regional Planning- Development of New Airport- Data Required before Site Selection- Airport Site Selection- Surveys for Site Selection- Drawings to be prepared- Estimation of Future Air Traffic Needs.

**UNIT - II**

**Runway Design:** Runway Orientation- Basic Runway Length- Corrections for Elevation, Temperature and Gradient- Airport Classification- Runway Geometric Design- Airport Capacity- Runway Configurations- Runway Intersection Design.

**UNIT - III**

**Structural Design Of Airport Pavements:** Introduction- Various Design Factors- Design Methods for Flexible Pavement- Design Methods for Rigid Pavement- LCN System of Pavement Design- Joints in Cement Concrete Pavement- Airport Pavement Overlays- Design of an Overlay.

**UNIT- IV**

**Visual Aids:** General- Airport Marking- Airport Lighting.

**UNIT - V**

**Airport Grading And Drainage:** General- Computation of Earthwork- Airport Drainage- Special Characteristics and Requirements of Airport Drainage- Design Data- Surface Drainage Design- Subsurface Drainage Design.

**REFERENCE BOOKS:**

1. Airport Planning And Designing by S.K. Khanna, M.G. Arora.
2. Highway Engineering including Expressways and Airport Engineering by Dr. L.R. Kadyali, Dr.N.B. Lal.
3. Highway Engineering including Airport Pavements by Dr. S.K. Sharma.
4. Transportation Engineering by S.P. Chandola.

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**TRANSPORTATION ENGINEERING**

**HIGHWAY MATERIAL CHARACTERIZATION LAB (Lab – I)**

**Course Objectives:** The students will acquire knowledge about

1. Objective material characterization of aggregates.
2. Fundamental tests on Bitumen

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

1. Characterize the pavement materials.
2. Perform quality control tests on pavements and pavement materials.
3. Conduct test on Aggregate & bitumen.

**List of Experiments:**

**(A) Aggregate Characteristics**

1. Crushing Strength
2. Impact test
3. Shape tests  
Sieve analysis on Fine & Coarse aggregate (Gradation for different Layers in highway)
4. Los Angeles Abrasion Test
5. Specific gravity & Water absorption Test

**(B) Bitumen**

6. Penetration test
7. Softening point test
8. Ductility test
9. Flash & Fire point test
10. Specific gravity test
11. Viscosity Test
12. Marshall Stability Mix Design

**REFERENCES BOOKS:**

1. Highway Engineering – S.K. Khanna & C.E.G. Justo. New Chand & Brothers.
2. Highway material Testing - S.K. Khanna & C.E.G. Justo.
3. IRC: SP: 19; 2001, Manual For Survey, Investigation & Preparation of Road Projects.

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**TRAFFIC CHARACTERIZATION LAB (Lab – II)**

**Course Objectives:** The students will acquire knowledge about

1. Analyzing characteristics of traffic
2. Various parameter related to delay, speeds and headways

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

1. Gain Knowledge about various traffic surveys
2. Analyze traffic parameters for various studies.

**Traffic Characteristics Survey: -**

1. Classified Volume counts
2. Spot Speeds
3. Gap Acceptance
4. Headway-space & time mean
5. Delay studies
6. Volume-capacity-Competency for different highways
7. Lane discipline and its impact
8. Vehicle- Road-Median-clave impact analysis

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**TRANSPORTATION ENGINEERING**

**RESEARCH METHODOLOGY AND IPR**

**Prerequisite:** None

**Course Objectives:**

- To understand the research problem
- To know the literature studies, plagiarism and ethics
- To get the knowledge about technical writing
- To analyze the nature of intellectual property rights and new developments
- To know the patent rights

**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 emphasize 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-I:**

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-II:**

Effective literature studies approaches, analysis, Plagiarism, Research ethics

**UNIT-III:**

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-IV:**

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-V:**

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. 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.

**TEXT BOOKS:**

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

**REFERENCES:**

1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
3. Mayall, "Industrial Design", McGraw Hill, 1992.
4. Niebel, "Product Design", McGraw Hill, 1974.
5. Asimov, "Introduction to Design", Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
7. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. TRANSPORTATION ENGINEERING**

**ENGLISH FOR RESEARCH PAPER WRITING (Audit Course - I & II)**

**Prerequisite:** None

**Course objectives:** Students will be able to:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

**UNIT-I:**

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

**UNIT-II:**

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

**UNIT-III:**

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

**UNIT-IV:**

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,

**UNIT-V:**

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

**TEXT BOOKS/ REFERENCES:**

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's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. TRANSPORTATION ENGINEERING**

**DISASTER MANAGEMENT (Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:** Students will be able to

- learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- 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

**UNIT-I:**

**Introduction:**

Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

**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

**UNIT-II:**

**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.

**UNIT-III:**

**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.

**UNIT-IV:**

**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.

**UNIT-V:**

**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.

**TEXT BOOKS/ REFERENCES:**

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

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. TRANSPORTATION ENGINEERING**

**SANSKRIT FOR TECHNICAL KNOWLEDGE (Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:**

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

**Course Outcomes:** Students will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science & technology can be understood
- Being a logical language will help to develop logic in students

**UNIT-I:**

Alphabets in Sanskrit,

**UNIT-II:**

Past/Present/Future Tense, Simple Sentences

**UNIT-III:**

Order, Introduction of roots,

**UNIT-IV:**

Technical information about Sanskrit Literature

**UNIT-V:**

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

**TEXT BOOKS/ REFERENCES:**

1. "Abhyaspustakam" – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. TRANSPORTATION ENGINEERING**

**VALUE EDUCATION (Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:** Students will be able to

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

**Course outcomes:** Students will be able to

- Knowledge of self-development
- Learn the importance of Human values
- Developing the overall personality

**UNIT-I:**

Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

**UNIT-II:**

Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

**UNIT-III:**

Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness.

**UNIT-IV:**

Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

**UNIT-V:**

Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation, Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

**TEXT BOOKS/ REFERENCES:**

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. TRANSPORTATION ENGINEERING**

**CONSTITUTION OF INDIA (Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:** Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

**Course Outcomes:** Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

**UNIT-I:**

**History of Making of the Indian Constitution:** History Drafting Committee, (Composition & Working), **Philosophy of the Indian Constitution:** Preamble, Salient Features.

**UNIT-II:**

**Contours of Constitutional Rights & Duties:** Fundamental Rights Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

**UNIT-III:**

**Organs of Governance:** Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualification, Powers and Functions.

**UNIT-IV:**

**Local Administration:** District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

**UNIT-V:**

**Election Commission:** Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

**TEXT BOOKS/ REFERENCES:**

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. TRANSPORTATION ENGINEERING**

**PEDAGOGY STUDIES (Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:** Students will be able to:

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

**Course Outcomes:** Students will be able to understand:

- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

**UNIT-I:**

**Introduction and Methodology:** Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.

**UNIT-II:**

**Thematic overview:** Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

**UNIT-III:**

Evidence on the effectiveness of pedagogical practices, Methodology for the indepth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the scho curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

**UNIT-IV:**

**Professional development:** alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes

**UNIT-V:**

**Research gaps and future directions:** Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

**TEXT BOOKS/ REFERENCES:**

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.

3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. [www.pratham.org/images/resource%20working%20paper%202.pdf](http://www.pratham.org/images/resource%20working%20paper%202.pdf).

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. TRANSPORTATION ENGINEERING**

**STRESS MANAGEMENT BY YOGA (Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:**

- To achieve overall health of body and mind
- To overcome stress

**Course Outcomes:** Students will be able to:

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

**UNIT-I:**

Definitions of Eight parts of yog. (Ashtanga)

**UNIT-II:**

Yam and Niyam.

**UNIT-III:**

Do's and Don't's in life.

- i) Ahinsa, satya, asthaya, bramhacharya and aparigraha
- ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

**UNIT-IV:**

Asan and Pranayam

**UNIT-V:**

- i) Various yog poses and their benefits for mind & body
- ii) Regularization of breathing techniques and its effects-Types of pranayam

**TEXT BOOKS/ REFERENCES:**

1. 'Yogic Asanas for Group Training-Part-I': Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. TRANSPORTATION ENGINEERING**

**PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS**  
**(Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:**

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

**Course Outcomes:** Students will be able to

- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students

**UNIT-I:**

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

**UNIT-II:**

Neetisatakam-Holistic development of personality

- Verses- 52,53,59 (don't's)
- Verses- 71,73,75,78 (do's)

**UNIT-III:**

Approach to day to day work and duties.

- Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

**UNIT-IV:**

Statements of basic knowledge.

- Shrimad Bhagwad Geeta: Chapter 2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:

**UNIT-V:**

- Chapter 2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter 18 – Verses 37,38,63

**TEXT BOOKS/ REFERENCES:**

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.