HINDUSTAN
INSTITUTE OF TECHNOLOGY & SCIENCE
(DEEMED TO BE UNIVERSITY)
CHENNAI

M.Plan. (TRANSPORTATION PLANNING)

(Duration: 2 Years)

CURRICULUM

(Applicable for Students admitted from Academic Year 2022-23)

SCHOOL OF PLANNING, ARCHITECTURE & DESIGN EXCELLENCE

HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE

HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE

Motto:

To Make Every Man *a* Success *and* No Man *a* Failure

Vision:

To be an International Institute of Excellence, providing a conducive environment for education with a strong emphasis on innovation, quality, research and strategic partnership blended with values and commitment to society.

Mission:

- *To create an ecosystem that promotes learning and world class research.*
- *To nurture creativity and innovation.*
- *To instil highest ethical standards and values.*
- *To pursue activities for the development of the Society.*
- *To develop national and international collaborations with institutes and industries of eminence.*
- *To enable graduates to become future leaders and innovators.*

Value Statement:

Integrity, Innovation, Internationalization.

SCHOOL OF PLANNING ARCHITECTURE AND DESIGN EXCELLENCE (SPADE)

Vision:

To facilitate the creation of built environment by adopting holistic approaches to promote sustainable development in Architecture, Planning & Design.

Mission:

- *To qualify students to address concerns of the 21st century and making them globally competent.*
- *To empower students by imparting Architecture, Planning & Design knowledge in diverse areas with social commitment.*
- *To enable them to handle the complexities of modern requirements and encouraging exploration, innovation and creative experimentation in shaping the living environment.*

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):
The program is expected to enable the students to

PEO - 1	*Graduands will be future transport planners equipped with adequate skills required to comprehend traffic and transportation planning issues in the urban and regional context and to analyze it through its physical, socio-economic, cultural, political and ecological dimensions of the human settlements.*
PEO - 2	*Graduands will be professionals who are sensitized about the various facets of transportation planning for human settlements and who have the required analytical skills needed for performing the assigned task related to transport planning process, its plan formulation and implementation.*
PEO - 3	*Graduands will be able to prepare sustainable development plans via transportation planning by understanding the characteristics of the city.*

PROGRAMME'S OUTCOMES (PO'S):

At the end of this program, graduates will be able to

- *Develop communication skills through drawn, visual, verbal and written representations of transportation planning propositions by understand their cultural, professional, and technical implications.*
- *To involve them in group work so that the team building becomes the nature of their work for the comfortable outcomes in the field they choose.*
- *Create awareness of traditional values and historic significances of transportation planning systems in the past and apply them.*
- *Practical skills for spatial planning through studio and lab exercises.*
- *Integrating theory and studio contents and application of theoretical inputs in the transportation planning studio.*
- *To study history and theory of urban and regional planning and their relevance with transportation planning process and implementation.*
- *To learn mapping and survey techniques and spatial standards.*
- *To study the demographic data and apply GIS in transportation planning.*
- *To equip with study advanced planning techniques.*

PROGRAMME'S SPECIFIC OUTCOMES (PSO'S):

The graduates of M. Plan (Transportation Planning) program will be able to

1. *PSO-1: Prepare a comprehensive mobility plan for an urban and regional setting with emerging concepts like sustainability following a systematic process of analyzing various alternatives with the adoption of modern transportation planning theories that includes physical, social, economic, geographical, political and cultural aspects of people and their lifestyle.*
2. *PSO-2: Use of latest software tools and other appropriate and innovative techniques pertaining to transportation planning and management in a wide range of documentation, presentation, analysis and applications for implementation of comprehensive mobility plans.*
3. *PSO-3: Perform a systematic research on their specific area of interest in the domain of transportation planning for the welfare of the society and profession.*

M. PLAN (TRANSPORTATION PLANNING)

SEMESTER - I									
SL. NO	**COURSE CATEGORY**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
THEORY									
01.	PC	TPA3701	Road Planning and Design	2	0	0	2	2	2
02.	PC	ARC3702	Energy, Climate Change and Urban Development	3	0	0	3	1	3
03.	PC	ARC3703	Planning Theory and Techniques	3	0	0	3	1	3
04.	PC	TPA3704	Infrastructure, Socio-Economic Aspects of Planning and Housing	2	0	0	2	2	2
05.	PC	TPA3705	GIS and Remote Sensing Techniques for Transport Planning	3	0	0	3	1	3
06.	MLC	ZZZ4715	Research Methodology and IPR	2	0	0	2	1	2
STUDIO									
07.	PC	TPA3791	Transport Planning Studio – I (Area Planning)	0	0	10	5	2	10
TOTAL				**15**	**0**	**10**	**20**	**10**	**25**
L – Lecture ; T – Tutorial ; P – Practical ; C – Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER II									
SL. NO	**COURSE CATEGORY**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
THEORY									
01.	PC	TPA3706	Urban Transport Planning	3	0	0	3	1	3
02.	PC	TPA3707	Transport Modelling	3	0	0	3	1	3
03.	PC	TPA3708	Transport Economics and Financing	3	0	0	3	1	3
04.	ELE	E1	Elective – I	2	0	0	2	1	2
05.	PC	TPA3709	Land Use and Transport Planning	2	0	0	2	1	2
06.	OE	OE	Open Elective / Other subject from M. Plan	3	0	0	3	1	3
STUDIO									
07.	PC	TPA3792	Transport Planning Studio – II (Urban Planning - CMP)	0	0	10	5	3	10
			Summer Internship	Minimum 2 months					
TOTAL				**16**	**0**	**10**	**21**	**9**	**26**
L – Lecture ; T – Tutorial ; P – Practical ; C – Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER III									
SL. NO	**COURSE CATEGORY**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
THEORY									
01.	PC	TPA3710	Intelligent Transportation Systems	3	0	0	3	1	3
02.	PC	TPA3711	Transport Policy & Institutional Framework	2	0	0	2	1	2
03.	PC	TPA3712	Regional Transport Planning	2	0	0	2	1	2
04.	ELE	E2	Elective – II	2	0	0	2	1	2
STUDIO									
04.	PC	TPA3793	Transport Planning Studio – III (Regional Planning)	0	0	12	6	-	12
05.	PC	TPA3898	Transport Planning Thesis – Phase I	0	0	10	5	-	10
06.	MLC	TPA3897	Evaluation of Summer Internship				2		
TOTAL				**8**	**0**	**22**	**22**	**4**	**31**
L – Lecture ; T – Tutorial ; P – Practical ; C – Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER IV									
SL. NO	**COURSE CATEGORY**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
Studio									
01.	PC	TPA3899	Transport Planning Thesis - Phase II	0	0	24	12	11	24
			TOTAL	**0**	**0**	**24**	**12**	**11**	**24**
L – Lecture ; T – Tutorial ; P – Practical ; C – Credit; S- Self Study; TCH- Total Contact Hours									

TOTAL NUMBER OF CREDITS: 75

Note:

- 2 hours of Studio (P) = 1 Credit
- 1 hour of Lecture (L) = 1 Credit
- TCH = Total contact hours.

LIST OF DEPARTMENTAL ELECTIVES WITH GROUPING - SEMESTER WISE									
Elective No	**SEMESTER**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
ELECTIVE - I									
I	II	TPA3721	Airport and Railway Planning and Management	2	0	0	2	1	2
	II	TPA3722	Environmental Impact Assessment of Transportation Projects	2	0	0	2	1	2
	II	TPA3723	Traffic Control and Road Safety	2	0	0	2	1	2
ELECTIVE - II									
II	III	TPA3724	Transport Infrastructure Finance and Investment Appraisal	2	0	0	2	1	2
	III	TPA3725	Transport Infrastructure Design	2	0	0	2	1	2
	III	TPA3726	Logistics Planning and Management	2	0	0	2	1	2

PROGRAMME STRUCTURE

PSO I	PSO II	PSO III
Prepare a comprehensive mobility plan for an urban and regional setting with emerging concepts like sustainability following a systematic process of analyzing various alternatives with the adoption of modern transportation planning theories that includes physical, social, economic, geographical, political and cultural aspects of people and their lifestyle.	*Use of latest software tools and other appropriate and innovative techniques pertaining to transportation planning and management in a wide range of documentation, presentation, analysis and applications for implementation of comprehensive mobility plans.*	*Perform a systematic research on their specific area of interest in the domain of transportation planning for the welfare of the society and profession.*
• *Develop communication skills through drawn, visual, verbal and written representations of transportation planning propositions by understand their cultural, professional, and technical implications.* • *To involve them in group work so that the team building becomes the nature of their work for the comfortable outcomes in the field they choose.*	• *Practical skills for spatial planning through studio and lab exercises.* • *To learn mapping and survey techniques and spatial standards.* • *To study the demographic data and apply GIS in transportation planning.*	• *Create awareness of traditional values and historic significances of transportation planning systems in the past and apply them.* • *To equip with study advanced planning techniques.*

• *Integrating theory and studio contents and application of theoretical inputs in the transportation planning studio.* • *To study history and theory of urban and regional planning and their relevance with transportation planning process and implementation.*		
Road Planning and Design	GIS and Remote Sensing Techniques for Transport Planning	Research Methodology and IPR
Energy, Climate Change and Urban Development	Transport Planning Studio – I (Area Planning)	Transport Planning Thesis – Phase I
Planning Theory and Techniques	Transport Planning Studio – II (Urban Planning - CMP)	Transport Planning Thesis - Phase II
Infrastructure, Socio-Economic Aspects of Planning and Housing	Summer Internship	
Urban Transport Planning	Transport Planning Studio – III (Regional Planning)	
Transport Modelling		
Transport Economics and Financing		

Land Use and Transport Planning		
Intelligent Transportation Systems		
Transport Policy & Institutional Framework		
Regional Transport Planning		
Airport and Railway Planning and Management		
Environmental Impact Assessment of Transportation Projects		
Traffic Control and Road Safety		
Transport Infrastructure Finance and Investment Appraisal		
Transport Infrastructure Design		
Logistics Planning and Management		

SEMESTER – I

COURSE TITLE	ROAD PLANNING AND DESIGN			CREDITS	2
COURSE CODE	TPA3701	COURSE CATEGORY	PC	L-T-P-S	2-0-0-2
Version	1.0	Approval Details		LEARNING LEVEL	BTL - 4

ASSESSMENT SCHEME			
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project / Surprise Test / Quiz	ESE
15%	20%	15%	50%

Course Description	**The course aims to familiarize students with the road planning and its design, focusing on traffic fundamentals, design of the road infrastructure including intersections, traffic management systems and traffic surveys.**
Course Objective	1. To infer the basic concepts of traffic engineering and its fundamentals which includes road dimensions and norms. 2. To analyze the road infrastructure facilities with respect to its dimensions and demand. 3. To analyze the intersections and the junctions in the road network with respect to standards and norms. 4. To discuss the traffic management and safety systems being followed and its implications in road network planning. 5. To infer the various traffic and transport planning surveys and its implications.
Course Outcome	Upon completion of this course, the students will be able to 1. Infer on the basic concepts of traffic engineering and its fundamentals. 2. Analyze the road infrastructure facilities with respect to its dimensions and demand 3. Analyze the intersections and the junctions in the road network with respect to standards and norms. 4. Discuss the traffic management and safety systems being followed in Indian conditions and its implications in road network planning. 5. Discuss the various traffic and transport planning surveys and its usefulness in transport planning studios.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PS O-3
CO-1	1	1	3	1	-	-	3	-	2	3	-	-
CO-2	1	1	1	1	2	-	3	-	2	3	-	-
CO-3	1	1	1	1	2	-	3	-	2	3	-	-
CO-4	1	1	-	1	-	-	3	-	2	3	-	2
CO-5	1	1	1	1	-	-	3	-	2	3	-	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION TO BASIC CONCEPTS OF TRAFFIC	**(8)**
Definition, concepts, scope and utility of traffic engineering; relationship between the traffic flow variables, fundamental diagrams of traffic flow; Definition of capacity and level of service, factors affecting capacity and level of service, static and dynamic PCU, Design service volume, capacity norms for urban roads with different widths.	**CO-1 BTL-2**
MODULE 2: DESIGN OF URBAN ROAD INFRASTRUCTURE	**(6)**
Urban Road cross-sectional elements- right of way, carriageway, median, service lane, footpath, curb, camber, side slope, service road etc. for different hierarchy of urban roads; geometry of horizontal curves and vertical curves of urban roads, super elevation, sight distance, access control etc. along urban roads; Street Lightings types and design; guard rails; traffic signs and marking; NMT facilities, road landscape design features on urban roads.	**CO-2 BTL-4**
MODULE 3: DESIGN OF INTERSECTIONS	**(6)**
Types of intersections, visibility, Design principles – alignment and vertical profile, visibility, radii of curves, channelization; roundabouts- capacity and design; capacity of signalized intersection; Grade separated intersection design elements- ramp gradient, acceleration and deceleration lanes, weaving sections, etc.	**CO-3 BTL-4**
MODULE 4: TRAFFIC MANAGEMENT SYSTEMS AND SAFETY	**(6)**
Introduction to traffic signals, warrant for signals, phasing and inter green period, saturation flow, optimization of signals, Vehicle actuated signal facilities, coordination of traffic signal, area traffic control system; Basic principles of regulation and its enforcement; Traffic management measures, Transport System Management techniques, Road safety- collection and analysis of accident data, accident prevention strategies.	**CO-4 BTL-2**

MODULE 5: TRANSPORT PLANNING SURVEYS AND STUDIES	(4)
Urban transport planning process; study area delineation, zoning; data needs; surveys and studies; analytical outputs and their use. Origin and Destination – Parking Survey	**CO-5 BTL-2**

TEXT BOOKS	
1	L.R. Kadiyali, Traffic Engineering and Transportation Planning, Khanna Publishers, 2011.
2	O'Flaherty, A. Coleman, Highways: the Location, Design, Construction and Maintenance of Road Pavements, 4th Ed. , Elsevier, 2006.
REFERENCE BOOKS	
1	A. Veeraragavan, S.K. Khanna and C.E.G. Justo, Highway Engineering, Nem Chand & Brothers, 2014.
2	Nicholas J. Garber, and Lester A. Hoel, Principles of Traffic and Highway Engineering, Cengage Learning India, 2nd Edition, 2010.
3	Institute of Transportation Engineers, Anurag Pande and Brian Wolshon, Traffic Engineering Handbook, Seventh Edition, John Wiley & Sons, New Jersey, 2016.
	Fred L. Mannering, Scott S. Washburn, Kilareski Walter P., Principles Of Highway Engineering And Traffic Analysis, Wiley India Pvt Ltd., 4th Edition, 2011.
E BOOKS	
1.	https://www.amazon.in/Understanding-Traffic-Systems-Analysis-Presentation-ebook/dp/B06XDPMGVW
2.	https://www.worldcat.org/title/traffic-planning-and-engineering/oclc/644083015
MOOC	
1	https://www.mooc-list.com/course/highway-engineering-openlearning
2	https://www.openlearning.com/courses/highway-engineering-skaa-2832/?cl=1

COURSE TITLE	**ENERGY, CLIMATE CHANGE AND URBAN DEVELOPMENT**		**CREDITS**		**3**
COURSE CODE	**ARC3702**	**COURSE CATEGORY**	**PC**	**L-T-P-S**	**3-0-0-1**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL - 2**
ASSESSMENT SCHEME					
First Periodical	**Second**	**Seminar/ Assignments/ Project /**			**ESE**

Assessment	Periodical Assessment	Surprise Test / Quiz	
15%	**20%**	**15%**	**50%**
Course Description	**The course will equip students with various aspects and impacts of climate change and energy consumption. It will enable them in understanding the role of urban planning in energy management and adapting to impacts of climate change.**		
Course Objective	1. To generalize the importance of climate change and the resources available in the earth. 2. To discuss the various facets of energy generation, consumption and future needs of energy. 3. To distinguish the various methods adopted to manage energy though urban planning techniques. 4. To predict the effects of climate change in urban areas. 5. To discuss the various means through which energy is managed		
Course Outcome	Upon completion of this course, the students will be able to- 1. Discuss climate change and importance of resources available in the earth. 2. Infer different aspects of energy generation, consumption and its future needs. 3. Estimate the various methods for managing energy through urban planning techniques. 4. Discuss the effects of climate change on urban areas. 5. Distinguish between various means of energy and resource management.		
Prerequisites: NIL			

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO -6	PO -7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	**1**	**2**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO-2	**1**	**-**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO-3	**1**	**2**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**3**	**-**	**2**
CO-4	**1**	**-**	**-**	**-**	**3**	**2**	**-**	**-**	**2**	**3**	**-**	**2**
CO-5	**1**	**2**	**-**	**-**	**3**	**2**	**-**	**-**	**2**	**3**	**-**	**2**

1: Weakly related, 2: Moderately related and 3: Strongly related	
MODULE 1: INTRODUCTION	**(12)**
Land and resources - Sustainable policies and programs – Conservation of water and other resources - Optimal utilization of energy through mixed land uses and clustered developments – Protection of coastal resources and reduction of ecological footprint. Understanding Climate Change: Greenhouse gases, Anthropogenic causes, Carbon Cycle, Global Warming, ozone depletion –Inventory of GHGs, Urban Heat Islands International and National Efforts: United Nations Framework Convention on Climate Change.	**CO-1 BTL-2**
MODULE 2: ENERGY GENERATION AND CONSUMPTION	**(9)**
Energy Supply and Demand, Energy Consumption in cities, determinants of energy demand. Renewable and alternate source of energy. Energy issues. An Assessment of Population Development and its Implications on Settlements, Buildings and Resource Consumption with Particular Focus on Energy Consumption.	**CO-2 BTL-2**
MODULE 3: ENERGY PLANNING & MANAGEMENT, AND MITIGATION & ADAPTATION TO CLIMATE CHANGE	**(9)**
Energy efficient development, Compact city form, Transit oriented development. Mechanisms and measures for mitigating and adapting to climate change at various levels. Energy Management, traditional and contemporary approaches with respect to energy, water, manpower, etc.	**CO-3 BTL-2**
MODULE 4: URBAN CLIMATOLOGY AND CLIMATE CHANGE	**(9)**
Urban climatology, effects of thermal pollution, factors causing heat sink effects, direct radiation, climatic effects on Urban areas, control techniques. Climate Change and City Planning, application of Energy code. Inherent uncertainties that accompany climate change which affects urban planning.	**CO-4 BTL-2**
MODULE 5: RESOURCE MANAGEMENT	**(6)**
Resource depletion -impacts on air, water, land, human health, quality of life. Resource regions, their problems and potentials. Resource management, traditional and contemporary approaches. Resource management in view of Climate change.	**CO-5 BTL-2**
TEXT BOOKS	
1	David Owen Green Metropolis: Why Living Smaller, Living Closer, and Driving Less are the Keys to Sustainability, 2009.
REFERENCE BOOKS	

1	S.K Dash Climate change: an Indian perspective, New Delhi, Cambridge University Press, 2007.
2	Jenks, Mike; Burgess, Rod Compact cities: Sustainable urban forms for developing countries, Spon Press, London, 2000.
3	Bicknell, Jane Adapting cities to climate change: understanding and addressing the development Change, Earthscan, London, 2009.
4	Andres Duany, Jeff Speck and The Smart Growth Manual, McGraw-Hill Mike London, 2009
E BOOKS	
1.	https://www.kobo.com/us/en/ebook/energy-and-climate-in-the-urban-built-environment
MOOC	
1	https://www.coursera.org/learn/globalenergyandclimatepolicy?

COURSE TITLE	**PLANNING THEORY AND TECHNIQUES**			**CREDITS**	**3**
COURSE CODE	**ARC3703**	**COURSE CATEGORY**	**PC**	**L-T-P-S**	**3-0-0-1**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL - 4**
ASSESSMENT SCHEME					
First Periodical Assessment	**Second Periodical Assessment**	**Seminar/ Assignments/ Project / Surprise Test / Quiz**			**ESE**
15%	**20%**	**15%**			**50%**
Course Description	**The course will enable students with various theories and concepts of city planning followed not just in India but worldwide. It will equip them with various aspects of demography and population projection methods. Students will learn various types of plans involved in urban planning process and there significance in city development.**				

Course Objective	1. To Discuss the evolution of Cities and the city building process in India and abroad. 2. To infer the various theories associated with the growth of the cities. 3. To demonstrate the various emerging concepts associated with the growth of the cities. 4. To discuss the source and importance of demography in the plan preparation process. 5. To relate the various types of plans developed in our country and its objectives from time to time.
Course Outcome	Upon completion of this course, the students will be able to- 1. Discuss the process of city building and evolution of cities in Indian and foreign context. 2. Discuss the various theories associated with growth of cities 3. Classify the various emerging concepts associated with growth of cities. 4. Infer the importance of demography in plan preparation process. 5. Analyze the various types of plans developed in India from time to time.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	1	2	3	-	-	3	-	-	-	3	-	-
CO-2	1	2	3	-	-	3	-	-	-	3	-	-
CO-3	1	2	3	1	-	2	-	-	2	3	-	2
CO-4	1	2	3	-	-	-	-	3	3	3	-	-
CO-5	1	2	3	1	2	-	-	-	-	3	-	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: EVOLUTION AND PLANNING HISTORY	**(12)**
Relevance of the study of evolution of settlements; Hunter, gatherer, farmer and formation of organized society; Cosmological and other influences, origins and growth of cities, Human settlements as an expression of civilizations; Town planning in ancient India; Medieval, renaissance, industrial and postindustrial cities; City as a living spatial entity; Concepts of landmark, axis, orientation; City form as a living space; City as a political statement: New Delhi, Chandigarh, Washington D.C. Brasilia etc;	**CO-1 BTL-2**
MODULE 2: THEORIES OF CITY DEVELOPMENT	**(9)**

Land use and land value theory of William Alonso; Ebenezer Howard's Garden City Concept; and Green Belt Concept; City as an organism: a physical, social, economic and political entity; Emerging Concepts: global city, inclusive city, safe city, etc.; City of the future and future of the city; Shadow cities, divided cities; Theories of city development including Concentric Zone Theory, Sector Theory, Multiple Nuclei Theory and other latest theories;	**CO-2 BTL-2**
MODULE 3: EMERGING CONCEPTS IN PLANNING THEORIES	**(6)**
Models of planning: Advocacy and Pluralism in Planning; Systems approach to planning: rationalistic and incremental approaches, mixed scanning and middle range planning; Equity planning; Political Economy Model.	**CO-3 BTL-3**
MODULE 4: DEMOGRAPHY	**(9)**
Sources of demographic data in India, Settlement type, growth pattern and structure: urban settlement analysis, Concentration: spatial, vertical and size, periurban sprawl, economic base; Rural Settlements – Size, occurrence and character, transformation, Policies towards various size class settlements. Population structure and composition – Age, sex, gender, marital status, caste, religion, literacy level, etc.; Age - sex ratio, structure, pyramid; dependency ratio; occupational structure; Fertility; mortality, migration analysis, natural growth of population, migration and its implications in spatial planning;	**CO-4 BTL-2**
MODULE 5: TYPES OF PLANS	**(9)**
Master plan, Development Plan, Detailed Development Plan, Regional Plan, structure Plan and Plan making process, Deficiency, Delineation of Planning area, Assessment of developmental issues, Plan period and phasing, Projection of requirements, Formulation of aim and objectives, Development proposals and land use planning, Delineation of zones, Resource mobilization, Implementation mechanism, Monitoring and review, Role of Public Participation.	**CO-5 BTL-4**
TEXT BOOKS	
1	Kavita Datta and G.A. Jones, 'Housing and Finance in Developing Countries', Routledge, London, 2010.
2	Rao, P.S.N. Urban Governance and Management Kanishka Pub. and IIPA, New Delhi, 2005.
REFERENCE BOOKS	
1	Government of India National Urban Housing and Habitat Policy, Ministry of Housing and Urban Poverty Alleviation, New Delhi, 2007.

2	Glaesar, Bernhard Housing, Sustainable Development and Rural Poor Sage, New Delhi, 2015
3	Friedrichs, J Affordable Housing and the Homeless Walter de Grugten & Co, Berlin, 2008.
E BOOKS	
1	https://www.routledge.com/The-Routledge-Handbook-of-Planning-Theory/Gunder-Madanipour-Watson/p/book/9780367331955
2	https://www.kobo.com/ww/en/ebook/population-studies-and-development-from-theory-to-fieldwork
MOOC	
1	https://www.coursera.org/lecture/sustainability/demographic-transition-o0DZ1

COURSE TITLE	**INFRASTRUCTURE, SOCIO-ECONOMIC ASPECTS OF PLANNING AND HOUSING**		**CREDITS**		**2**
COURSE CODE	**TPA3704**	**COURSE CATEGORY**	**PC**	**L-T-P-S**	**2-0-0-2**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL - 2**
ASSESSMENT SCHEME					
First Periodical Assessment	**Second Periodical Assessment**	**Seminar/ Assignments/ Project / Surprise Test / Quiz**			**ESE**
15%	**20%**	**15%**			**50%**
Course Description	**The course will enable students with the basics of sociology and economics and its relation to housing and built environment. The other part of the course concentrates on the role of physical and social infrastructure planning and its role in the overall urban planning.**				

Course Objective	1. To infer the sociological and economic concepts and its relation to cities. 2. To discuss the importance of housing sector in the overall built environment and in the development fabric of the city. 3. To defend the role of infrastructure planning and their contribution in the overall growth of the urban area. 4. To infer the standards with respect to social infrastructure facilities in the country 5. To infer the standard for the physical infrastructure facilities in our country
Course Outcome	Upon completion of this course, the students will be able to- 1. Associate the role of sociology and economics in the city development process. 2. Explain the role played by the housing sector in the overall development of the city. 3. Estimate the importance of infrastructure planning and its level of service in achieving the desired outcome of the urban area. 4. Infer to the overall development of the space and the contribution of social infrastructure facilities in achieving the same. 5. Infer to the overall development of the space and the contribution of physical infrastructure facilities in achieving the same.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	1	1	-	-	3	-	-	-	-	3	-	-
CO-2	1	1	-	-	3	-	-	-	-	3	-	-
CO-3	1	1	-	1	3	-	-	-	1	3	-	-
CO-4	1	1	-	2	3	-	-	-	1	3	-	2
CO-5	1	1	-	2	3	-	-	-	1	3	-	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: NATURE AND SCOPE OF SOCIOLOGY & ECONOMICS (8)

Sociological concepts and methods, man and environment relationships; Socio-cultural profile of Indian society and urban transformation; Tradition and modernity in the context of urban and rural settlements; Agglomeration economics - Economics of scale - Multiplier effect-concepts and scope - Economic base of cities and region - Understanding economic base and changing spatial structure of urban areas.	**CO-1 BTL-2**

MODULE 2: HOUSING AND BUILT ENVIRONMENT	(6)
Significance of housing in national development goals; Housing as a basic entitlement - core issues of housing, factors affecting residential location, theoretical knowledge of ecological, neo-classical, institutional approach to housing; estimating housing shortage, housing need, current methods of demand assessment, typologies of housing, housing norms; Densities and standards; Urban sprawl and environmental damages; Gender based planning of neighborhoods and human settlements.	**CO-2 BTL-2**
MODULE 3: INTRODUCTION TO INFRASTRUCTURE PLANNING	**(5)**
Importance of infrastructure, objectives of the utilities, services planning and implications on public health and environment; Economic - introduction to policies and programmes in infrastructure planning; Issues and concerns of maintaining the utilities and services, need and importance of service level benchmarks of water supply, sanitation, sewerage, solid waste and transportation.	**CO-3 BTL-2**
MODULE 4: SOCIAL INFRASTRUCTURE	**(6)**
Types of social infrastructure; Health care - essential service, availability, access and utilisation, standards, public and private institutions, policies, National Rural Healthcare Mission, hierarchy of health care establishments; Education - primary and secondary educational institutions, standards, policies, right to education (RTE); Public and community spaces – recreational, safety and security.	**CO-4 BTL-2**
MODULE 5: PHYSICAL INFRASTRUCTURE	**(5)**
Role of physical planner in planning of utilities and services; Systems and network layouts of Water supply distribution system, storm water drainage system, sewerage system, Rainwater harvesting and land requirements; Design principles of utilities; Collection, treatment, distribution and disposal aspects of solid waste management; Power generation, distribution and transmission; design standards of utilities.	**CO-5 BTL-2**

TEXT BOOKS

1	William G. Flanagan Urban Sociology-images and Structures Rowman & Littlefield Publishers Inc, 2010.
2	Centre for Science & Environment, State of India's Environment – A Citizen Report, CSE, New Delhi, 2006.

REFERENCE BOOKS

1	Charles Correa, Housing and Urbanization. Thames and Hudson, New York, 2000.
2	Government of India National Urban Housing and Habitat Policy Ministry of Housing and Urban Poverty Alleviation, New Delhi, 2007.

3	Santen J.D. and Liptan, T.W. Sustainable Storm Water Management: A Landscape Driven Approach to Planning and Design, Timber Press, Portland, Oregon, 2017.
4	Chandrappa R., Das D.B. Solid Waste Management: Principles and Practice, Springer, Heidelberg, 2012.
5	D N Dwivedi Principles of Economics Vikas Publishing House, 2006.
6	Karl E. Case Principles of Economics Pearson Education, 2009.
E BOOKS	
1	https://www.icevirtuallibrary.com/doi/book/10.1680/ip.27473
2	https://link.springer.com/book/10.1007/978-3-030-48559-7
MOOC	
1	https://www.edx.org/course/urban-infrastructure-management
2	https://www.edx.org/course/smart-cities-management-of-smart-urban-infrastru-2

COURSE TITLE	**GIS AND REMOTE SENSING TECHNIQUES FOR TRANSPORT PLANNING**		**CREDITS**		**3**
COURSE CODE	**TPA3705**	**COURSE CATEGORY**	**PC**	**L-T-P-S**	**3-0-0-1**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL - 4**
ASSESSMENT SCHEME					
First Periodical Assessment	**Second Periodical Assessment**	**Seminar/ Assignments/ Project / Surprise Test / Quiz**			**ESE**
15%	**20%**	**15%**			**50%**
Course Description	**The course will enable students to understand the various applications of Geo informatics systems and its current development in shaping the planning profession. The course will also outline the role of geo informatics in transportation planning and management in various cities.**				

Course Objective	1. To discuss the importance of geo-informatics and its basic utilization in the field of transport planning. 2. To infer the role of Geo-informatics including 3D modelling technique in transportation planning profession. 3. To infer the role of geo-informatics management in traffic and transportation planning and management. 4. To summarize the application of geo-informatics in transportation planning. 5. To develop a project based application of geo-informatics system in transportation planning
Course Outcome	Upon completion of this course, the students will be able to- 1. Associate the various introduction about geo informatics utilized in the field. 2. Discuss the role of geo-informatics systems including 3D modelling techniques in transportation planning. 3. Infer on the role of geo-informatics management system in transportation planning. 4. Discuss the role of geo-informatics in transportation planning. 5. Develop a project based application of geo-informatics system in transportation planning.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	1	1	-	3	-	-	3	3	3	3	3	-
CO-2	1	1	-	3	-	-	-	3	3	3	3	-
CO-3	1	1	-	1	-	-	-	-	3	3	3	-
CO-4	1	1	-	1	-	-	-	3	3	3	3	-
CO-5	-	3	-	3	2	-	2	3	3	3	3	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION TO GEO-INFORMATICS (9)

Definitions – Geoinformatics, Remote Sensing, Geographic Information Systems (GIS), Spatial Data Infrastructure; the concept of earth surface projections and geoids; limitations of Database management system (DBMS), engineering drawings and CADD packages – the need for GIS, Spatial and non-spatial data, raster and vector data, spatial thematic models.	**CO-1 BTL-2**

MODULE 2: GEOGRAPHIC INFORMATION SYSTEMS FOR TRANSPORT PLANNING (9)	
Spatial data analysis - buffer, overlay, 3D analysis and modelling; Emerging and advanced technology - web-enabled GIS, GPS tracking and monitoring, model builder, transparency through GIS, community participation through GIS, monitoring and management, mobile geo-spatial data collection, aerial mobile mapping, emergency response planning.	**CO-2 BTL-2**
MODULE 3: INFORMATION MANAGEMENT SYSTEMS FOR TRANSPORTATION (9)	
Transportation Information Systems (TIS), geo-spatial standards, data sources, issues, guidance and services for transportation and infrastructure planning; Intelligent Transport Systems (ITS); Executive information system; Pavement management system, bridge management, maintenance management, safety management; Transportation System Management (TSM), toll modelling, travel demand forecasting and freight movements, simulation models; Corridor preservation and right-of-way, construction management; Hazardous cargo routing, overweight/oversize vehicles permit routing, accident analysis, environment impact, land side economic impact and value-capture analysis and Others.	**CO-3 BTL-2**
MODULE 4: APPLICATIONS IN TRANSPORTATION & INFRASTRUCTURE PLANNING (9)	
Preparation of transportation network, infrastructure maps, etc.; Planning and design for transport networks; Planning for hazardous material release incidents, risk analysis and decision making; Evacuation planning, development of new traffic analysis zones.	**CO-4 BTL-2**
MODULE 5: PROJECT WORK (9)	
To develop/submit lab based assignments and portfolios on application of geo-spatial techniques for transport related projects.	**CO-5 BTL-4**

TEXT BOOKS

1	Singleton, A.D., Spielman, S. and Folch, D. Urban Analytics (Spatial Analytics and GIS), Sage, Thousand Oaks, California, 2018.
2	Jamwal, A.K., Remote Sensing and GIS, Jnanada Prakashan, Delhi, 2008.

REFERENCE BOOKS

1	Jan Van Sickle, Basic GIS Coordinates, Second Edition, CRC Press; 2ndEd., USA, 2010.
2	Richards, J.A. and Xia, X., Remote Sensing Digital Image Analysis: An Introduction, Birkhauser, London, 2006.
3	Lillesand, T., Kiefer, R.W., and Chipman, J. Remote Sensing and Image Interpretation, Wiley, London, 2011.

4	Chang K.T. Introduction to Geographic Information Systems, McGraw Hill Education, New York, 2017.
E BOOKS	
1	https://www.gisday.com/content/dam/esrisites/en-us/about/events/gis-day/what-is-gis.pdf
2	https://learn.arcgis.com/en/arcgis-book/
MOOC	
1	https://www.esri.com/training/mooc/
2	https://www.coursera.org/specializations/gis

COURSE TITLE	**RESEARCH METHODOLOGY & IPR**		**CREDITS**		**2**
COURSE CODE	**ZZZ4715**	**COURSE CATEGORY**	**MLC**	**L-T-P-S**	**2-0-0-1**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL - 4**

ASSESSMENT SCHEME

First Periodical Assessment	**Second Periodical Assessment**	**Seminar/ Assignments/ Project / Surprise Test / Quiz**	**ESE**
15%	**20%**	**15%**	**50%**

Course Description	**The course will enable students in formulation of research problem and proposals. It will help them to understand the importance and significance of Intellectual Property Rights (IPR). The course will also equip students with understanding of various data collection methods, sampling and analysis techniques.**
Course Objective	1. To discuss the formulation of research problem 2. To discuss the importance of ideas, concepts and creativity. 3. To infer the significance of IPR in the growth of individual and nation building. 4. To summarize protection of IPR for new, better products and bring economic and social benefits. 5. To examine the information and follow research ethics.

Course Outcome	Upon completion of this course, the students will be able to 1. Discuss the research problem formulation. 2. Infer that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity. 3. Infer that IPR have taken such important place in growth of individuals & nation. 4. Summarize 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. 5. Examine the research related information and to follow research ethics.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO -6	PO -7	PO -8	PO-9	PS O-1	PS O-2	PS O-3
CO-1	**1**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO-2	**1**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO-3	**1**	**1**	**-**	**-**	**2**	**-**	**-**	**--**	**-**	**-**	**-**	**3**
CO-4	**1**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO-5	**1**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: RESEARCH PROBLEM FORMULATION	**(9)**
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	**CO-1 BTL-2**
MODULE 2: RESEARCH PROPOSAL AND ETHICS	**(9)**
Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.	**CO-2 BTL-2**
MODULE 3: DATA ANALYSISAND INTERPRETATION	**(9)**
Classification of Data, Methods of Data Collection, Sampling, Sampling techniques procedure and methods, Ethical considerations in research Data analysis, Statistical techniques and choosing an appropriate statistical technique, Hypothesis, Hypothesis testing, Data processing software (e.g. SPSS etc.), statistical inference, Interpretation of results.	**CO-3 BTL-2**

MODULE 4: NATURE OF INTELLECTUAL PROPERTY	(9)
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.	**CO-4 BTL-2**
MODULE 5: PATENTS RIGHTS AND NEW DEVELOPMENTS IN IPR	**(9)**
Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.	**CO-5 BTL-3**

TEXT BOOKS	
1.	Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students, 2009.
2.	Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction", 2010
3.	C.R. Kothari, Gaurav Garg, Research Methodology Methods and Techniques, New Age Publication. 2011
REFERENCE BOOKS	
1.	Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners, 2007
2.	Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007.
3.	Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
4.	T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008
5.	International publishers, Third Edition. Ranjit Kumar, Research Methodology: A Step-by-Step Guide for Beginners, 2nd Edition, SAGE, 2005
6.	Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition, 2017
7.	Creswell, John W. Research design: Qualitative, quantitative, and mixed methods, approaches. Sage publications, 2013.
E BOOKS	

1	https://iaear.weebly.com/uploads/2/6/2/5/26257106/research_methods_entiree_book_umasekaram-pdf-130527124352-phpapp02.pdf
2	https://www.researchgate.net/publication/319207471_HANDBOOK_OF_RESEARCH_METHODOLOGY
MOOC	
1	https://www.coursera.org/learn/research-methods
2	https://www.openlearning.com/courses/introduction-to-research-methodology/?cl=1

COURSE TITLE	**TRANSPORT PLANNING STUDIO – I (AREA PLANNING)**			**CREDITS**	**5**
COURSE CODE	**TPA3791**	**COURSE CATEGORY**	**PC**	**L-T-P-S**	**0-0-10-2**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL - 5**
ASSESSMENT SCHEME					
CIA			**ESE**		
60%			**40%**		
Course Description	**The course aims to equip students with understanding and reviewing socio-economic issues in planning practice. It will enable students to appreciate an area in relation to city. The studio will also give students hands on experience of developing a layout plan within the specified site and framework of regulations .**				
Course Objective	1. To associate a film which is related to socio-economic issues and understand the various development issues and absorb them into planning practice. 2. To discuss a planning literature and understanding its problem, approach, methodology and analysis. 3. To design the contextual development of an area in relation to the city. 4. To summarize the problems of a city development plan and designing a solution.				

Course Outcome	Upon completion of this course, the students will be able to 1. Discuss on a film which focuses on socio- economic issues or developmental issues in society. 2. Infer a literature to understand its problem, approach, methodology and analysis. 3. Design a contextual development of an area in relation to the city. 4. Explain a proposal to the problems identified in the city development plan.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO -9	PSO-1	PSO-2	PSO-3
CO-1	1	2	-	3	3	-	3	3	3	3	3	1
CO-2	2	2	-	3	3	2	-	-	3	3	3	1
CO-3	2	3	1	2	1	-	2	2	3	3	3	2
CO-4	1	2	-	3	1	-	2	2	3	3	3	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: FILM APPRECIATION (INDIVIDUAL ASSIGNMENT)	**(10)**
Films related to city development and socio-economic issues will be screened for students. The purpose of these films is to educate the students' understanding of various development issues and to absorb them in the planning practice. At the end of the film, a discourse around the film will also be held. After viewing the films, each student is expected to write about its main focus, city / region context, its applicability to Indian environment by answering the given questions in not more than half a page.	**CO-1 BTL-2**
MODULE 2: LITERATURE REVIEW (INDIVIDUAL ASSIGNMENT)	**(20)**
Each student is expected to read the article given from a journal / book and write a summary of not more than a page (250 words only) highlighting the problem, approach, methodology, analysis, how the author arrived at the conclusion and its relevance to Indian context.	**CO-2 BTL-2**
MODULE 3: AREA APPRECIATION	**(90)**
Student should be thought about various survey techniques and mapping like data base for physical surveys including land use, building use, density, building age, etc., and socio-economic surveys; Survey techniques; Land use classification or coding and expected outputs; Techniques of preparing base maps including understanding the concepts of scales, components and detailing for various levels of plans like regional plan, city plan, zoning plan, and local area plan.	**CO-3 BTL-5**

• The aim of the area appreciation exercise is to enable the students to understand and contextualize the location of the area in relation to the city, zone and area in which the particular place is situated. • This is done in relation to the socio-economic, spatial and cultural characteristics of that city, zone, location, etc. • The main purpose is to make the students appreciate the locational attributes of land parcels for future development in a city. • Due to the size of the area, this exercise is done in groups of students being assigned to a particular area.	
MODULE 4: CITY DEVELOPMENT PLAN - GROUP ASSIGNMENT	**(30)**
A City is a multi-dimensional, dynamic and a futuristic space. Understanding city involves appreciating this multi direction, and include them in the city making process. A job of physical planner does not merely understand the current conflict in development but to emerge out of this and to come out with a vision for the city. To arrive at this vision, a planner needs to understand the dynamics of various components of the city and how and what level interventions can be made to achieve that vision. A group of students are expected to study a city in terms of its present problems and issues identification.	**CO-4** **BTL-5**

TEXT BOOKS	
1	Jodhka, S.S. (ed.), Village Society, Orient Blackswan, Hyderabad, 2012.
2	Smith, Carl, et. al., Residential Landscape Sustainability – A Checklist Tool Blackwell Pub., Oxford, 2008.
REFERENCE BOOKS	
1	Vidyarthi, S. One Idea Many Plans: An American City Design Concept in Independent India**,** Routledge, New York, 2015.
2	Ministry of Urban Development Revised Tool Kit for Preparation of CDP, Government of India, New Delhi, 2009.
3	Stevens, N.J., Salmon, M.P., Walker, H.G., and Stanton, A.N. Human Factors in Land Use Planning and Design, CRC Press, New York, 2008.
E BOOKS	
1	https://www.researchgate.net/publication/268448595_First_Year_Experience_and_Planning_Studio_Pedogogics

SEMESTER - II

COURSE TITLE	URBAN TRANSPORT PLANNING		CREDITS		3
COURSE CODE	TPA3706	COURSE CATEGORY	PC	L-T-P-S	3-0-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL - 4

ASSESSMENT SCHEME			
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project / Surprise Test / Quiz	ESE
15%	20%	15%	50%

Course Description	**The course will familiarize the students with respect to public transport system infrastructure facilities planning guidelines, its role in the society, its scheduling of the transport vehicles and its network integration. The other part of the course concentrates on the role of non-motorized transport in terms of sustainable development of the cities.**
Course Objective	1. To discuss the impact of urban form and land use on transportation, especially focusing on the traffic density. 2. To examine the role of non-motorized transport and their impact on sustainable transport development. 3. To infer the concept of public transport system and their contribution in achieving the goals of sustainable development. 4. To outline the functioning of public transport system especially with respect to network planning and its scheduling of the transport vehicles. 5. To infer the planning guidelines of public transport infrastructure depot facilities.
Course Outcome	Upon completion of this course, the students will be able to- 1. Discuss the impact of urban form and land use on transport infrastructure facilities. 2. Compute the role played by the non-motorized transport systems in achieving the sustainable development goals of the city. 3. Analyze the role played by the public transport systems in achieving the sustainable development goals of the city. 4. Analyze the manner in which public transport system networking and schedules of the vehicles are being worked out. 5. Analyze the standards of public transport infrastructure depot facilities and its justification with respect to its usage.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	3	-	-	-	-	3	-	-	-	3	3	-
CO-2	-	-	-	-	-	3	-	-	-	3	3	-
CO-3	-	-	-	1	-	2	-	-	2	3	3	-
CO-4	-	-	-	-	-	-	-	3	3	3	3	2
CO-5	-	-	-	1	2	-	-	-	-	3	3	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: URBAN TRANSPORT AND LAND USE	**(9)**
Urban activity systems, urban road structure, urban forms and structure and its impact on travel pattern, land use-transport cycle, concept of accessibility and its impact on land use; urban structure and public transport, urban passenger transport system characteristics, public transport modes; urban freight transport; principles of land use- transport model.	**CO-1 BTL-2**
MODULE 2: PLANNING FOR SUSTAINABLE TRANSPORT	**(9)**
Concepts of sustainability; Sustainable transport systems, NMT, public transport. Planning principles and process; Planning norms and standards; planning frameworks for NMT infrastructure improvements; Analytical methods - NMT site analysis; NMT network analysis. NMT Facilities - Facilities on Highways and Primary Arterials, Designs based on Roadway function, Safety and Intersections; Local Street Design with respect to NMT; Financing NMT Infrastructure. Planning for NMT - Integration of NMT into transport master plans.	**CO-2 BTL-3**
MODULE 3: INTRODUCTION TO PUBLIC TRANSPORT SYSTEMS	**(9)**
Urban passenger transport system characteristics, public transport modes, genesis of public transport system, mass transit system, Para transit system, technological features, Intermodal connection, Demand for public transport, public transport demand and supply indicators, determinants of public transport supply and demand, public transport supply and demand characteristics in cities of various sizes and socio economic setting. Public transport based city forms and structure, Transit Oriented Development (TOD); Impact of city density, size, activity concentration.	**CO-3 BTL-4**
MODULE 4: PUBLIC TRANSPORT NETWORK PLANNING AND SCHEDULING	**(9)**

Public transport based city forms and structure, Transit Oriented Development (TOD); Impact of city density, size, activity concentration on public transport patronage. Form, type and density of bus route network, bus route network planning principles; Types of bus priority measures, merits and limitations, case studies; bus operation design; bus scheduling and time table principles.	**CO-4 BTL-4**
MODULE 5: BUS STOPS, TERMINALS AND DEPOT INFRASTRUCTURE (9)	
Bus stops – types and characteristics, planning guidelines, pedestrian – public transport interface; Bus Terminals – types, assessment of facilities and land areas for terminals; interchange- concepts, function and planning guidelines; bus depot -- concepts, function, activity and land requirements, planning guidelines.	**CO-5 BTL-4**

TEXT BOOKS	
1.	Institute of Transportation Engineers (Michael D. Meyer Editor), Transportation Planning Handbook, Fourth Edition, John Wiley & Sons, Inc., New Jersey, 2016.
2.	Hook, W., Non-Motorized Transport, Federal Ministry for Economic Cooperation & Development, Germany, 2005.
REFERENCE BOOKS	
1	Verma, A. and Ramanayya, T.V., Public Transport Planning and Management in Developing Countries, CRC Press, London, 2014.
2	Black, W.R., Sustainable Transport: Problems and Solutions. Gulford Press, New York, 2010.
3	Henrik Gudmundsson, Ralph P. Hall, Greg Marsden and Josias Zietsman, Sustainable Transportation: Indicators, Frameworks and Performance Management, Springer, 2016
4	Preston L. Schiller, Eric C. Brunn and Jeffrey R. Kenworthy. An Introduction to Sustainable Transportation: Policy, Planning and Implementation, earthscan, London, 2010.
5	Jeffrey Tumlin, Sustainable Transportation Planning: Tools for creating Vibrant, Healthy and Resilient Communities, John Wiley & Sons, Inc, New Jersey, 2012
E BOOKS	

1	https://www.elsevier.com/books/transportation-land-use-and-environmental-planning/deakin/978-0-12-815167-9
2	https://www.witpress.com/books/978-1-78466-077-2
MOOC	
1	https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-ar11/
2	https://www.edx.org/course/smart-cities-management-of-smart-urban-infrastru-2

COURSE TITLE	**TRANSPORT MODELLING**		**CREDITS**		**3**
COURSE CODE	**TPA3707**	**COURSE CATEGORY**	**PC**	**L-T-P-S**	**3-0-0-1**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL - 2**
ASSESSMENT SCHEME					
First Periodical Assessment	**Second Periodical Assessment**	**Seminar/ Assignments/ Project / Surprise Test / Quiz**			**ESE**
15%	**20%**	**15%**			**50%**
Course Description	**The course will enable the students to understand the basics of transport modelling in terms of transportation forecasting with respect to latest software's and its impact on the built environment.**				
Course Objective	1. To discuss the urban travel demand with respect to transportation and its infrastructure facilities. 2. To estimate the various techniques involved in calculating intercity travel demand and their respective transportation models. 3. To extrapolate the various simplified transportation models being practiced in the field for estimating travel demand. 4. To discuss the various important transportation models which is used in the fabrication of network effect in transport facilities. 5. To summarize the basic transport demand models like trip generation, trip distribution, etc.				

Course Outcome	Upon completion of this course, the students will be able to- 1. Discuss the role played by various urban travel demand models with respect to transportation and its infrastructure facilities. 2. Estimate the role played by various techniques involved in calculating intercity travel demand and their respective transportation models. 3. Associate the importance of various simplified transportation models which is being practiced in the field for estimating travel demand. 4. Infer the role played by other various important transportation models which is used in the fabrication of network effect in transport facilities. 5. Discuss the impact of various other basic transport demand models like trip generation, trip distribution, etc.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO -1	PO -2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	2	2	1	-	-	3	2	-	2	3	-	-
CO-2	2	2	-	-	-	3	2	-	2	3	-	-
CO-3	2	2	-	1	2	2	3	-	2	3	2	-
CO-4	2	2	-	2	2	-	3	-	3	3	2	2
CO-5	2	2	-	1	2	-	3	-	3	3	2	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: URBAN TRAVEL DEMAND	**(9)**
Demand for transportation, microeconomic demand theory, travel demand analysis, disaggregate travel demand models	**CO-1 BTL-2**
MODULE 2: TRAVEL CHOICE AND INTER-CITY TRAVEL DEMAND	**(9)**
Measurement of choice, stated preference techniques, willingness to pay, stated discrete choice models- probit models, logit model; calibration of choice models, abstract mode choice, value of time, generalized cost etc.; Intercity travel demand characteristics, approach to intercity demand analysis, direct demand models.	**CO-2 BTL-2**
MODULE 3: SIMPLIFIED TRAVEL DEMAND MODELS	**(9)**
Sketch planning methods, demand estimation from traffic counts, Quick response techniques for travel demand estimation (QRT).	**CO-3 BTL-2**
MODULE 4: OTHER IMPORTANT TECHNIQUES AND MODELS	**(9)**

Vehicle ownership forecasting, Graph theory application in network analysis, Activity based travel analysis, Land use transport models (LUTM) etc.	**CO-4 BTL-2**
MODULE 5: TRANSPORT DEMAND MODELING	**(9)**
Aggregate demand modeling approach- trip generation models, trip distribution models and its calibration, modal split models and its calibration, traffic assignment techniques; calibration and validation checks; alternate scenario development, model testing and evaluation; freight generation models.	**CO-5 BTL-2**

TEXT BOOKS	
1.	Juan de Dios Ortuzar and Luis G. Willumsen, Modelling Transport, 4th Edition, John Wiley and Sons, New York 2011.
2.	Moshe Ben-Akiva, Hilde Meersman and Eddy Van de Voorde, Freight Transport Modelling, Emerald Group Publishing, 2013
REFERENCE BOOKS	
1	Juan de Dios Ortuzar and Luis G. Willumsen, Modelling Transport, 4th Edition, John Wiley and Sons, New York 2011
2	Joe Castiglione, Mark Bradley and John Gliebe, Activity-Based Travel Demand Models: A Primer, TRB, Washington, D.C., 2015
3	Laurie A. Garrow, Discrete Choice Modelling and Air Travel Demand: Theory and Applications, Routledge, 2010
4	Bruton, M. J., An Introduction to Transportation Planning (The Living Environment), UCL Press, London, UK, 2000.
5	Dios Ortuzar J. (2001), Modelling Transport, Wiley, New York
E BOOKS	
1	https://www.amazon.in/Modelling-Transport-Juan-Dios-Ort%C3%BAzar-ebook/dp/B005CPJU5Y
2	https://www.worldcat.org/title/handbook-of-transport-modelling/oclc/808100568
MOOC	
1	https://ocw.tudelft.nl/courses/transportation-and-spatial-modelling/
2	https://courses.uwe.ac.uk/Z42000153/travel-demand-models-and-scenarios

COURSE TITLE	TRANSPORT ECONOMICS AND FINANCING		CREDITS		3
COURSE CODE	TPA3708	COURSE CATEGORY	PC	L-T-P-S	3-0-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL - 2

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project / Surprise Test / Quiz	ESE
15%	20%	15%	50%

Course Description	**The course will enable the students to understand the role of financing and costing in analyzing the feasibility of the transportation project. It will also provide them with an insight on the various financial and management techniques involved in preparing the feasibility report of a project.**
Course Objective	1. To discuss the various transport demand and supply techniques and the methods of forecasting the demand in the future. 2. To infer the principle of pricing with respect to utilization of various transport infrastructure facilities as user pay principle and the role of subsidy. 3. To discuss the methods of estimating and costing the various physical infrastructure facilities including the labor cost. 4. To infer the economic feasibility of a transportation planning project. 5. To infer the financial feasibility of a transportation planning project.
Course Outcome	Upon completion of this course, the students will be able to- 1. Discuss the various transport demand and supply techniques and the methods of forecasting the traffic demand for the future. 2. Infer the principles of pricing of various transport infrastructure facilities as user pay principle and the role of subsidy given by the government. 3. Discuss the various methods employed in estimating and costing the physical infrastructure project facilities. 4. Discuss the economic feasibility report of a transportation planning project. 5. Discuss the financial feasibility report of a transportation planning project.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO -6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO -3

CO-1	**2**	**1**	**-**	**2**	**2**	**-**	**3**	**-**	**2**	**3**	**2**	**-**
CO-2	**2**	**1**	**-**	**2**	**3**	**-**	**3**	**-**	**2**	**3**	**2**	**-**
CO-3	**2**	**1**	**-**	**2**	**3**	**-**	**3**	**-**	**2**	**3**	**2**	**-**
CO-4	**2**	**1**	**-**	**2**	**3**	**-**	**3**	**-**	**3**	**3**	**2**	**-**
CO-5	**2**	**1**	**-**	**2**	**3**	**-**	**3**	**-**	**3**	**3**	**2**	**2**

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: TRANSPORT DEMAND AND SUPPLY	**(9)**
Movement, transport and location, transport and economic development; Demand for transport, factors influencing demand; elasticity of demand, measures of elasticity; supply of transport, elasticity of supply; demand forecasting.	**CO-1 BTL-2**
MODULE 2: COSTING AND PRICING OF TRANSPORT SERVICES	**(9)**
Fixed and variable cost, joint and common cost, cost allocation, user cost internal cost, external cost, economic cost; Principle of pricing, marginal cost pricing, price discrimination , operational objectives of pricing; revenues, transport subsidies.	**CO-2 BTL-2**
MODULE 3: ESTIMATION AND COSTING OF TRANSPORT INFRASTRUCTURE	**(9)**
Estimation and costing of earthwork, excavation, foundation, embankment of highways, flyovers, sidewalks, tunnels , railways , etc.,; estimation and costing of drainage and drainage structure; estimation of different items along with machinery, human resources, natural resources	**CO-3 BTL-2**
MODULE 4: ECONOMIC FEASIBILITY OF TRANSPORT PROJECTS	**(9)**
Concept of economic feasibility; estimation of economic costs- project cost, investment strategy, phasing of capital costs, operation and maintenance costs; estimation of economic benefits- benefits to users, non-users , benefits to community and economy; economic appraisal- cost benefit analysis, EIRR,NPV; case studies	**CO-4 BTL-2**
MODULE 5: FINANCIAL FEASIBILITY OF TRANSPORT PROJECTS	**(9)**
Concept of financial feasibility; Project costs- capital cost, O &M costs ;project revenues- toll charges, fare box revenue, advertisement revenue etc. ,financial viability –FIRR; Case studies	**CO-5 BTL-2**
TEXT BOOKS	

1	Sarkar, P.K. and Maitri, V., Theory and Applications of Transport Economics in Highway and Transport Planning Standard Publisher 2010.
2	Papacostas, C.S. and Prevedours, Transportation Engineering and Planning Prentice Hall, 2001
REFERENCE BOOKS	
1	Indian Road Congress, Manual of Economic Evaluation of Highway Projects IRC, 1989
2	Chakraborty, M. Estimating, Costing, Specification and Valuation of Civil Engineering 23rd Edition The New Book Depot 2010
3	Telliford, G. Public – Private Transportation Partnerships around the World Nova Science Publishers 2009
4	Khan M.Y. and Jain, P.K. Financial Management 4th Edition Tata McGraw Hill
E BOOKS	
1	https://www.e-elgar.com/shop/gbp/books/economics-and-finance/transport-eaf.html
2	https://www.kobo.com/us/en/ebook/concepts-of-transportation-economics
MOOC	
1	https://www.gsd.harvard.edu/course/transportation-economics-and-finance-fall-2021/

COURSE TITLE	**LAND USE AND TRANSPORT PLANNING**		**CREDITS**		**3**
COURSE CODE	**TPA3709**	**COURSE CATEGORY**	**PC**	**L-T-P-S**	**3-0-0-1**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL - 4**
ASSESSMENT SCHEME					
First Periodical Assessment	**Second Periodical Assessment**	**Seminar/ Assignments/ Project / Surprise Test / Quiz**			**ESE**
15%	**20%**	**15%**			**50%**

Course Description	**The course will enable students to understand the interrelationship between transport infrastructure projects and the land use surrounding it. Course will also outline the best possible interaction between the both which helps in enhancing the quality of life of the residents in the city.**
Course Objective	1. To infer the interrelationship between transport infrastructure facilities and the immediate land use surrounding it. 2. To predict the pattern of mobility of a resident today, highlighting the life style change and the role of ICT. 3. To discuss the various transport land use models and their impact in the interrelationship between transport infrastructure facility and the immediate land use surrounding it. 4. To infer the role of public transport system and its effective management with respect to sustainable development. 5. To analyze the best possible integration of land use and transport system being achieved all over the world, and its takeaways.
Course Outcome	Upon completion of this course, the students will be able to- 1. Discuss the interrelationship between transport infrastructure facilities and the immediate land use surrounding it. 2. Infer the resident's mobility pattern in today's changing lifestyle and the role of ICT in achieving it. 3. Infer the interrelationship between various transport infrastructure facility and land use surrounding it. 4. Discuss the role of public transport system and its effective management with respect to sustainable development. 5. Outline the best possible land use and transport infrastructure integration all over the world, and their strategies in achieving the same.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO -1	PO -2	PO -3	PO-4	PO-5	PO-6	PO -7	PO -8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	**1**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO-2	**1**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO-3	**1**	**2**	**3**	**1**	**2**	**-**	**3**	**-**	**2**	**3**	**3**	**-**
CO-4	**1**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**3**	**3**	**-**	**-**
CO-5	**1**	**2**	**2**	**1**	**2**	**-**	**-**	**-**	**3**	**3**	**3**	**3**

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: LAND USE AND TRANSPORTATION PLANNING	(9)
Comparative Land Use and Transportation Planning - Metropolitan-ization Forces, Patterns and Trends, Concerns - Accessibility: The Land Use-Transportation Link - Basics of Travel Demand: Persons and Firms - Effects of land use on travel - The Influence of Land Use on Mobility and Accessibility - The Land Use Effects of Transportation Policies, The Transportation Effects of Land Use Policies	**CO-1 BTL-2**
MODULE 2: CONTEMPORARY LIVING PATTERN OF MOBILITY	**(9)**
Historic and contextualized travel practices; Travel in technological culture; ICT based mobility innovations; Social features of smart transportation and smart mobility.	**CO-2 BTL-2**
MODULE 3: THE LAND USE TRANSPORT MODEL	**(9)**
Partial and general models – The general structure of the Lowry model – The economic base mechanism – The location of activities – The integration of the economic base and allocation mechanisms – Problems and limitations – Discrete choice model theoretical framework - The multinomial logit model (MNL) - The hierarchical logit model (HL)	**CO-3 BTL-2**
MODULE 4: MANAGING TRANSPORT AND SOCIETY	**(9)**
Rise and decline of public transport; Restructuring traffic facilities; Use of social research; Ideology and policy perspective of urban transportation; User friendly design of places for safe mobility and travel for all; Efficient transport plan; Management and control of the environmental impacts of transport systems in communities and cities.	**CO-4 BTL-2**
MODULE 5: CASE STUDIES OF LAND USE TRANSPORT INTEGRATION	**(9)**
Public Transportation and Metropolitan Growth: Case Studies Singapore - Roadways and Metropolitan Growth: São Paulo - Land Use Mobility, Accessibility in Metropolitan China	**CO-5 BTL-4**

TEXT BOOKS	
1	Integrated Land-Use and Transportation Models Behavioral Foundations. Martin Lee-Gosselin (Universite Laval, Quebec, Canada), Sean Doherty, 2005
2	The Geography of Transport Systems by Jean-Paul Rodrigue, Claude Comtois, Brian Slack. Published by Routledge, 2009.

REFERENCE BOOKS	
1	Downs, A. 2004b, “Why traffic congestion is here to stay… and will get worse,” Access, No. 25, 2004.

2	Downs, Anthony. "Remedies That Increase Densities," Chapter 12 in Still Stuck in Traffic: Coping with Peak-Hour Traffic Congestion. Washington, DC: The Brookings Institution. 2004.
3	Muller, Peter O. "Transportation and Urban Form: Stages in the Spatial Evolution of the American Metropolis," in Hanson and Giuliano, Geography of Urban Transportation. 2004.
4	Giuliano, Genevieve. "Land Use Impacts of Transportation Investments: Highway and Transit," in Hanson and Giuliano, Geography of Urban Transportation. 2004.
5	Peters F.P., Time, Innovation and Mobilities: Travel in Technological Cultures, Taylor & Francis, UK. 2006.
E BOOKS	
1	https://www.elsevier.com/books/transportation-land-use-and-environmental-planning/deakin/978-0-12-815167-9
2	https://www.routledge.com/Metropolitan-Transport-and-Land-Use-Planning-for-Place-and-Plexus/Levinson-Krizek/p/book/9781138924260
MOOC	
1	https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-ar11/
2	https://ocw.mit.edu/courses/urban-studies-and-planning/11-953-comparative-land-use-and-transportation-planning-spring-2006/

COURSE TITLE	**TRANSPORT PLANNING STUDIO – II (URBAN PLANNING)**			**CREDITS**	**5**
COURSE CODE	**TPA3792**	**COURSE CATEGORY**	**PC**	**L-T-P-S**	**0-0-10-2**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL - 5**
ASSESSMENT SCHEME					
CIA			**ESE**		
60%			**40%**		

Course Description	**The course aims to equip students in the preparation of comprehensive traffic and transportation plan for a city. The course will also explore on the various techniques involved in field survey and data collection besides coming out with the proposals and strategies in addressing the transportation issues.**
Course Objective	1. To compile the role of traffic related software's and survey techniques which will be used in the collection of primary data, its analysis techniques for the preparation of comprehensive traffic and transportation plan. 2. To propose a comprehensive traffic and transportation plan for a city.
Course Outcome	Upon completion of this course, the students will be able to 1. Create a solution for the effective implementation of comprehensive traffic and transportation planning plan with the help of software. 2. Devise a comprehensive traffic and transportation plan for a city.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO -1	PO -2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	1	2	-	3	3	-	3	3	3	3	3	1
CO-2	2	2	-	3	3	2	-	-	3	3	3	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: TRAFFIC LABORATORY AND SOFTWARE APPLICATIONS (30)

The intent of this course (being part of the studio) is to strengthen the capabilities of the students in use of various instruments available in traffic laboratory. In addition, the students will be trained in the field of GIS using standard software such as ARCVIEW, ARCGIS, etc. and use of standard transport planning and traffic engineering software such as TRIPS, CUBE, VISUM, VISSIM, TransCAD, TRANSYT, etc.	**CO-1 BTL-5**

MODULE 2: COMPREHENSIVE TRAFFIC AND TRANSPORTATION PLAN FOR A CITY (120)

The objective of this studio exercise is to train the students for the preparation of a comprehensive transport plan of a city. This exercise will involve field data collection on road networks, traffic and travel studies including household surveys, public transport studies, parking and terminal studies, etc. Besides secondary data collection, data collected would be analyzed to assess the existing characteristics and identify various problems and issues. Travel demand models would be developed for the base year and travel demand forecasts would be made finalized based on alternate scenarios of development, and then transport plan and proposals would be formulated.	**CO-2 BTL-5**

TEXT BOOKS	
1	Daamen, W. et. al, Traffic Simulation and Data: Validation Methods and Applications, CRC, Press, USA, 2017.
2	Flaherty, C A O', Transport Planning and Traffic Engineering, CRC Press, USA, 2016.
REFERENCE BOOKS	
1	Ortúzar, J. De and Willumsen, L. G., Modelling Transport, John Wiley and Sons, United Kingdom, 2011.
2	Verma, A. Integrated Public Transportation System, VDM Verlag, 2010.
3	Verma, A. and Ramanayya, T.V. Public Transport Planning and Management in Developing Countries, CRC Press, London, 2014.
4	Sarkar, P.K., Maitri, V. and Joshi, G.J. Transportation Planning: Principles, Practices and Policies, Prentice Hall India, New Delhi, 2014.
E BOOKS	
1	https://www.kobo.com/us/en/ebook/land-use-transport-planning-in-hong-kong

SEMESTER - III

COURSE TITLE	INTELLIGENT TRANSPORTATION SYSTEMS		CREDITS		3
COURSE CODE	TPA3710	COURSE CATEGORY	PC	L-T-P-S	3-0-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL - 3

ASSESSMENT SCHEME			
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project / Surprise Test / Quiz	ESE
15%	20%	15%	50%

Course Description	**The course will enable students to understand the basics of intelligent transport systems, its performance, evaluation techniques adopted, best practices around the world in its implementation and its impact in achieving smart mobility.**
Course Objective	1. To discuss the concepts and components of smart mobility. 2. To infer the basic concepts and techniques involved in intelligent transport systems. 3. To summarize on the application of intelligent transport system in transport infrastructure. 4. To infer the performance, implementation and evaluation of intelligent transport systems. 5. To translate the best case study around the world with respect to the role of Intelligent transport systems on achieving smart mobility.
Course Outcome	Upon completion of this course, the students will be able to- 1. Associate the basic concepts and components of smart mobility. 2. Discuss the basic concepts and techniques involved in the usage of intelligent transport systems. 3. Infer the application of intelligent transport system in transport infrastructure and its related components. 4. Discuss the performance, implementation and evaluation of intelligent transport systems. 5. Translate the best case studies around the world with respect to the role of intelligent transport system on achieving smart mobility.
Prerequisites: NIL	

CO, PO AND PSO MAPPING												
CO	**PO -1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PSO-1**	**PSO-2**	**PSO-3**
CO-1	**1**	**2**	**1**	**1**	**2**	**-**	**-**	**-**	**3**	**3**	**-**	**-**
CO-2	**2**	**2**	**-**	**2**	**2**	**-**	**2**	**-**	**3**	**3**	**2**	**-**
CO-3	**2**	**2**	**-**	**2**	**2**	**-**	**2**	**-**	**3**	**3**	**2**	**-**
CO-4	**2**	**2**	**-**	**2**	**2**	**-**	**2**	**3**	**3**	**3**	**2**	**-**
CO-5	**2**	**2**	**-**	**2**	**2**	**-**	**2**	**-**	**3**	**3**	**-**	**3**
1: Weakly related, 2: Moderately related and 3: Strongly related												

MODULE 1: SMART MOBILITY	**(9)**
Concepts and components of smart mobility, role of ITS in smart mobility and smart cities; Public Private Partnership as a tool to implement smart mobility projects; smart mobility solutions for differently-abled; Integration of smart and green mobility	**CO-1 BTL-2**
MODULE 2: INTELLIGENT TRANSPORT SYSTEMS	**(9)**
Definition, concepts, types of Intelligent Transportation Systems (ITS); ITS technology, software, equipment. Traffic management, emergency and incident management, public transport system, terminal and depot management system, parking infrastructure management, commercial vehicle management, highway surveillance, case studies.	**CO-2 BTL-2**
MODULE 3: APPLICATION OF ITS IN TRANSPORT INFRASTRUCTURE	**(9)**
User Services and technologies, Area traffic control, urban traffic control system technology, transportation system management, highway control, intelligent vehicle highway system, highway surveillance, Traffic regulation and enforcement; ITS in public transportation – operations and management; parking management.	**CO-3 BTL-2**
MODULE 4: PERFORMANCE, IMPLEMENTATION AND EVALUATION OF ITS	**(9)**
Costing of ITS, ITS benefits assessment, economic and financial analysis of ITS. Implementation, case studies, institutional and organizational issues. Evaluation by Simulation Modelling.	**CO-4 BTL-2**
MODULE 5: CASE STUDIES ON SMART MOBILITY	**(9)**
Application of ITS in demand management, transport supply provision, Disruptive technologies; shared mobility.	**CO-5 BTL-3**
TEXT BOOKS	
1.	Chowdhury, M.A. and Sadek Adel, Fundamentals of Intelligent Transportation System, , Artech House Inc, 685 Canton Street, 2010.

2.	L. Vlacic, M. Parent, F. Harashima, Intelligent Vehicle Technologies – Theory and Applications, Butterworth-Heinemann, 2010.
REFERENCE BOOKS	
1	Bob Williams, Intelligent Transport Systems Standards, Artech House Publishers, 2008.
2	Sarkar, P., Jain, A.K., Intelligent Transport Systems, PHI Learning Private Limited, New Delhi. 2017.
3	E. Bekiaris and Y.J. Nakanishi, Economic Impacts of Intelligent Transportation Systems: Innovations and Case Studies, Elsevier/JAI, 2004.
4	J.M. Sussman, Perspectives on Intelligent Transportation Systems (ITS), Springer, 2005
E BOOKS	
1	https://link.springer.com/book/10.1007/978-3-319-14768-0
2	https://www.oreilly.com/library/view/intelligent-transport-systems/9781118894781/
MOOC	
1	https://actu.epfl.ch/news/mooc-traffic-flow-modeling-and-intelligent-transpo/
2	https://www.futurelearn.com/courses/transport-systems-global-issues-and-future-innovations

COURSE TITLE	**TRANSPORT POLICY & INSTITUTIONAL FRAMEWORK**		**CREDITS**		**2**
COURSE CODE	**TPA3711**	**COURSE CATEGORY**	**PC**	**L-T-P-S**	**2-0-0-1**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL - 2**
ASSESSMENT SCHEME					
First Periodical Assessment	**Second Periodical Assessment**	**Seminar/ Assignments/ Project / Surprise Test / Quiz**			**ESE**

15%	20%	15%	50%

Course Description	**The course will help students in understanding the existing transport policy and institutional framework currently being practice in the country. This course will also through light on the various acts and legislation passed with respect to transport sector and best case examples around the world regarding the same.**
Course Objective	1. To discuss the basics of transport policy making and how it's being practiced in the country. 2. To distinguish the various transport sector policies being developed which includes non-motorized transport, public private partnership, etc. 3. To infer the need and outcome of various transport related legislations and acts being based in the country. 4. To discuss the instructional framework, that is currently being practiced in the country with respect to the functioning of the transport sector. 5. To generalize the outcome of various best practices in India with respect to transport institutional framework and policy set up.
Course Outcome	Upon completion of this course, the students will be able to- 1. Associate the basics of transport policy making mechanism in our country. 2. Infer the role of various transport related policies which includes non-motorized transport, public private partnership, metro rail, etc. in the overall framework of transport systems in our country. 3. Discuss the role played by various acts and legislation with respect to transport system management in our country. 4. Infer the role played by the institutional framework of transport sector and its strategies in achieving the goals and objectives. 5. Infer the outcome of various best practices with respect to transport policy and institutional framework in India.
Prerequisites: NIL	

CO, PO AND PSO MAPPING

CO	PO -1	PO -2	PO-3	PO-4	PO-5	PO-6	PO -7	PO-8	PO -9	PSO-1	PSO-2	PSO-3
CO-1	1	1	-	2	3	2	-	-	-	3	-	-
CO-2	1	1	-	2	3	2	-	-	-	3	-	-
CO-3	1	1	-	2	3	2	-	-	-	3	-	-

CO-4	**1**	**2**	**-**	**2**	**3**	**2**	**-**	**-**	**-**	**3**	**-**	**-**
CO-5	**1**	**2**	**-**	**3**	**3**	**-**	**-**	**-**	**3**	**3**	**-**	**3**

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION TO TRANSPORT POLICY MAKING	**(6)**
Basic concepts of policy, strategy and tactics, fundamentals of transport policy, theoretical and historical perspectives; principles of transport policy making at local, national and international level.	**CO-1 BTL-2**
MODULE 2: TRANSPORT SECTOR POLICIES	**(6)**
National transport policies in sectors of road sector, Road transport, railways, civil aviation, ports and shipping; financial outlays in transport sector; National urban transport policy (NUTP); urban bus service provision policies, MRTS policies, NMT policies, Logistics and freight sector policies; PPP in transport sector; International and national case studies on best practices in urban, regional and national transport policies.	**CO-2 BTL-2**
MODULE 3: TRANSPORT LEGISLATION AND ACTS	**(6)**
Road Transport Corporation (RTC) Act, Motor Vehicle Act, National Highway Act; Legislations in Railways, Civil Aviation, Ports sector, Logistics sector, Multimodal Transport Act etc.	**CO-3 BTL-2**
MODULE 4: INSTITUTIONAL FRAMEWORKS IN TRANSPORT SECTOR	**(6)**
Institutional set ups in Roads, Road transport, Railways, Civil Aviation, Ports and Shipping, Metro Rail Corporations, State Road Transport Undertakings. City Bus Undertakings; Urban Transport set up in Municipal Authorities, local bodies etc.; Unified Metropolitan Transport Authority (UMTA); Special Purpose Vehicles (SPV's), Role of NGO's etc.; innovative methods in institutional strengthening, institutional audit and capacity building.	**CO-4 BTL-2**
MODULE 5: CASE STUDIES	**(6)**
A review of regulating policies and case studies on national, state and regional policies and governance implications of these policies.	**CO-5 BTL-2**

TEXT BOOKS	
1.	Planning Commission National Transport Development Policy Committee, India Transport Report: Moving India to 2032. Government of India, 2014.
2.	O'Flaherty, C.A., Transport Planning and Traffic Engineering, Department of Transport, USA, 2000.

REFERENCE BOOKS	
1	National Transport Development Policy Documents, Government of India, New Delhi, 2012.

2	National Urban Transport Policy, Ministry of Urban Development, Government of India, New Delhi, 2006.
3	Stopher, P. and Stanley J. Introduction to Transport Policy: A Public Policy View, Edward Elgar Publishing Ltd., Northampton, Massachusetts, 2014.
4	Ministry of Urban Development. The Urban and Regional Development Plan Formulation and Implementation (URDPFI) Guidelines, Government of India, New Delhi, 2015.
E BOOKS	
1	https://www.routledge.com/Integrated-Transport-Policy-Implications-for-Regulation-and-Competition/Preston-Smith-Starkie/p/book/9781138737297
2	https://repositorio.cepal.org/bitstream/handle/11362/44246/1/S1800932_en.pdf
MOOC	
1	https://www.kth.se/en/forskning/forskningsplattformar/transport/forskning/forskningsteman/politiska-och-institutionella-ramar-1.853031
2	https://www.coursera.org/learn/transport-eu-law

COURSE TITLE	**REGIONAL TRANSPORT PLANNING**		**CREDITS**		**2**
COURSE CODE	**TPA3712**	**COURSE CATEGORY**	**PC**	**L-T-P-S**	**2-0-0-1**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL - 2**
ASSESSMENT SCHEME					
First Periodical Assessment	**Second Periodical Assessment**	**Seminar/ Assignments/ Project / Surprise Test / Quiz**			**ESE**
15%	**20%**	**15%**			**50%**
Course Description	**The course will enable the students to understand the principles behind regional transportation planning. The course also concentrates on regional travel demand and its analysis methods.**				

Course Objective	1. To discuss the basics of regional transport planning and its approaches. 2. To infer the various types of regional transport systems and its analysis. 3. To extrapolate the regional transport demand using various models like econometric model, etc. 4. To infer the impact of regional network analysis and its applications. 5. To discuss the regional transport policy which is being implemented in our country.
Course Outcome	Upon completion of this course, the students will be able to- 1. Associate the role of basics of regional transport planning systems and its details. 2. Infer the various types of regional transport systems being implemented in our country. 3. Discuss the various regional transport models being utilized for the analysis and design purposes. 4. Infer the various regional network analysis methods and its applications. 5. Summarize the role of regional transport policy being implemented in our country.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	1	1	-	2	2	-	-	-	-	3	2	-
CO-2	1	1	-	2	2	-	-	-	-	3	2	-
CO-3	1	1	-	2	2	2	-	-	3	3	2	-
CO-4	1	1	-	2	2	-	-	-	3	3	2	-
CO-5	1	1	-	2	2	-	-	-	3	3	2	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: OVERVIEW OF REGIONAL PLANNING	**(6)**
Approach to regional planning, types of regions and their characteristics, delineation of region for transport planning; backwardness and regional disparity in development; role of connectivity and regional transport in development and backwardness.	**CO-1 BTL-2**
MODULE 2: REGIONAL TRANSPORT SYSTEMS	**(6)**
Regional transport system, types, characteristics, regional transport supply, regional traffic and travel pattern, emerging issues.	**CO-2 BTL-2**
MODULE 3: REGIONAL TRAVEL DEMAND	**(6)**

Regional travel demand determinant, regional demand models, regional accessibility, sequential travel demand models, econometric models, regional public transport demand.	**CO-3 BTL-2**
MODULE 4: REGIONAL NETWORK ANALYSIS	**(6)**
Regional network system, rural road network planning, graph theory applications- connectivity and accessibility measures.	**CO-4 BTL-2**
MODULE 5: REGIONAL TRANSPORT POLICY	**(6)**
Regional transport infrastructure, system planning imperatives, integration aspects, system selection, policy aspects at regional level.	**CO-5 BTL-2**

TEXT BOOKS	
1.	Glasson, J. and Marshall, T., Regional Planning, Routledge, London, 2007.
2.	Verma A., Integrated Public Transportation System: Planning and Modelling. Vdm Publishing House, Mauritius, 2010.
REFERENCE BOOKS	
1	Vinod K. T. M., Micro Regional Transport Planning / Research. School of Planning and Architecture, Delhi, 2000.
2	Appiah-Opoku, S.'Urban and Regional Planning', in Barney Warf (ed.) Encyclopaedia of Geography, Sage, London. Six Volumes, 2010.
3	Calthorpe, P. and Fulton, W. The Regional City: Planning for the End of Sprawl, Island Press, Washington, D.C, 2001.
E BOOKS	
1	https://www.nap.edu/catalog/22338/a-guide-to-regional-transportation-planning-for-disasters-emergencies-and-significant-events
2	https://www.eolss.net/ebooklib/bookinfo/transportation-engineering-planning.aspx
MOOC	
1	https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-252j-urban-transportation-planning-fall-2016/

COURSE TITLE	TRANSPORT PLANNING STUDIO – III (REGIONAL PLANNING)			CREDITS	6
COURSE CODE	TPA3792	COURSE CATEGORY	PC	L-T-P-S	0-0-12-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL - 5

ASSESSMENT SCHEME

CIA	ESE
60%	40%

Course Description	**The course aims to equip students in the preparation of regional transport plan for an identified region. The course will also explore on the various techniques involved in field survey and data collection besides coming out with the proposals and strategies in addressing the transportation issues.**
Course Objective	1. To create a microsimulation of an identified area with respect to traffic demand, analysis and its network management. 2. To devise a comprehensive traffic and transportation plan for the identified region.
Course Outcome	Upon completion of this course, the students will be able to 1. Create a microsimulation of the identified area and will be able to propose guidelines and design intervention for the betterment of the region, based on the simulation modelling 2. Design a comprehensive traffic and transportation plan for the identified region, with the proposals and implementation strategies.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO -1	PO -2	PO -3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	3	3	2	3	3	1	3	3	3	3	3	2
CO-2	3	3	2	3	3	1	3	3	3	3	3	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: APPLICATION OF MICRO SIMULATION	(60)
Various analytical quantitative techniques and methods for transport infrastructure; recent advancements in transport models; application of statistical and transport planning software, data requisition and survey methods; Structure and approach to feasibility studies. Micro-simulation using dedicated software packages	**CO-1 BTL-5**

MODULE 2: DETAILED PROJECT REPORT STUDY ON TRANSPORT INFRASTRUCTURE PLANNING, DESIGN AND MANAGEMENT FOR A CASE STUDY (120)	
The objective of this studio exercise is to train the students for conducting a detailed project level study related to transport infrastructure planning, design and management aspects for a case study. This exercise will involve relevant field data collection besides secondary data collection. The data collected would be analysed to assess the existing characteristics and identify various problems and issues. Based on the scope of the study, alternate mprovement, planning design and management strategies would be formulated and evaluated by taking into account costs and benefits; proposals and Cost benefit analysis (CBA).	**CO-2 BTL-5**

TEXT BOOKS	
1	Plane, D.A., Mann, L.D., Button, K. and Nijkamp, P. Regional Planning, Edward Elgar Publishing, Cheltenham, 2007.
2	O'Flaherty, C.A., Transport Planning and Traffic Engineering, Dept. of Transport, USA, 2000.
REFERENCE BOOKS	
1	Ortúzar, J. De and Willumsen, L. G., Modelling Transport, John Wiley and Sons, United Kingdom, 2011.
2	Verma A., Integrated Public Transportation System: Planning and Modelling. Vdm Publishing House, Mauritius, 2010.
3	Vinod K. T. M., Micro Regional Transport Planning / Research. School of Planning and Architecture, Delhi, 2000.
E BOOKS	
1	https://www.taylorfrancis.com/books/edit/10.1201/9781315281896/transport-infrastructure-systems-gianluca-dell-acqua-fred-wegman
2	https://link.springer.com/book/10.1007/978-3-030-79857-4

COURSE TITLE	TRANSPORT PLANNING THESIS – I			CREDITS	5
COURSE CODE	TPA3898	COURSE CATEGORY	PC	L-T-P-S	0-0-10-0

Version	1.0	Approval Details		LEARNING LEVEL	BTL - 2

ASSESSMENT SCHEME

CIA	ESE
40%	60%

Course Description	**Transport Planning Thesis 1 is a formal report written systematically on a particular topic as related to town and country planning. The material written systematically may be useful in fourth semester when the same topic with literature reviewed systematically be confined as a part of thesis..**
Course Objective	To infer various literatures relevant to the topic so as to widen and enrich the literature pertaining to a topic of research.
Course Outcome	Upon completion of this course, the students will be able to 1. Discuss the literature review in his topic of interest in the field of planning and in the preparation of systematic report.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO -1	PO -2	PO-3	PO-4	PO-5	PO-6	PO-7	PO -8	PO-9	PSO-1	PS O-2	PS O-3
CO-1	3	3	-	3	3	3	-	3	3	3	-	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: LITERATURE STUDY (150)

It is a formal report written systematically on a particular topic as related to Transportation Planning. This exercise is taken up as to widen and enrich the literature pertaining to a topic of research. It may focus upon cross section of literature of a topic with or without research hypothesis. The material written systematically may be useful in fourth semester when the same topic with literature reviewed systematically be confined as a part of Planning thesis - II. There will be three reviews conducted internally and at the end of the semester there will be a viva voce conducted by the Institute comprising of a panel with one external member.	**CO-1 BTL-2**

TEXT BOOKS

1	Brubaker, D.L. and Thomas, R.M. Thesis and Dissertations: A Guide to Planning, Research and Writing, 2007
2	Bracken, I. Urban Planning Methods, Research and Policy Analysis, Routldge, 2008.
REFERENCE BOOKS	
1	Wang, X., Von Hofpe, R. Research Methods in Urban and Regional Planning 2007 Springer
2	White, P., Developing Research Questions, Second Edition, Macmillan International, New York, 2017.
3	Ward, K., Researching the City: A Guide for Students, Sage, New York, 2020.
4	Healey, P. and Silva, E., The Routledge Handbook of Planning Research Methods, Routledge, New York, 2015.
5	McVoy, B.T. and Machi, A.L., The Literature Review: Six Steps to Success, Corwin Press, 2009.
E BOOKS	
1	https://www.amazon.in/Sustainable-Approaches-Urban-Transport-Dinesh-ebook/dp/B07TWNJZB9

COURSE TITLE	**EVALUATION OF SUMMER INTERNSHIP**			**CREDITS**	**2**
COURSE CODE	**TPA3897**	**COURSE CATEGORY**	**MLC**	**L-T-P-S**	**0-0-0-0**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL - 5**
ASSESSMENT SCHEME					
CIA			**ESE**		
100%			**-**		
Course Description	**Summer internship allows the students to work in a transport planning organization for 2 months where they can engage themselves in activities related to urban and regional planning and gain field experience by doing site visits and various surveys related to planning.**				

Course Objective	The summer Internship Training is aimed at providing the necessary acumen and knowledge to the students to become employable by any Planning Organization. The Internship is also expected to make familiar the practical demands and complexities of planning. The students may also utilize the Internship Programme to strengthen the quality of their Dissertation/ Thesis works.
Course Outcome	Upon completion of this course, the students will be able to 1. To associate the working of an office and the execution in the site practically

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	3	3	-	3	3	-	3	3	3	3	3	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: Internship **2 Months**

The choice of the place of training shall be Planning Firms, Government Organizations, Quasi Government organizations, Development Authorities, etc. The final evaluation of the summer internship will be based on the following features. i. Office training ii. Field visit and data collection techniques and training iii. Critical analysis of the project iv. Report Preparation Students should send their joining report, monthly progress reports (in the prescribed format) and completion report during the period of summer internship. Students should prepare the portfolio of the work done during this period.	**CO-1** **BTL-5**

SEMESTER – IV

COURSE TITLE	TRANSPORT PLANNING THESIS – I			CREDITS	10
COURSE CODE	TPA3899	COURSE CATEGORY	PC	L-T-P-S	0-0-20-15
Version	1.0	Approval Details		LEARNING LEVEL	BTL - 5

ASSESSMENT SCHEME	
CIA	ESE
30%	70%

Course Description	Students shall be required to undertake thesis work in the areas of relevance and concern in the transport planning and development process.
Course Objective	The objective of Transport Planning thesis allows students to do a broad areas of study which would include, • Planning for region, urban development and renewal • Planning for infrastructure development • Urban governance, management and finance • Environmental and sustainable development • Heritage conservation and tourism • Planning implications of Smart cities, Green cities, Digital Cities, Eco-Cities. • e-Governance and urban local governments and e-Participation of communities in city infrastructure planning and development • Any other emerging areas in the field of transport planning.
Course Outcome	Upon completion of this course, the students will be able to • Develop a basic understanding of the area chosen for study (by carrying out a detailed Literature review). • summarize the detailed exploration of the topic (by way of surveys and studies). • Devise a plan with address the issues and concerns those emerge out of the study and suggest recommendations, proposals, strategies, and execution mechanism.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO - 1	PO -2	PO-3	PO-4	PO-5	PO-6	PO -7	PO -8	PO-9	PSO-1	PSO-2	PS O-3
CO-1	3	3	-	3	3	-	3	3	3	3	3	3

1: Weakly related, 2: Moderately related and 3: Strongly related

THESIS	(300)
The students are required to carry out independent research and prepare a thesis on a topic on Transportation planning selected by them and approved the faculty under the supervision of a research guide allocated by the department. The main objective of the Thesis is to provide an opportunity to the students to conduct an original study and develop a subject of their choice, which adds significantly to the knowledge of Transportation planning. This attempt would also give a chance to the students to demonstrate their abilities to use and apply planning theories and techniques they have learnt in theory subjects and to arrive at independent conclusions. Depending upon the theme of the Thesis, investigations may involve original field work (collection of primary data), compilation and analysis of data already available and critical analysis before its synthesis in the form of conclusions and policy recommendations. Each student is required to undertake a terminal project on a subject related to Urban and Regional Transportation Development (Road, Rail, Port and Airport) concern preferably related to Travel behavior, Land use and Accessibility, Travel demand forecasting modelling, Public transport system, Transportation Infrastructure Design and Management, transportation logistics Intelligent transport system, etc., The Thesis shall be monitored continuously and periodically through internal marked review to check the consistency of work, the relevance of the analysis with respect to the data collected and project scope, and the progress towards logical proposals. The final output shall be firstly in the form of extended abstract, which once approved by the department will be followed by the submission of a detailed report and maps/visuals for external jury members, in a given format. The thesis shall also be presented orally in external jury by each student in the form of visuals / drawings for each topic. The detailed thesis report will be submitted in the required format.	**CO-1** **BTL-5**

TEXT BOOKS	
1	Brubaker, D.L. and Thomas, R.M. Thesis and Dissertations: A Guide to Planning, Research and Writing, 2007.
2	F. Abdul Rahim Thesis Writing, New Age International (P) Limited Publishers, New Delhi, 2005.

REFERENCE BOOKS	
1	Kastens, K. Pfirman, S., Stute, M., Abbott, D. and Scholz, C. How to Write Your Thesis - Colombian University, 2010
2	Bracken, I. Urban Planning Methods, Research and Policy Analysis, Routldge, 2008.

3	Wang, X., Von Hofpe, R. Research Methods in Urban and Regional Planning, Springer, 2007.

ELECTIVES

<table>
<tr><td>COURSE TITLE</td><td colspan="2">AIRPORT AND RAILWAY PLANNING AND MANAGEMENT</td><td colspan="2">CREDITS</td><td>2</td></tr>
<tr><td>COURSE CODE</td><td>TPA3721</td><td>COURSE CATEGORY</td><td>ELE</td><td>L-T-P-S</td><td>2-0-0-1</td></tr>
<tr><td>Version</td><td>1.0</td><td>Approval Details</td><td></td><td>LEARNING LEVEL</td><td>BTL - 2</td></tr>
<tr><td colspan="6">ASSESSMENT SCHEME</td></tr>
<tr><td>First Periodical Assessment</td><td>Second Periodical Assessment</td><td colspan="3">Seminar/ Assignments/ Project / Surprise Test / Quiz</td><td>ESE</td></tr>
<tr><td>15%</td><td>20%</td><td colspan="3">15%</td><td>50%</td></tr>
<tr><td>Course Description</td><td colspan="5">The course will enable the students to understand the basics of airport and railway planning and management. The other part of the course also concentrates of port infrastructure and its impact on planning.</td></tr>
<tr><td>Course Objective</td><td colspan="5">1. To discuss the various aspects of rail infrastructure development, its functioning and management.
2. To discuss the various components of airport infrastructure development and its functioning and management.
3. To infer the various components of port infrastructure development and its functioning and management.
4. To extrapolate the relationship that exist between port and its hinterland with respect to planning and management of the space.
5. To summarize the aspects with respect to infrastructure planning for tourism and its developments.</td></tr>
<tr><td>Course Outcome</td><td colspan="5">Upon completion of this course, the students will be able to-
1. Associate the role of rail infrastructure, its functioning and management and its impact on the national economy.
2. Associate the role of airport infrastructure, its functioning and management and its impact on the national economy.
3. Infer the role of port infrastructure, its functioning and management and its impact on the national economy.
4. Discuss the relationship that exist between port and its hinterland, and their contribution in the development of the nation.
5. Summarize the importance of infrastructure development for tourism enhancement and its development.</td></tr>
<tr><td colspan="6">Prerequisites: NIL</td></tr>
</table>

CO, PO AND PSO MAPPING												
CO	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PSO-1**	**PSO-2**	**PSO-3**
CO-1	**1**	**1**	**-**	**2**	**2**	**-**	**-**	**-**	**2**	**3**	**-**	**-**
CO-2	**1**	**1**	**-**	**2**	**2**	**-**	**-**	**-**	**2**	**3**	**-**	**-**
CO-3	**1**	**1**	**-**	**2**	**2**	**-**	**-**	**-**	**2**	**3**	**-**	**-**
CO-4	**1**	**1**	**-**	**2**	**2**	**-**	**-**	**-**	**2**	**3**	**-**	**-**
CO-5	**1**	**1**	**-**	**2**	**2**	**-**	**-**	**-**	**2**	**3**	**-**	**-**
1: Weakly related, 2: Moderately related and 3: Strongly related												

MODULE 1: RAIL INFRASTRUCTURE	**(6)**
Rail alignment surveys; Permanent way- rails, sleepers, ballast, sleepers; Curvature of track types of curves, degree of curvature, super -elevation, transition curves; railway points, crossings and junctions; station yards; terminals- size, parking, circulation, platforms, passenger service and amenities area; metro rail alignment and stations design elements.	**CO-1 BTL-2**
MODULE 2: AIRPORTS	**(6)**
Airport location planning; Components of airport design; Air side development – runways, taxiways, aprons, air and ground navigation and traffic control aids; Land side development – passenger building, cargo facilities, internal airport circulation and parking; Design of ground access facilities and airport support facilities etc.; land side airport connectivity planning.	**CO-2 BTL-2**
MODULE 3: PORT INFRASTRUCTURE	**(6)**
Port components; Ship size and cargo characteristics; Port Infrastructure for cargo handling and storage, marine access infrastructure, cargo specific berths and port facilities.	**CO-3 BTL-2**
MODULE 4: PORT AND ITS IMPACT ON HINTERLAND	**(9)**
Evolution of port-city relationship, Anyport Model, port-city relationship; Traffic and Social impact assessment of port on hinterland; Captive and non-captive hinterlands assessment.	**CO-4 BTL-2**
MODULE 5: PLANNING TRANSPORT INFRASTRUCTURE FOR TOURISM	**(9)**
Infrastructure planning for sustainable tourism: The social practices approach - The role of transport infrastructure in international tourism development: A gravity model approach - Tourism and international trade - Planning transport for special events - Tourism infrastructure: inequality and externality issues – Tourism Infrastructure support services – Travel safety and security – Walkways and informal sector; Transport Infrastructure in tourist precincts	**CO-5 BTL-2**

TEXT BOOKS	
1.	O'Flaherty, C.A., Transport Planning and Traffic Engineering, An Imprint of Elserver, 2006.
2.	Chris, N. (ed.), Handbook of Research Methods and Applications in Transport Economics and Policy, Edward Elgar Publishing Ltd, Cheltenham, 2015.
REFERENCE BOOKS	
1	Rangwala, S.C., Rangawala, K.C. and Rangawala, P.S., Airport Engineering Eighth Edition, Charoter Publishing House Ltd, 2008.
2	Giuliano, G. and Hanson, S. (eds.) The Geography of Urban Transportation, Fourth Edition, Guildford, London, 2017.
3	Ministry of Shipping, Sagarmala, National Perspective Plan of Indian Ports, Government of India, New Delhi, 2016.
4	Thoresen, Carl A., Port designer's handbook: recommendations and guidelines, Thomas Telford, London, 2003.
5	Satish Chandra and M. Agrawal, Railway Engineering, Second Edition, Oxford University Press, 2013.
E BOOKS	
1	https://www.amazon.in/TRANSPORTATION-PLANNING-PRABIR-KUMAR-SARKAR-ebook/dp/B00TQPICP0
2	https://www.amazon.in/Transport-Planning-Management-Developing-Countries-ebook/dp/B00QFFY55A
MOOC	
1	https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-201j-transportation-systems-analysis-demand-and-economics-fall-2008/
2	https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-203j-logistical-and-transportation-planning-methods-fall-2006/

COURSE TITLE	**ENVIRONMENTAL IMPACT ASSESSMENT OF TRANSPORTATION PROJECTS**		**CREDITS**		**2**
COURSE	**TPA3722**	**COURSE**	**ELE**	**L-T-P-S**	**2-0-0-1**

CODE		CATEGORY			
Version	1.0	Approval Details		LEARNING LEVEL	BTL - 2

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project / Surprise Test / Quiz	ESE
15%	20%	15%	50%

Course Description	**The course will enable the students to understand the impact of transportation projects on the environment. The course will also outline the procedure to perform an environmental impact assessment for a transportation project.**
Course Objective	1. To discuss the concept of urban mobility and the challenges which people face on day to day basis. 2. To infer the pollution which is happening due to the transport systems around the world. 3. To discuss the aspects of environmental quality and its management. 4. To summarize the various legislations which is passed with respect to environmental management and the legal tools available in safeguarding the environment sustainably. 5. To generalize the various mitigate measures available with respect to the safeguard of the environment.
Course Outcome	Upon completion of this course, the students will be able to- 1. Infer the concept of urban mobility and its challenges. 2. Associate the pollution levels in the atmosphere due to the functioning of the transport systems and its related facilities. 3. Infer the need to have a well maintained environmental quality in the atmosphere. 4. Discuss the legal provision available in safeguarding the environment and its related ill effects. 5. Summarize the various mitigate measures available to safeguard the environment towards sustainable development.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	1	2	-	3	-	-	-	-	3	3	-	-

CO-2	**1**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**
CO-3	**1**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**
CO-4	**1**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**
CO-5	**1**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: URBAN MOBILITY CHALLENGE	**(6)**
Urban mobility challenge, the state of urban passenger transport, mobility and urban form, equitable access to urban mobility, urban mobility and the environment, towards sustainable urban mobility	**CO-1 BTL-2**
MODULE 2: MEASUREMENT AND POLLUTION PREDICTION	**(6)**
Measurement of Air and Noise Pollution, Land Acquisition, Rehabilitation, Collection, Compilation and Presentation of Pollution and Impact Data, Measuring Impact before construction, at the time of construction and after construction, Prediction, Modeling and Validation	**CO-2 BTL-2**
MODULE 3: ENVIRONMENTAL QUALITY AND MANAGEMENT	**(6)**
Importance of EIA, Environmental Appraisal, EIA Statement, Vehicle and Traffic Noise, Ambient Noise Level, Heath Effects, Vibration – Damage to building, Exhaust Emission – Pollutant, Health effects, Air Pollution, Urban Ambient Air Quality Standards, Effects on Human being, Vegetation and Animals.	**CO-3 BTL-2**
MODULE 4: ENVIRONMENTAL MAINTENANCE AND LEGAL SYSTEMS	**(9)**
Impact of Traffic on Environment – Network Pattern, Urban Growth Indicators of Environmental Quality, Energy use, Fuel Economy in Transportation, Energy Efficiency strategies	**CO-4 BTL-2**
MODULE 5: MITIGATIVE MEASURES AND POLICIES	**(9)**
Mitigative Measures for Air and Noise Pollution Policies and Strategies, Involvement of Stakeholders, Public Participation, Institutional Arrangements.	**CO-5 BTL-2**

TEXT BOOKS

1.	UNCHS, Habitat, Planning And Design For Sustainable Urban Mobility, Global Report On Human Settlements 2013
2.	NCHRP Report 541. Consideration of Environmental Factors in Transportation Systems Planning, TRB, 2005.

REFERENCE BOOKS

1	Peter Morris and Riki Therivel, Methods of Environmental Impact Assessment (Natural and Built Environment Series), 3rd Edition, Routledge, 2009
2	TRB Special Report 268. Surface Transportation Environmental Research: A Long-Term Strategy, National Academies Press, 2005
3	Keith W. Little, Environmental Fate and Transport Analysis with Compartment Modeling, CRC Press, Taylor & Francis Group, 2012.
4	Gupta, K.R. and Maiti, P., Global Environment: Problems and Policies, Atlantic Publisher, New Delhi, 2009.
5	Amanda, K., Environmental Justice and Land Use Conflict, Taylor and Francis, London, 2017.
E BOOKS	
1	https://www.amazon.in/Environmental-Impact-Assessment-Bankim-Chandra-ebook/dp/B084C7L9R6
2	https://onlinelibrary.wiley.com/doi/book/10.1002/0471722022
MOOC	
1	https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-253j-transportation-policy-and-environmental-limits-spring-2004/
2	https://ocw.mit.edu/courses/earth-atmospheric-and-planetary-sciences/12-103-strange-bedfellows-science-and-environmental-policy-fall-2005/

COURSE TITLE	**TRAFFIC CONTROL AND ROAD SAFETY**		**CREDITS**		**2**
COURSE CODE	**TPA3723**	**COURSE CATEGORY**	**ELE**	**L-T-P-S**	**2-0-0-1**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL - 4**
ASSESSMENT SCHEME					
First Periodical Assessment	**Second Periodical Assessment**	**Seminar/ Assignments/ Project / Surprise Test / Quiz**			**ESE**

15%	20%	15%	50%

Course Description	**The course will enable the students to know the basics of various traffic control measures and techniques which is currently adopted. The other part of the course concentrates on the case studies where traffic management is effective which resulted in the reduction in the accidents.**
Course Objective	1. To discuss the various traffic signs and signaling system being adopted all over the world. 2. To infer the need for traffic control system and how it is regulated in major cities. 3. To infer on the accident investigation system and its results in change of traffic alignment. 4. To discuss about the road safety parameters and its implications. 5. To analyze the traffic junction / signal / accident prone zone and come out with the proposals for the improvement of same.
Course Outcome	Upon completion of this course, the students will be able to- 1. Associate the role of various traffic signals and signaling system which is functioning around us. 2. Discuss the role of traffic control system and its regulatory mechanism. 3. Extrapolate the works involved in traffic accident investigation strategy and its analytical domain. 4. Infer the importance of road safety parameters and its implications in transport planning. 5. Design the realignment of traffic junction / signal / accident prone zone with the analysis.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO - 1	PO -2	PO -3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PS O-3
CO-1	1	2	2	-	2	-	-	-	2	3	-	-
CO-2	1	2	2	-	2	-	-	-	2	3	-	-
CO-3	1	2	2	-	2	-	-	-	2	3	-	-
CO-4	1	2	2	-	2	-	-	-	2	3	-	-
CO-5	1	2	-	-	2	-	-	-	2	3	-	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: TRAFFIC SIGNS AND SIGNALS SYSTEMS (6)

Traffic signs, control aids and street furniture; Types of traffic signal systems - Fixed, vehicle actuated; coordinated control of traffic Signals, phasing and inter green period, saturation flow, optimization of signals	**CO-1 BTL-2**
MODULE 2: TRAFFIC CONTROL AND REGULATION	**(6)**
Area traffic control, urban traffic control system technology, transportation system management, highway control and incident management, intelligent vehicle highway system, highway surveillance, application of software such as TRANSYT, Split Cycle Offset Optimization Technique (SCOOT) etc. for traffic control and management, Traffic regulation and enforcement.	**CO-2 BTL-2**
MODULE 3: ACCIDENT INVESTIGATION AND ANALYSIS	**(6)**
Overview of accident scenario- national and international; Accident data collection and investigation studies, black spots, collision and condition diagrams; statistical techniques for analysis of accident data.	**CO-3 BTL-2**
MODULE 4: ROAD SAFETY	**(9)**
Effects of road, vehicle and driver on accidents; safety of vulnerable road users; Planning and design for safety, safety during construction; Road Safety Audit (RSA) – principles, procedures and practice, code of good practice, Checklist, RSA at links and intersections; Traffic calming measures.	**CO-4 BTL-2**
MODULE 5: PROJECT WORK	**(9)**
To take up a major traffic signal / junction / accident prone zone, and come with its proposals for road safety and traffic management.	**CO-5 BTL-4**
TEXT BOOKS	
1.	L.R. Kadiyali, Traffic Engineering and Transportation Planning, Khanna Publishers, 2011.
2.	TRB Highway Capacity Manual, Transportation Research Board, Washington, D.C., 2010
REFERENCE BOOKS	
1	Roger P. Roess, Elena S. Prassas and William R. McShane, Traffic Engineering, Prentice Hall, 4th Edition, 2010
2	Nicholas J. Garber, Lester A. Hoel, Nicholas J. Garber, Lester A. Hoel, Principles of Traffic and Highway Engineering, Cengage Learning India, 2nd Edition, 2010
3	Fred L. Mannering, Scott S. Washburn, Kilareski Walter P., Principles Of Highway Engineering And Traffic Analysis, Wiley India Pvt Ltd., 4th Edition, 2011.

4	Currin, Introduction to Traffic Engineering: Manual F/data Collect & Analysis, CL Engineering, 2nd Edition, 2012.
5	Geetam Tiwari and Dinesh Mohan, Transport Planning and Traffic Safety: Making Cities, Roads, and Vehicles Safer, CRC Press, 2016.
6	Hamada Alshaer Demanding Traffic Control and Management in Next Generation Networks, Lap Lambert academic publishing, 2010
E BOOKS	
1	https://onlinelibrary.wiley.com/doi/book/10.1002/9781119307853
2	https://morth.nic.in/sites/default/files/road_safety_books.pdf
MOOC	
1	https://safetraining.com/course/traffic-control-construction-online-course/
2	https://www.trainanddevelop.ca/courses/traffic-control-persons-for-construction/

ELECTIVE - II

COURSE TITLE	**TRANSPORT FINANCE AND INVESTMENT APPRAISAL**		**CREDITS**		**2**
COURSE CODE	**TPA3724**	**COURSE CATEGORY**	**ELE**	**L-T-P-S**	**2-0-0-1**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL - 2**
ASSESSMENT SCHEME					
First Periodical Assessment	**Second Periodical Assessment**	**Seminar/ Assignments/ Project / Surprise Test / Quiz**			**ESE**
15%	**20%**	**15%**			**50%**
Course Description	**The course will enable the students to understand the transport financing system and its investment strategies. The course will also outline of the various financial strategies being adopted with respect to the development of transport networks all over the world.**				

Course Objective	1. To discuss the characteristics of transport infrastructure facilities, its growth trend and investment strategy. 2. To infer the various techniques available with respect to transport costing and recovery management. 3. To estimate the various alternative financing mechanism available with respect to transport infrastructure development around the world. 4. To infer the various techniques adopted with respect to project formulation and appraisal of transport infrastructure project. 5. To associate the institutional and regulatory framework currently available in the country with respect to transport infrastructure development and maintenance.
Course Outcome	Upon completion of this course, the students will be able to- 1. Infer the characteristics of transport infrastructure facilities, its growth trends and strategies. 2. Discuss the various techniques adopted with respect to transport costing and recovery management. 3. Estimate the various alternative financing mechanism available in the world with respect to transport infrastructure development. 4. Discuss the various techniques adopted with respect to transport infrastructure project formulation and appraisal. 5. Associate the institutional and regulatory framework currently available in the country.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO -1	PO -2	PO -3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO -3
CO-1	**1**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**3**	**3**	**-**	**-**
CO-2	**1**	**2**	**2**	**-**	**2**	**-**	**-**	**-**	**3**	**3**	**-**	**-**
CO-3	**1**	**2**	**2**	**-**	**2**	**-**	**-**	**-**	**3**	**3**	**-**	**-**
CO-4	**1**	**2**	**2**	**-**	**2**	**-**	**-**	**-**	**3**	**3**	**-**	**-**
CO-5	**1**	**2**	**2**	**-**	**2**	**-**	**-**	**-**	**3**	**3**	**-**	**-**

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: TRANSPORT INFRASTRUCTURE	**(6)**
Characteristics of transport infrastructure, Growth trends, Investment need and budgetary support, existing financing pattern, financial recurrent expenditure.	**CO-1 BTL-2**
MODULE 2: TRANSPORT COSTING AND RECOVERY	**(6)**

Transport costing, pricing principles, cost recovery pricing, deficits; Financial capital investment, municipal development funds, capital market/debt.	**CO-2 BTL-2**
MODULE 3: ALTERNATIVE FINANCING MECHANISMS	**(6)**
Multilateral and Bilateral Financing mechanism, Financial Institutions, Private sector participation, land as a resource, public private partnership, annuity based approach risk management	**CO-3 BTL-2**
MODULE 4: PROJECT FORMULATION AND APPRAISAL	**(9)**
Definition, Objectives, Importance of project formulation, Project appraisal and management; need of project appraisal, detailed project report, Feasibility studies; concepts of financial feasibility (Pay-back period, Internal Rate of Return (IRR), Discounted Cash Flow (DCF) , Net Present Value (NPV), Cost Benefit Ratio (CBR), Methodology for project identification and formulation; financial cost benefit analysis, social-cost benefit analysis	**CO-4 BTL-2**
MODULE 5: INSTITUTIONAL AND REGULATORY FRAMEWORK	**(9)**
Risk management, financing institute, fund providers, role and function, documentation and agreement, institutional and regulatory framework implementation	**CO-5 BTL-2**

TEXT BOOKS	
1.	A. Richard, Richard Hemming and H. Barry, The International Handbook of Public Financial Management Center for aid and public expenditure, Hamburg, Germany, 2013.
2.	Allen. F, Yago. G, Financing the Future, Market-Based Innovations for Growth, Pearson Publications, Indianapolis, Indiana, 2013.
REFERENCE BOOKS	
1	Athena Roumboutsos, Hans Voordijk, Aristeidis Pantelias, Funding and Financing Transport Infrastructure, Rutledge Publications, New York, USA, 2018.
2	Karl F Seidman, Economic Development Finance, Sage publications, California, USA, 2012
3	Kerzner, H. R., Project Management: A Systems Approach to Planning, Scheduling, and Controlling, John Wiley & Sons, New York, USA, 2013.
4	Lester, A., Project Management, Planning and Control, Butterworth Heineman publishing house, Portsmouth, USA, 2007.
5	Kenneth A. Small and Erik T. Verhoef, Urban Transportation Economics, 2nd Edition, Routledge, London, 2007.

E BOOKS	
1	https://www.amazon.in/Innovation-Public-Transport-Finance-Property-ebook/dp/B01G2BOUOC
2	https://www.taylorfrancis.com/books/mono/10.4324/9781315588636/innovation-public-transport-finance-shishir-mathur
MOOC	
1	https://www.coursera.org/lecture/global-financing-solutions/infrastructure-finance-tCDDI
2	https://www.my-mooc.com/en/mooc/infrafinance/

COURSE TITLE	**TRANSPORT INFRASTRUCTURE DESIGN**		**CREDITS**		**2**
COURSE CODE	**TPA3725**	**COURSE CATEGORY**	**ELE**	**L-T-P-S**	**2-0-0-1**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL - 2**
ASSESSMENT SCHEME					
First Periodical Assessment	**Second Periodical Assessment**	**Seminar/ Assignments/ Project / Surprise Test / Quiz**			**ESE**
15%	**20%**	**15%**			**50%**
Course Description	**The course will enable the students to know the basics of transport infrastructure design focusing on roadways, railways airports, ports and the interchange among these transport terminals. The course will also outline the basic space standards adopted for all these transit terminals.**				
Course Objective	1. To discuss the basic parameters involved with respect to road infrastructure design development. 2. To discuss the basic parameters involved with respect to railway track and its terminal infrastructure design development. 3. To discuss the basic parameters involved with respect to airport terminal infrastructure design development. 4. To discuss the basic parameters involved with respect to ports, docks and harbor terminal infrastructure design development.				

	5. To infer the various parameters considered while design a interchange facility between roads, airports, railway station and harbors.
Course Outcome	Upon completion of this course, the students will be able to- 1. Infer the important factors and its functioning with respect to road infrastructure development. 2. Infer the important factors and its functioning with respect to railway track and station infrastructure development. 3. Infer the important factors and its functioning with respect to airport terminal infrastructure development. 4. Infer the important factors and its functioning with respect to ports, docks and harbor infrastructure development. 5. Discuss the basic parameters considered while designing an interchange facility with respect to roads, railway station, airports and port terminals.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	1	2	1	-	3	-	-	-	2	3	-	-
CO-2	1	2	1	-	3	-	-	-	2	3	-	-
CO-3	1	2	1	-	3	-	-	-	2	3	-	-
CO-4	1	2	1	-	3	-	-	-	2	3	-	-
CO-5	1	2	1	-	3	-	-	-	2	3	-	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: ROAD INFRASTRUCTURE	**(6)**
Design of roundabouts; Design of grade separated intersection and interchange; design of tunnel roads; Design of bus stops and shelters, bus bays; Parking facilities (surface and multi – level), metering system, layout design; design of pedestrian facilities (subways, foot over bridges); cycle tracks; NMT facilities.	**CO-1 BTL-2**
MODULE 2: RAIL INFRASTRUCTURE	**(6)**
Rail alignment surveys; Permanent way- rails, sleepers, ballast, sleepers; Curvature of track-types of curves, degree of curvature, super -elevation, transition curves; railway points, crossings and junctions; station yards; terminals- size, parking, circulation, platforms, passenger service and amenities area; metro rail alignment, bullet train and stations design elements	**CO-2 BTL-2**
MODULE 3: AIRPORTS	**(6)**

Airport location planning; Components of airport design; Air side development – runways, taxiways, aprons, air and ground navigation and traffic control aids; Land side development – passenger building, cargo facilities, internal airport circulation and parking; Design of ground access facilities and airport support facilities etc.; land side airport connectivity planning	**CO-3 BTL-2**
MODULE 4: PORTS, DOCKS AND HARBOUR	**(6)**
Harbors - Types, layout, components of harbor- entrance, approach channel, turning basin, sheltered basin, breakwaters, wharves and quays, dry docks, Jetties and piers; Appurtenances to Harbour- Aprons, Transit Sheds, Warehouses, Moorings; Ports- types, components, Seaport location planning and land side connectivity	**CO-4 BTL-2**
MODULE 5: MULTIMODAL INTERCHANGE	**(6)**
Types of modal interchange, facility requirements for interchanges, international case studies and best practices for modal interchanges; components of modal interchange design, space standards, movement control, parking; design standards, access control design, mobility assistance.	**CO-5 BTL-2**
TEXT BOOKS	
1.	Brysson Cunningham, The Dock and Harbour Engineer's Reference Book: Being a Compilation of Notes on Vrious Matters Connected with Maritime Engineering and Ports and Harbours, BiblioLife, 2014
2.	Verma A., Integrated Public Transportation System: Planning and Modelling. Vdm Publishing House, Mauritius, 2010,
REFERENCE BOOKS	
1	Blow, C. J., Transport terminals and modal interchanges: planning and design, Elsevier, United Kingdom, 2005.
2	Kadiyali L. R, Transportation Engineering, Khanna Publishers, New Delhi, 2016.
3	Srinivasan, R. Harbour, Dock and Tunnel Engineering, Charotar Publishing House Pvt. Ltd., Anand, India, 2009.
4	Khanna, S. K., Arora, M. G., and Jain, S. S. Airport planning and Design, Sixth Edition, Nem Chand and Bros, Roorkee, India, 2012
E BOOKS	
1	https://www.amazon.in/Funding-Financing-Transport-Infrastructure-Business-ebook/dp/B075FXRWSW
2	https://www.amazon.in/Infrastructure-Finance-Europe-Transport-Telecommunications-ebook/dp/B01LLTTEF0
MOOC	
1	https://courses.leeds.ac.uk/i579/transport-infrastructure-design-and-construction-msc-eng-

2	https://ocw.tudelft.nl/programs/master/transport-infrastructure-logistics/

COURSE TITLE	**LOGISTICS PLANNING AND MANAGEMENT**		**CREDITS**		**2**
COURSE CODE	**TPA3726**	**COURSE CATEGORY**	**ELE**	**L-T-P-S**	**2-0-0-1**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL - 2**
ASSESSMENT SCHEME					
First Periodical Assessment	**Second Periodical Assessment**	**Seminar/ Assignments/ Project / Surprise Test / Quiz**			**ESE**
15%	**20%**	**15%**			**50%**
Course Description	**The course will enable the students to understand the basics of logistics management and its relationship with respect to transport infrastructure development and maintenance. The course will also outline the works happening in transport terminals like airports with respect to logistics maintenance and management.**				
Course Objective	1. To discuss the concept of logistics management and supply chain mechanism which is currently practiced in the country. 2. To associate the need for inventory planning and management with respect to transport terminals in the country. 3. To infer on the various freight transport systems and its pros and cons available in the country. 4. To summarize the role of freight terminals and warehouses in logistics management and supply chain. 5. To generalize the freight distribution and management practices being followed all around the world.				
Course Outcome	Upon completion of this course, the students will be able to- 1. Infer the concept of logistics management and supply chain and its relationship with transportation planning. 2. Associate the need for inventory planning and management of it with respect to transport terminal management. 3. Discuss the role of various freight terminals and warehouses in logistics management. 4. Summarize the role of freight terminals and warehouses in logistics management and supply chain.				

	5. Generalize the freight distribution and management practices being followed all over the world.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	1	2	3	-	2	-	-	-	2	3	-	-
CO-2	1	2	2	-	2	-	-	-	2	3	-	-
CO-3	1	2	2	-	2	-	-	-	2	3	-	-
CO-4	1	2	2	-	2	-	-	-	2	3	-	-
CO-5	1	2	2	-	2	-	-	-	2	3	-	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: CONCEPTS OF LOGISTICS AND SUPPLY CHAIN	**(6)**
Introduction to logistics and distribution, integrated logistics and supply chain, customer service and logistics, channels of distribution, role of 3PL and 4PL, key issues and challenges for logistics. Planning framework for logistics, logistics processes, supply chain segmentation, logistics network planning, logistics management and organization, manufacturing and materials management.	**CO-1 BTL-2**
MODULE 2: INVENTORY PLANNING AND MANAGEMENT	**(6)**
Basic inventory planning and management, inventory and supply chain, purchasing and supply, storage and handling systems, order picking and replenishment	**CO-2 BTL-2**
MODULE 3: FREIGHT TRANSPORT SYSTEMS	**(6)**
Historical perspectives on facility location, facility location criteria, single and multiple facility location models; Transport modes selection, vehicle route selection models (VRP), vehicle scheduling models (TSP), Transportation Problem, fleet sizing etc.	**CO-3 BTL-2**
MODULE 4: FREIGHT TERMINALS AND WAREHOUSES	**(9)**
Warehousing, types of various warehouses, planning and design consideration of warehouses, warehousing cost, inventory models, inventory cost, Planning of Inland Container Depot, Container Freight Stations, Integrated Freight Complex, Logistics hubs etc.	**CO-4 BTL-2**
MODULE 5: FREIGHT DISTRIBUTION AND MANAGEMENT	**(9)**
Principles of freight distribution, management of freight traffic, Cost and distribution economics, performance monitoring, benchmarking, information and communication technology in freight distribution, security and safety issues; logistics and environment.	**CO-5 BTL-2**

TEXT BOOKS	
1.	Rushton, A. et. al., The Handbook of logistics and Distribution Management, Kogan Page Limited, United Kingdom, 2010
2.	Waters, D., Logistics: An Introduction to Supply chain Management, Palgrave Macmillan, New York, 2010.
REFERENCE BOOKS	
1	Ghiani, G. et. al, Introduction to Logistics Systems Planning and Control, John Wiley and Sons Ltd. United Kingdom, 2004.
2	Tseng, Y. et. al, The Role of Transportation in Logistics Chain, Proceedings of the Eastern Asia Society for Transportation Studies, Vol. 5, 2005.
3	David Lowe, Intermodal Freight Transport, Elsevier Butterworth-Heinemann Publishers, 2005.
4	Petros A. Ioannou, Intelligent Freight Transportation, CRC Press, 2008
5	Planning Commission National Transport Development Policy Committee, India Transport Report: Moving India to 2032. Government of India, 2014.
E BOOKS	
1	https://www.amazon.in/Logistics-Supply-Management-Martin-Christopher-ebook/dp/B01DDSJ52O
2	https://www.phindia.com/Books/ShoweBooks/MzI1/Logistics-Supply-Chain-Management-Distribution-Management
MOOC	
1	https://www.edx.org/learn/logistics
2	https://www.my-mooc.com/en/mooc/principles-of-global-logistics-management/