Department of Civil Engineering

List of programs in School of Engineering and their POs & PSOs

1. **M.Tech Transportation Engineering**
   School of Engineering and Technology provides M. Tech. degrees in the following programmes:

1. PROGRAM OUTCOMES OF M. TECH TRANSPORTATION ENGINEERING

PO1. Engineering knowledge: Acquire in-depth knowledge of Transportation Engineering, including wider and global perspectives, with an ability to discriminate, evaluate, analyse and synthesise existing and new knowledge, and integration of the same for enhancement of knowledge.

PO2. Problem analysis: Analyse complex Transportation Engineering problems critically, apply independent judgement for synthesising information to make intellectual and/or creative advances for conducting research in a wider theoretical, practical and policy context.

PO3. Design/development of solutions: An ability to plan, analyse, design and implement engineering problems and design system components or processes to meet the specified needs.

PO5. Conduct investigations of complex problems: An ability to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO6. Modern tool usage:An ability to apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

Suresh Gyan Vihar University HOD Civil Department JAIPUR

M.Tech Transportation Engineering
Program Specific Outcomes:

PSO-1: Demonstrate the thorough knowledge of the profession and implement it for the enrichment of the quality of life in society.

PSO-2: Demonstrate design skills by using software and technical support.

PSO-3: Demonstrate the ability to undertake research projects in various fields of civil engineering using software and experimental techniques.

PSO-4: Demonstrate ability for teamwork and lifelong learning.

Paper Code	**TE 501**
Paper Title	**Transportation Planning**
Course outcomes	**Course Learning Outcomes are as listed below:**
CO 1	To understand urban activity system and travel patterns
CO 2	To know four-stage travel demand modelling
CO 3	To define the classical methods of urban transportation planning

Paper Code	**TE 503**
Paper Title	**Advanced Highway Material Characterization**
Course outcomes	**Course Learning Outcomes are as listed below:**
CO 1	To understand the concept of capacity
CO 2	To conduct traffic surveys
CO 3	To design the links and intersections
CO 4	To build safety into every aspect of design

Paper Code	TE 505
Paper Title	**Research Methodology & IPR**
Course outcomes	**Course Learning Outcomes are as listed below:**
CO 1	To apply the different numerical techniques to transportation problems
CO 2	To understand applications of probability theory
CO 3	To use regression and correlational analysis to process transportation data

Paper Code	TE 507
Paper Title	**Railway, Airports, Ports and Harbour**
Course outcomes	**Course Learning Outcomes are as listed below:**
CO 1	To understand the concept of capacity
CO 2	To conduct traffic surveys

CO 3	To design the links and intersections
CO 4	To build safety into every aspect of design

Paper Code	**CE 502**
Paper Title	**Pavement Analysis, Design and Construction**
Course outcomes	**Course Learning Outcomes are as listed below:**
CO 1	To know the stresses, strains and deflections in rigid and flexible pavements; traffic loading; and material characterization.
CO 2	To design methodologies for both rigid and flexible pavements
CO 3	To understand the structural and functions failure and the evaluation of pavements

Paper Code	**CE 504**
Paper Title	**Traffic Engineering & Modeling**
Course outcomes	**Course Learning Outcomes are as listed below:**
CO 1	To conduct the traffic surveys, roadside and household interviews
CO 2	To perform laboratory test on subgrade soil, aggregates and bitumen
CO 3	To carry out mix design for the CC pavement, GSB, DBM, SDBC, BC, etc.

Paper Code	CE 506
Paper Title	**Transportation-Environment Interaction and Analysis**
Course outcomes	Upon successful completion students should be able to:
CO 1	To understand the concept of capacity
CO 2	To conduct traffic surveys
CO 3	To design the links and intersections build safety into every aspect of design

Paper Code	CE 508
Paper Title	Sustainable Construction Engineering
Course outcomes	Upon successful completion students should be able to:
CO 1	Improved Project Planning

CO 2	More Efficient and Cost Effective Project Delivery
CO 3	Improved Infrastructure Management Decisions
CO 4	Safer more cost effective work technologies and processes

Paper Code	**CE 601**
Paper Title	Remote sensing and GIS
Course outcomes	Upon successful completion students should be able to:
CO 1	Understand the principles of aerial and satellite remote sensing, Able to comprehend the energy interactions with earth surface features, spectral properties of water bodies .
CO 2	Understand the basic concept of GIS and its applications, know different types of data representation in GIS.
CO 3	Illustrate spatial and non spatial data features in GIS and understand the map projections and coordinates systems

Paper Code	**CE 603**
Paper Title	Advanced Concrete Technology
Course outcomes	Upon successful completion students should be able to:
CO 1	understand the properties and test procedures of aggregate, bituminous materials, composites and recycled waste products.
CO 2	know the different types of bituminous pavement construction and its principles.
CO 3	Know the design of concrete structures.
CO 4	do bituminous and PCC mix design
CO 5	Understand few other special types of concrete.

SURESH GYAN VIHAR UNIVERSITY

Accredited by NAAC with 'A' Grade

Department of Civil Engineering

SYLLABI

(Session 2021-22)

Of

M.Tech - Transportation Engineering

Scheme and Syllabus

(Civil Engineering)

SURESH GYAN VIHAR UNIVERSITY

Department of Civil Engineering

Teaching and Examination Scheme for M. Tech.: Transportation Engineering

Session 2021-22

I YEAR **I Semester**

S.NO	Course Code	Course Name	Credit	Contact Hours/Week			Exam Hours	Weightage (%)	
				L	T/S	P		CE	ESE
PROGRAMME CORE									
1	TE 501	Transportation Planning	4	3	1	0	3	40	60
2	TE 503	Advanced Highway Material Characterization	4	3	1	0	3	40	60
3	TE 505	Research Methodology & IPR	4	3	1	-	3	40	60
4	TE 507	Railway, Airports, Ports and Harbours	4	3	1	0	3	40	60
5	TE 521	Pavement Design Laboratory	3	0	0	3		40	60
UNIVERSITY CORE									
6	PC 501	Proficiency in co-curricular activities	2	-	-	-	-	100	
7	EM 501	Employability skills	1	1	2	0	3	100	
UNIVERSITY ELECTIVE									
9		Students can opt from the list of university Elective							
		Total	**23**	**13**	**6**	**-**	**-**	**-**	**-**

Theory (17 Credit) + Lab (03 Credit) +Proficiency in Co-curricular Activities (2 Credit) + Employability skills (01 Credit) = 23 Credit

L= Lecture **T=Tutorial** **CE=Continuous Evaluation**
S= Seminar **P= Practical** **ESE= End Semester Examination**

SURESH GYAN VIHAR UNIVERSITY

Department of Civil Engineering

Teaching and Examination Scheme for M. Tech.: Transportation Engineering

Session 2021-22

I YEAR **II Semester**

S. No.	Course Code	Course Name	Credits	Contact Hrs/ Wk.			Exam. Hours	Weight age (%)	
				L	T/S	P		CE	ESE
PROGRAMME CORE									
1	TE 502	Pavement Analysis, Design and Construction	4	3	1	-	3	40	60
2	TE 504	Traffic Engineering & Modeling	4	3	1	-	3	40	60
3	TE 506	Transportation-Environment Interaction and Analysis	4	3	1	-	3	40	60
4	TE 510	Sustainable Construction Engineering	4	3	1	-	3	40	60
5	TE 552	Practical Training (4 Weeks)	3	-	-	-	3	60	40
6	TE 518	Traffic engineering lab	1	-	-	2	3	60	40
7	TE 556	SEMINAR	1	-	-	3	3	60	40
UNIVERSITY CORE									
8	PC 502	Proficiency in co-curricular activities	2	-	-	-	-	100	-
9	EM 502	Employability skills	1	1	3	0	3	100	
UNIVERSITY ELECTIVE									
11		Students can opt from the list of university Elective							
		Total	**25**	**13**	**7**	**5**			

Theory (18 Credit) + Lab (04 Credit) +Proficiency in Co-curricular Activities (2 Credit) + Employability skills (01 Credit) = 25 Credit

L= Lecture **T=Tutorial** **CE=Continuous Evaluation**

S= Seminar **P= Practical** **ESE= End Semester Examination**

SURESH GYAN VIHAR UNIVERSITY

Department of Civil Engineering

Teaching and Examination Scheme for M. Tech.: Transportation Engineering

Session 2021-22 **III SEM**

II YEAR

S. No.	Course Code	Course Name	Credits	Contact Hrs/ Wk.			Exam. Hours	Weight age (%)	
				L	T	P		CE	ESE
PROGRAMME CORE									
1	TE 601	Remote sensing and GIS	4	3	1	-	3	40	60
2	TE 603	Advanced ConcreteTechnology	4	3	-	-	3	40	60
3	TE 607	Dissertation phase I - Industrialproject	4	-	-	-	3	40	60
4	TE 663	SEMINAR	3	-	-	5	-	60	40
UNIVERSITY CORE									
5	PC 601	Proficiency in co-curricular activities	2	-	-	-	-	100	-
UNIVERSITY ELECTIVE									
		Students can opt from the list of university Elective							
		Total	**17**	**6**	**1**	**5**			
		Grand total		**12**					

Theory (8 Credit) + Lab (07 Credit) +Proficiency in Co-curricular Activities (2 Credit) = 17Credit

L= Lecture **T=Tutorial** **CE=Continuous Evaluation**

S= Seminar **P= Practical** **ESE= End Semester Examination**

SURESH GYAN VIHAR UNIVERSITY

Department of Civil Engineering

Teaching and Examination Scheme for M. Tech.: Transportation Engineering

Session 2021-22

II YEAR **IV SEM**

S. No.	Course Code	Course Name	Credits	Contact Hrs/ Wk.			Exam. Hours	Weight age (%)	
				L	T	P		CE	ESE
		A: Practical And Sessional							
1	TE 602	Dissertation II	18	-	-	4	3	60	40
		Total	**18**	**0**	**0**	**4**			
		Grand total	**16**						

TRANSPORTATION PLANNING

TE 501 **C(L,T,P) = 4 (3,1,0)**

Unit	Course Content	Contact Hours
I	**INTRODUCTION:** Objective, scope and outcome of the course **Introduction to transportation planning:** Fields of transportation Engineering; System- Environment Ensemble; Transportation planning process; Transportation problems and problem solving process.	7
II	**Transportation data and survey methods:** Type of Transportation data and its sources, Data quantity and quality, Accuracy and Precision, Sampling techniques, sample sizes, Transportation Planning surveys – Documentation searches, Person surveys, Household surveys, In-transit surveys, Road-side surveys, etc.	7
III	**Transportation Modes and Technologies:** Technologies of Transport and System Components, Network Analysis; Minimum Path Algorithms, Path Characteristics, Path-Vehicle Interaction – Discrete Flows and Continuous Flows, Vehicle and its Performance, System Performance, Vehicle and Container, Weight to Volume relation, Terminal Planning, Operational Planning.	7
IV	**Four-stage Sequential Planning:** Urban transportation planning process; trip generation, correlation analysis and regression analysis; trip distribution, Growth factor methods and Synthetic methods; modal split models, first generation, second generation, behavioural models; minimum travel path computations; Trip assignments, route assignment, multiple assignment and network assignment.	7
V	**Land use–Transportation Planning:** Urban Forms, mobility and activity hierarchy; accessibility-based early-era models; Lowery's model and its derivatives; Modern era models.	8
	Total	**36**

Textbooks:

1. B. G. Hutchinson, "Principles of Urban Transport Systems Planning" Scripta Book Co., Washington – 1974
2. Anthony J. Richardson, Elizabeth S. Ampt and Arnim H. Meyburg, "Survey Methods for Transport Planning" Eucalyptus Press, Australia- 1995
3. Roy Thomas, "Traffic Assignment Techniques", Avebury Technical, Aldershot, England – 1991

Reference books:

1. C A O'Flaherty, ed , "Transport Planning and Traffic Engineering", Butterworth Heinemann, Elsevier, Burlington, MA - 2006
2. C Jotin Khisty and B Kent Lall, "Transportation Engineering – An Introduction", Prentice Hall of India Pvt Ltd., New Delhi -2003

Advanced Highway Material Characterization

TE 503 **C (L,T,P) = 4 (3,1,0)**

Unit	Course Content	Contact Hours
I	**INTRODUCTION :** Objective, scope and outcome of the course **Aggregates:** Classification, physical and strength characteristics, proportioning of aggregates, Aggregate texture and skid resistance, polishing of aggregates.	7
II	**Soil:** Classification, Structural and Constructional problems in soil subgrade, Identification and strength tests, Soil-moisture movement, Sub-soil drainage, Soil stabilization, Characteristics and use of Fly Ash, Bottom ash and Pond Ash	8
III	**Bitumen:** Bitumen sources and manufacturing, Bitumen constituents, structure and Rheology, Mechanical and engineering properties of bitumen, Tests on bitumen, Emulsions, Tar – Properties, types, modifications, Durability of bitumen, Adhesion of bitumen, Modified bitumen.	8
IV	**Bituminous Mixes:** Desirable properties of mixes, Design of bituminous mixes, Tests on bituminous mixes, Fillers, Theory of fillers and specifications. Marshall, Hubbard Field & Hveam Methods.	7
V	**Cement Concrete:** Constituents and their requirements, Physical, plastic and structural properties of concrete, Factors influencing mix design, Design of concrete mixes for DLC and PQC with appropriate admixtures like flyash and high range water reducing admixtures etc.	7
	Total	**37**

Textbooks:

1. Krebs, Robert D. And Walker, R. D., "*Highway Materials*", McGraw Hill Book Co., New York-1971
2. Her Majesty's Stationery Office, "*Soil Mechanics for Road Engineers*", Ministry of Transport, Road Research Laboratory, UK- 1966
3. Her Majesty's Stationery Office, "*Bituminous Materials in Road Construction*", Ministry of Transport, Road Research Laboratory, UK -1966
4. Her Majesty's Stationery Office, "*Concrete Roads Design and Construction*", Ministry of Transport, Road Research Laboratory, UK-1966

Reference books:

1. Read, J. And Whiteoak, D., "*The Shell Bitumen Handbook*", Fifth edition, Shell Bitumen, Thomas Telford Publishing, London-2003
2. Relevant IRC and IS codes

RAILWAY, AIRPORTS, PORTS AND HARBOURS

TE 507 **C (L,T,P) 4(3,1,0)**

Unit	Course Content	Contact Hours
I	**INTRODUCTION :** Objective, scope and outcome of the course Railway: Transportation and its development, Long term operative plans for Indian Railways. Classification of Railway lines and their track standards, Railway terminology, Traction and tractive Resistance, Hauling capacity and tractive effort of locomotives, different Types of Tractions.	7
II	Permanent Way: Alignment Surveys, Requirement, gauges, track section, Coning of wheels, Stresses in railway track, high speed track. Geometric design of railway track, Gauge, Gradient, speed, super elevation, cant deficiency, Negative super elevation, curves, length of transition curves, grade compensations.	7
III	Airports: Development of Air Transportation in India: Airport site election. Modern aircrafts. Airport obstructions: Zoning Laws, Imaginary surfaces, Approach and Turning zone, clear zone, vert. Clearance for Highway & Railway.	7
IV	Runway and taxiway design: Windrose, cross wind component, Runway Orientation and confuguration. Basic runway length and corrections, runway geometric design standards. Taxiway Layout and geometric design standards. Taxiway and other areas. Air traffic control: Need, Network, control aids, Instrumental landing systems	7
V	Ports and Harbours: Importance of ports and harbours. Impact on Indian trade and economy, Plan of harbour, various components, jetty, dolphins, bollards, their design and functions.	8
	Total	**36**

Textbooks:

1. Railway Engineering, Saxena;, Dhanpat Rai Publication,
2. Airport Planning & Design, Goyal & Praveen Kumar, Galgotia Publication
3. Harbour, Dock And Tunnel Engineerin, R. Srinivasan ,Charoter publishing house

Reference books:

1. Railway Engineering by Rangwala
2. Airport Engineering Planning And Design (Pb 2020) by SAXENA S.C.

.

RESEARCH METHODOLOGY AND IPR

TE 505 **C (L,T,P) = 4 (3,1,0)**

Unit	Course Content	Contact Hours
I	**INTRODUCTION :** Objective, scope and outcome of the course 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.	7
II	Effective literature studies approaches, analysis, Plagiarism, Research ethics.	8
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.	8
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.	**7**
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.	**7**
	Total	**37**

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"

Reference books:

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 NewTechnological Age", 2016.
7. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

PAVEMENT DESIGN LAB

TE 521

List of Practical:	
S No.	**Tests for Pavement design and Evaluation**
1	To do estimation of Design MSA for a road
2	To do estimation of Design CBR
3	To perform Design of flexible pavement
4	To perform Design of Rigid pavement
5	To conduct Benkelman Beam test on road
6	To assess road safety features on a stretch of road
7	To perform Plate load test for calculating modulus of subgrade reaction
8	To do estimation of Group Index Value
9	To study california Resistance Value Method

Textbooks:

1. Highway Engineering – S.K. Khanna & C.E.G. Justo. New Chand & Brothers.

Reference books:

1. Highway material Testing - S.K. Khanna & C.E.G. Justo.

PAVEMENT ANALYSIS, DESIGN AND CONSTRUCTION

TE 502 **C (L,T,P) = 3(3,0,0)**

Unit	Course Content	Contact Hours
I	**Introduction:** Components of pavement structure, importance of sub-grade soil properties on pavement performance. Functions of sub-grade, sub-base, base course and wearing course. **Stresses in Flexible Pavements:** Stresses in homogeneous masses and layered systems, deflections, shear failures, equivalent wheel and axle loads.	8
II	**Elements in Design of Flexible Pavements:** Loading characteristics-static, impact and repeated loads, effects of dual wheels and tandem axles, area of contact and tyre pressure, modulus or CBR value of different layers, equivalent single wheel load, equivalent stress and equivalent deflection criterion, equivalent wheel load factors, climatic and environmental factors.	8
III	**Design Methods for Flexible Pavements:** California bearing ratio (CBR), U.S. Navy method. Triaxial method, Mcleod method, Boussinesq's and Burmister's analysis and design method, IRC method for Flexible Pavement Design	8
IV	**Rigid Pavements:** Wheel load stresses, Westergaard's analysis, Bradbury's approachArlington test, Pickett's corner load theory and charts for liquid, elastic and soil of finite and infinite depths of subgrade. IRC Method of rigid pavement design. **Temperature Stresses:** Westergaard's and Thomlinson's analysis of warping stresses, Combination of stresses due to different causes, Effect of temperature variation on RigidPavements.	7
V	**Road Construction:** Bituminous Road construction procedures and specifications, Quality control requirements. Concrete Road construction: Construction methods, Quality control requirements, Joints in cement concrete pavements, reinforced cement concrete road construction. IRC & MORTH recommendations for construction of Bituminous and Concrete roads. Present practices being followed for quality assurance and speedy construction in the country like by NHAI.	7
	Total	**38**

Textbooks:

1. Yoder, E.J. and Witczak, M.W., "Principles of Pavement Design 2nd Ed", John Wiley & Songs, Inc. – 1975
2. O'Flaherty, A. Coleman, "Highways : the Location, Design, Construction and Maintenance of Road Pavements", 4th Ed., Elsevier - 2006
3. Fwa, T.F., "The Hand Book of Highway Engineering", CRC Press Taylor & Francies Group – 2006

Reference books:

1. Khanna, S.K. and Justo, C.E.G., "Highway Engineering Nem Chand Jain & Bros, - 2005
2. Papagiannakis, A.T. and Masad, E.A., "Pavement Design and Materials, John Wiley & Sons Inc - 2008

TRAFFIC ENGINEERING & MODELING

TE 504 **C (L,T,P) = 3 (3,0,0)**

UNIT	Course Content	Contact Hours
I	**Introduction:** Elements of traffic engineering, issues for traffic engineers; road users, vehicles, highways and control devices, modelling concepts.	8
II	**Traffic Stream Characteristics**: Traffic stream parameters, Time Space diagram, relationship among q,k,u, Macroscopic Fundamental Diagrams (MFD).	7
III	**Design concept for intersection & facilities**: Concept of capacity and LOS, Operational analysis of two-way and all-way stop controlled intersections and Roundabouts by US and Indian methods, design of parking facilities, types of signals, Design of signals by Indian, US and British methods, signal coordination.	7
IV	**Time Series Analysis:** Basic Components of Time Series, Smoothening and Decomposition Methods, Data Filters, Auto Correlations and Moving Averages.	7
V	**Management Techniques:** Traffic calming; Congestion and road user pricing; priority movements; traffic regulations and control systems; use of intelligent systems.	7
	Total	36

Textbooks:

1. William R. Mcshane and Roger P. Roess, "Traffic Engineering", Pearson (4th Edition). 2013
2. Kadiyali, L.R., "Traffic Engineering and Transport Planning", Khanna Publishers. 2012
3. C A O'Flaherty, Ed , "Transport Planning and Traffic Engineering", ButterworthHeinemann, Elsevier, Burlington, MA2006

Reference books:

1. May, A.D., "Fundamentals of Traffic Flow", Prentice Hall, Inc. 2nd Ed. 1990
2. Carlos F. Daganzo. "Fundamentals of Transportation and Traffic Operations", Pergamon 1997
3. Simon P. Washington, Matthew G. Karlaftis and Fred L. Mannering, "Statistical and Econometric Methods for Transportation Data Analysis", 2nd Edition, CRC Press2011

TRANSPORTATION ENVIRONMENT INTERACTION AND ANALYSIS

TE 506 **C (L,T,P) = 3 (3,0,0)**

Unit	Course Content	Contact Hours
I	**Introduction:** Interaction of transportation systems and facilities with surrounding environment, Impact of transportation on surrounding environment, impact of surrounding environment on transportation systems.	7
II	**Impact on Natural Environment:** Air quality impacts - sources of air pollutants, effects of air pollutants, key legislations and regulations, impact prediction approaches, identification and incorporation of mitigation measures; Noise Impacts - Basic information, key legislation and guidelines, impact prediction methods, identification and incorporation of mitigation measures, Noise barriers and their design; Ground water and marine pollution impacts; Environmental capacities of streets, Environmental Impact statements.	8
III	**Impact on Land Use and Value:** Conceptual approach for addressing socio-economic impacts; Visual impacts and criteria, scoring methodologies for visual impact analysis; Relocation impacts; Land value impacted due to transportation facility; Spatial reorganization and Regional Development impacts.	7
IV	**Environmental Impact Analysis:** Concepts of environmental impact analysis, key features of National environmental policy act and its implementation, screening in the EIA process, utility and scope of EIA process, Environmental protection acts EIA at national level, Conceptual approach for environmental impact studies, planning and management of impact studies, matrix and network methodologies for impact identification, description of the affected environmental – environmental indices; Public Participation – Objectives, and techniques for conflict management and dispute resolution, verbal communication in EIA studies .	8
V	**Energy Issues in Transportation:** Energy consumption, alternate transportation fuels, energy conservation, energy contingency strategies, energy analysis information and methods, Transportation alternatives.	8
	Total	**38**

Textbooks:

1. CANTER, L.W., Environmental impact assessment, McGraw-Hill, 1997
2. Peter Morris & Riki Therivel, Methods of Environmental Impact Assessment, Routledge, 2001.
3. Denver Tolliver, Highway Impact Assessment, Greenwood Publishing Group, 1993.
4. Edward K Morlok, Introduction to transportation Engineering and Planning, Mc-Graw Hill Book Company, New Delhi

Reference books:

1. John W. Dickey and others, Metropolitan Transportation Planning, Tata McGraw-Hill Publishing Compant Ltd., New Delhi
2. C. Jotin Khisty and B Kent lall, Transportation Engineering – An introduction, Prentice-Hall of India Pvt Ltd, New Delhi.

SUSTAINABLE CONSTRUCTION ENGINEERING

TE 510 **C(L,T,P)=3(3,0,0)**

Unit	Course Content	Contact Hours
I	Fundamentals of Sustainable Construction Engineering- Sustainability and resources, need, present practices at national and international level, The Sustainability Quadrant- challenges & Issues, Government initiatives	8
II	Construction Product, Process Design and Development- Sustainability of construction resources, process modifications, product performance evaluation.	7
III	Sustainability assessment using standard approaches- LEED/GRIHA rating evaluation process.	7
IV	Socio-economic feasibility of sustainable construction products- Innovative & customized sustainable product design based on social constraints, tools & aids available for sustainable construction products.	7
V	Life Cycle Assessment and Costing-Various aspects related to construction cost, present value analysis, life cycle stages, cost calculation & measures, evaluation criteria, uncertainty assessment, sensitivity analysis, break even analysis.	7
	Total	**36**

Textbooks:

1. Sustainable Engineering Practice ASCE Publication 2010.
2. Hagger Sustainable Industrial Design and Waste Management, Techniz Book 2010.
3. Helmut Rechberger, Practical handbook of Material Flow Analysis, Taylor & Francis. 2010

Reference books:

1. Michael Z. Hou, Heping Xie, Jeoungseok Yoon Underground Storage of CO2 and Energy Taylor & Francis, 2010
2. LEED for India: Reference Guide, 2011.

TRAFFIC ENGINEERING LAB

TE 518 **C (L, T, P) = 1 (0,0,2)**

S. No.	The experiments may include:
1	To conduct Traffic volume data collection at midblock section in urban area and its analysis
2	To conduct Traffic volume data collection at rural highway section and its analysis
3	To conduct Categorized vehicle speed data collection at urban and rural sections and its analysis
4	To Derive flow relationships between flow characteristics based on volume and speed data collected
5	To do Speed and delay study using Moving observed method
6	To peform Volume study at a roundabout to examine its capacity
7	To perform Volume and speed study at a four legged intersection
8	To perform Parking study in a market or commercial area (accumulation and duration analysis)
9	To Analysis accident data procured from police stations

Remote sensing and GIS

TE 601 **C (L,T,P) = 4 (3,1,0)**

Unit	Course Content	Contact Hours
I	**INTRODUCTION:** Objective, scope and outcome of the course	7
II	**Introduction: Definitions of GIS** – Components of GIS – Geographic data presentation: maps – mapping process – coordinate systems – transformations – map projections – geo referencing - data acquisition.	8
III	**Geographic Data Representation, Storage, Quality and Standards**: Storage - Digital representation of data – Data structures and database management systems – Raster data representation – Vector data representation – Concepts and definitions of data quality – Components of data quality – Assessment of data quality – Managing data errors – Geographic data standards.	8
IV	**GIS Data Processing, Analysis and Modeling:** Raster based GIS data processing – Vector based GIS data processing – Queries – Spatial analysis – Descriptive statistics – Spatial autocorrelation – Quadrant counts and nearest neighbour analysis – Network analysis – Surface modeling – DTM.	7
V	**GIS Applications:** Applications of GIS in Environment monitoring – Natural hazard management, Transport Planning, Analysis and monitoring. Use of softwares related to GIS applications in Transportation Engineering.	7
	Total	**37**

Text books:

1. Lo, C.P. & Yeung A.K.W., Concepts and Techniques of Geographic Information Systems, Prentice Hall of India, New Delhi, 2006.
2. Anji Reddy, M., Remote Sensing and Geographical Information Systems, B.S.Publications, Hyderabad, 2001.
3. Burrough, P.A., Principles of Geographical Information Systems, Oxford Publication, 1998.
4. Clarke, K., Getting Started with Geographic Information Systems, Prentice Hall, New Jersy, 2010.
5. DeMers, M.N., Fundamentals of Geographic Information Systems, John Wiley & Sons, New York, 2002.

Reference books:

1. Geo Information Systems – Applications of GIS and Related Spatial Information Technologies, ASTER Publication Co., Chestern (England), 1992
2. Jeffrey, S. & John E., Geographical Information System – An Introduction, Prentice-Hall, 1990
3. Marble, D.F., Galkhs HW & Pequest, Basic Readings in Geographic Information Systems, Sped System Ltd., New York, 1984.

ADVANCED CONCRETE TECHNOLOGY

TE 603 **C (L,T,P) = 3 (3,0,0)**

Unit	Course Content	Contact Hours
I	**INTRODUCTION:** Objective, scope and outcome of the course **Cement:** composition and reaction mechanism	7
II	**Concrete containing cementitious material:** Use of fly ash, silica fume and GGBFS in concrete, reaction mechanism, properties of fresh and hardened concrete	7
III	**Structural Concrete:** High Strength concrete, high performance concrete, Self-compacting concrete, ready mix concrete, polymer concrete: materials, admixtures, applications and properties of fresh and hardened concrete	8
IV	**Fiber Reinforced Concrete**: constituent materials and properties, mechanics of fiber reinforced concrete, properties of fresh and hardened concrete	8
V	**Durability of concrete:** Carbonation, chloride ingress, corrosion, sulphate attack, freezing and thawing: Factors affecting, effects, mechanisms, prevention and control **Creep and Shrinkage**: Factors affecting, effects, mechanisms, prevention and control	8
	Total	38

Text Books:

1. A.M. Neville, “Properties of Concrete”, Pearson Education, 1995

2. A.M. Neville & J.J. Brooks, “Concrete Technology”, Addison- Wesley, 1999

Reference books:

1. P.K. Mehta & P.J.M. Monterio, “Concrete”, ICI, 1999

HS 501 SOFT SKILLS TRAININIG I C (L, T, P) = 1 (1,1,0)

Unit	Course Contents	Hours
I	Spoken English – PICTURE (p=pronunciation, I=inflection, C=Clarity & courtesy, T=Tone, U=Understanding and feedback, R=Rate of speech and Repeatition, E=Emphasis), Body Language Training, Active Listening	8
II	Introduction to business terms, Economic Times Reading, Communication skills	8
III	Johari Window Training, Firo-B Training, Relationship Management	10
IV	Role Plays, Conflict Management	7
V	I'm OK U'r OK Training, Time Management Training	6
	Total	39

HS 502 SOFT SKILLS TRAININIG II C (L, T, P) = 1(1,0,0)

Unit	Course Contents	Hours
I	Making impact making business presentations	6
II	Team Management and Collaborative Work Culture	8
III	Training in Anchoring and Public Speaking	6
IV	Emotional Intelligence Training	7
V	Business Games, Business Etiquettes	10
	Total	37