

**SCHEME OF EXAMINATIONS**  
**&**  
**SYLLABI of M. Sc. (TRAFFIC MANAGEMENT)**  
**(Choice Based Credit System)**  
**FROM THE ACADEMIC SESSION**  
**2018-19**

**FACULTY OF MANAGEMENT SCIENCES**  
**M D UNIVERSITY, ROHTAK**

## **M.Sc. (Traffic Management)**

**PROGRAM OBJECTIVE:** The Global Status Report on Road Safety 2015 by the WHO reveals that the road traffic injuries claim more than 1.2 million lives each year. As per the report, this is the leading cause of death among young people aged between 15 and 29 years and it costs the governments approximately 3% of GDP. The report further states that low and middle-income countries are hardest hit, with double the fatality rates of high-income countries and 90% of global road traffic deaths. The M.Sc. (Traffic Management) Programme will be targeted to develop a pool of professionals to lead the safety management of road traffic. This would benefit the society in capacity building and yield professionals to cater to the ever increasing problem of traffic and lack of scientific investigation of road crashes.

**PROGRAM DURATION:** 2 years (4 Semesters)

**PROGRAM MODULES:** Traffic Engineering, Transport Planning, Fundamentals of Traffic Management, Quantitative Analysis & Information Management, Road Safety Audit , Road Crash Scene Management, Traffic Legislation and Regulation , Road crisis Management, Traffic Psychology and Driver Training, Intelligent Transport System(ITS), Traffic Control and Enforcement , Highway Asset Management, Logistics and Fleet Management , Road Accident Insurance and compensation, Transport Demand Management, Safe System Approach , Sustainable Transport Planning and Policies , Planning and Design for Vulnerable Road Users, Summer Vacation Training and Project Work.

**ENTRY REQUIREMENTS/ ELIGIBILITY :** Graduate in any discipline recognised as equivalent thereof by the M.D. University securing a minimum of 60 percent marks in aggregate of all semesters or equivalent in terms of CGPA grade are eligible to apply for admission to the course.

### Credit Matrix for M.Sc. (Traffic Management) Programme

Semester	Core Paper including practical (C)	Discipline Specific Elective Course (D)	Open Elective/ Interdisciplinary Course (O)	Foundation Elective Course (F)	Project work/ Training	Total Credits
I	20	-	-	-	-	20
II	17	3	3	2	-	25
III	13	3	3	-	3	22
IV	09	3	-	-	12	24
<b>Total</b>	<b>59</b>	<b>9</b>	<b>6</b>	<b>2</b>	<b>15</b>	<b>91</b>

**Total credits required for M.Sc. (Traffic Management) = 91**

### INSTRUCTIONS FOR THE STUDENTS

#### Types of Courses

##### **(A) Core Courses:**

A core course is a compulsory paper to be studied by a candidate as a core requirement to complete the requirements of a degree. The core component is based on papers that are unique to the programme and hence imperative for study to earn a degree in a given discipline/programme.

##### **(B) Elective Course:**

Elective course is a course which can be chosen from a pool of papers. It may be:

- Supportive to the discipline of study
- Providing an expanded scope
- Enabling an exposure to some other discipline/domain
- Nurturing student's proficiency/skill.

The elective papers are of two types:

##### a) **Open Elective**

An elective may be "Generic elective" focusing on those courses which add generic proficiency to the students. Discipline Centric may be chosen from an unrelated discipline. The latter may be called as an open elective.

##### *Discipline Centric Elective Paper*

A paper which a candidate can choose from a pool of papers from the main discipline or from a sister/related discipline which supports the main discipline.

##### *Open Elective Paper*

An elective paper chosen generally from an unrelated discipline with an intention to seek exposure is called an Open Elective. Each department may design syllabus of at least one paper which can be chosen as an open elective by the students of the other departments. These courses shall constitute a pool of open elective courses. The candidate may attempt this course either in Hindi or English irrespective of the medium of instructions for the course.

##### b) **Foundation Elective**

Foundation Elective Courses are value-based courses which may enhance the proficiency / skill. These electives could be computer awareness, information processing, office automation programming, communication skills, Spoken English, Knowledge of an additional Foreign Language, Personality Development, soft skills, Business and Management courses, entrepreneurship development etc.

**(C) Project/Field Work/Dissertation/Group Seminars**

It is a special paper where a candidate carries out the application of knowledge in solving/studying /exploring a real life /difficult problem in a creative way. Depending upon the scope and time framework available, the Project Work/Field work/Dissertation/Group.

**Note:**

1. The duration of all the end term theory examinations shall be 3 hours.
2. The Criteria for awarding internal assessment of 20 marks shall be as under:
  - a) Class test: 10 marks.
  - b) Assignment and Presentation: 5 marks
  - c) Attendance: 5 marks
    - Less than 65%: 0 marks*
    - Up to 70%: 2 marks*
    - Up to 75%: 3 marks*
    - Up to 80%: 4 marks*
    - Above 80%: 5 marks*

## SEMESTER I

Paper Code	Nomenclature	Course Structure Credits (L:T:P)	Total Credits	Hrs per Week	Marks			Total Marks
					Internal Marks	External Marks	Practical Marks (External)	
<b>CORE PAPER (C)</b>								
18IMT21C1	Fundamentals of Transport Planning	3:0:0	3	3	20	80		100
18IMT21C2	Fundamentals of Traffic Engineering	3:0:0	3	3	20	80		100
18IMT21C3	Fundamentals of Traffic Management and Road Safety	3:0:0	3	3	20	80		100
18IMT21C4	Quantitative Analysis and Information Management	2:1:0	3	3	20	80		100
18IMT21C5	Traffic Management Lab-I(Traffic Data)	0:0:4	4	8	-		100	100
18IMT21C6	Traffic Management Lab-II(Traffic Engineering)	0:0:4	4	8	-		100	100
<b>TOTAL CREDITS: 20</b>								

## SEMESTER II

Paper Code	Nomenclature	Course Structure Credits (L:T:P)	Total Credits	Hrs per Week	Marks			Total Marks
					Internal Marks	External Marks	Practical Marks (External)	
<b>CORE PAPER (C)</b>								
18IMT22C1	Road Safety Audit	3:0:0	3	3	20	80	-	100
18IMT22C2	Road Crash Scene Management	3:0:0	3	3	20	80		100
18IMT22C3	Traffic Legislation and Regulation	3:0:0	3	3	20	80		100
18IMT22C4	Traffic Management Lab – III (Road Crash Scene Management)	0:0:4	4	8	-	-	100	100
18IMT22C5	Traffic Management Lab - IV(Road Safety Audit)	0:0:4	4	8	-	-	100	100
<b>DISCIPLINE SPECIFIC ELECTIVE (D) (Opt any one)</b>								
18IMT22D1	Road Safety Crisis Management	3:0:0	3	3	20	80		100
18IMT22D2	Traffic Psychology and Driver Training							
<b>OPEN ELECTIVE/INTERDISCIPLINARY COURSE (O)</b>								
Each student will opt one course from the pool of Open Elective Courses provided by the University		3:0:0	3	3	20	80		100
<b>FOUNDATION ELECTIVE COURSE</b>								
Each student will opt one course from the pool of Foundation Elective Courses provided by the University		2:0:0	2	2	10	40		50
<b>TOTAL CREDITS: 25</b>								

Note: The Lab files shall be preserved by the Teacher In-charge for scrutiny at the time of conduct of practical by the external examiner.

**NOTE:** Immediately after the completion of the Second semester, the students shall proceed for their Summer Vacation Training (SVT) of 8 weeks duration in the organization assigned by the university/institution. The

Summer Training Report prepared after the completion of SVT shall be assessed in the third Semester as a compulsory course. The SVT will be submitted by the candidates in the manner as specified in the Ordinance. Summer Training Report shall be evaluated by External examiner only approved by the Vice Chancellor of the university from the panel of examiners recommended by the PGBOS in Management Sciences.

### SEMESTER III

Paper Code	Nomenclature	Course Structure Credits (L:T:P)	Total Credits	Hrs per Week	Marks			Total Marks
					Internal Marks	External Marks	Practical Marks (External)	
<b>CORE PAPER (C)</b>								
19IMT23C1	Intelligent Transport System(ITS)	3:0:0	3	3	20	80		100
19IMT23C2	Traffic Control and Enforcement	3:0:0	3	3	20	80		100
19IMT23C3	Highway Asset Management	3:0:0	3	3	20	80		100
19IMT23C4	Traffic Management Lab - V (ITS & Enforcement)	0:0:4	4	8	-	-	100	100
19IMT23C5	Summer Vacation Training Report	0:0:3	3	-	-	100		100
<b>DISCIPLINE SPECIFIC ELECTIVE (D) (Opt any one)</b>								
19IMT23D1	Transport Logistics and Fleet Management	3:0:0	3	3	20	80		100
19IMT23D2	Road Accident Insurance and Compensation							
19IMT23D3	Transport Economics							
<b>OPEN ELECTIVE/INTERDISCIPLINARY (O)</b>								
	Each student will opt one course from the pool of Open Elective Courses provided by the University	3:0:0	3	3	20	80		100
<b>TOTAL CREDITS: 22</b>								

### SEMESTER IV

Paper Code	Nomenclature	Course Structure Credits (L:T:P)	Total Credits	Hrs per Week	Marks		Total Marks
					Internal Marks	External Marks	
<b>CORE PAPER (C)</b>							
19IMT24C1	Transport Demand Management	3:0:0	3	3	20	80	100
19IMT24C2	Safe Systems Approach	3:0:0	3	3	20	80	100
19IMT24C3	Project Work	12	12	-	100* <sup>1</sup>	100	200
19IMT24C4	Comprehensive Viva Voce	3	3	-	-	100	100

<sup>1</sup> To be awarded by Supervisor Faculty assigned by Director/Principal

	<b>DISCIPLINE SPECIFIC ELECTIVE (D) (Opt any one)</b>						
19IMT24D1	Sustainable Transport Planning and Policies	3:0:0	3	3	20	80	100
19IMT24D2	Planning and Design for Vulnerable Road Users						
<b>TOTAL CREDITS: 24</b>							

**NOTE:**

**I. INSTRUCTIONS FOR THE CONDUCT OF PRACTICAL LAB WORK**

The practical Lab work examination(s) and Comprehensive Viva-voce of the courses shall be conducted by the Board of Examiners, comprising of one internal faculty member (to be appointed by the Director IMSAR or affiliated institution (if any); and one external examiner to be appointed by the Vice-Chancellor on the recommendations of the PG Board of Studies in Management.

**II. SUMMER TRAINING REPORT/PROJECT REPORT**

The topic of the Project Report (19IMT24C3) shall be finalized in the 3rd semester by a Committee of the faculty members to be constituted by Director/Principal of IMSAR/the affiliated Institute after presentation by candidate before the Committee.

Three copies of the final Training Report and Project Report, wherever specified, duly typed and spiral bound along with necessary certificates signed by the Supervisor concerned and countersigned by Director/Principal of the Institution (Training/Project guidelines has been separately approved by PGBOS in Management) will be submitted to the office of the Controller of Examinations, M D University, Rohtak within 20 days of the start of the semester examinations in which they appear.

The Project Report shall be evaluated both by the Internal as well as by the external examiner as specified in the scheme above.

## **Program Objectives:**

M.Sc. in Traffic Management is based upon the Safe Systems Approach which inculcates in individuals the understanding to manage complex and dynamic interaction between operating speeds, vehicles, road infrastructure and road user behaviour in a holistic and integrated manner so that road traffic moves in the most disciplined manner.

The program aims to create capabilities of individuals in domains of traffic management and develop scientific basis of comprehensively integrating the subject areas through the process of research, globally applied best practices and recognising the national and local needs.

This research based and need based education will help individuals rise to become traffic managers, support academic and research organizations, enhance their capabilities in order that scientific operations and road traffic is catalysed, injury and death occurring due to road crashes are minimised.



## SEMESTER-I

Paper Code: 18IMT21C1

Credits: 3

### Fundamentals of Transport Planning

Max. Marks: 80

Time: 3 Hours

**Course Objectives:** The purpose of the course is to provide the students with some basic concepts in transportation: The relationship between transportation system, land use dissemination and human activities, study methods to analyse transport systems, development of sustainable transport facilities and tools to assist decision making in transport planning. The course also includes the role of the transportation systems and the importance of the way it is integrated in the urban system. The course also includes selected topics in transport planning and policy development, basic models for predicting transport demand such as buses and trains.

Module	Topics
Unit I	<b>Land Use and Transport</b> Motorisation and Density, Mobility indicators, Mobility and accessibility, Urban sprawl and transport demand, land use-transport cycle, Urban forms : types, merits , Urban structure : concept, measures, Impact of urban form /structure on mobility patterns, Smart growth principles, sustainable mobility concepts
Unit II	<b>Transport Planning Process</b> Urban transport planning process; study area delineation, zoning; data needs; Aggregate demand modelling approach- trip generation models, trip distribution models and its calibration, modal split models and its calibration, traffic assignment techniques; calibration and validation checks; concepts of value of time and generalized cost
Unit III	<b>Public Transport Planning</b> Typology of public transport modes, genesis of mass transit system, Para transit system, technological features of rail and road based mass transit systems. Public Transport Based city form and Structure; Transit investments and urban growth; transit oriented development; impact of city density, size and activity concentration on public transport patronage.
Unit IV	<b>Urban Transport Policies</b> Transport policies and strategies, issues related to sustainability; A-S-I Framework, National Urban Transport Policy, Transit Oriented Development, Green Mobility; Mobility Consideration for disadvantaged Groups namely: Aged, Children, Women, Poor etc.; Case Studies on Mobility and Accessibility, international best practices

#### Suggested Readings:

- M. J. Bruton, Introduction to Transportation Planning, Hutchinson, London, 1985
- S. Ponnuswamy and David Johnson Victor, Urban Transportation: Planning, Operation and Management, McGraw Hill Education (India) Private Limited, 2012.
- Kadiyali L.R., Traffic Engineering & Transport Planning, Khanna Publishers, 2003
- Banister David, Transport Planning, 2nd edition, London, Spon Press, 2002.
- Michael D. Meyer, ITE (Institute of Transportation Engineers), Transportation Planning Handbook, John Wiley & Sons, 4th Edition, 2016.
- Yaron Hollander, Transport Modelling for a Complete Beginner, Publisher: CTthink!, 2016.
- Eduardo Alcantara Vasconcellos (2001) Urban Transport, Environment and Equity: The Case for Developing Countries, Publisher: Earthscan Ltd.

**INSTRUCTIONS:** There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt five questions in all.

## Fundamentals of Traffic Engineering

Max. Marks: 80

Time: 3 Hours

(Core Paper)

**Course Objectives:** The course aims to equip the students with the concepts, scope and utility of traffic engineering which includes the traffic flow theory and designing of Road infrastructure and intersections. It also seeks to equip the students with the knowledge of different types of Traffic Control Devices and their applications at various levels.

Module	Topics
<b>Unit I</b>	<b>Principles of Traffic Flow Theory</b> Definition, concepts, scope and utility of traffic engineering. Road users and behaviour. Relationship between the traffic flow variables, fundamental diagrams of traffic flow, Shockwave Analysis. Definition of capacity and level of service, factors affecting capacity and level of service, static and dynamic PCU, (Passenger Car Unit) Design service volume, capacity norms for urban roads, intercity and highways..
<b>Unit II</b>	<b>Design of Road Infrastructure</b> Road cross-sectional elements- right of way, carriageway, median, service lane, footpath, curb, camber, side slope, service road etc. for different hierarchy of roads; geometry of horizontal curves and vertical curves, super elevation, sight distance, access control etc, crash barriers / cushions.
<b>Unit III</b>	<b>Design of Intersections</b> Types of intersections, visibility, Design principles – alignment and vertical profile, visibility, radii of curves, channelization; roundabouts- capacity and design; capacity of signalized intersections; Grade separated intersection design elements.
<b>Unit IV</b>	<b>Traffic Control Devices</b> Traffic Sign, Road Markings, Traffic Signals, barricades, speed breakers, Traffic lighted bollards, intersection channelization, central refuges, traffic cones & drums, Warrant for signals, phasing and inter green period, saturation flow, optimization of signals; Vehicle actuated signal facilities; co-ordination of traffic signal, area traffic control system

**Suggested Readings:**

1. L R Kadiyali, Traffic Engineering and Transportation planning, Khanna Publishers. Delhi, 2003
2. S C Saxena, Traffic planning and design, Dhanpat Rai & Sons Delhi, 1989.
3. V N Vazirani & S P Chaondola, Transportation Engineering, Vol. I & II, Khanna Publishers. Delhi, 2015.
4. L J Pingnataro, Traffic Engineering: Theory and practice, Prentice Hall, Englewood, 1973.
5. Chakraborty, Partho and Animesh Das, Principles of Transportation Engineering, P H I Learning, 2015.
6. Highway capacity manual Transportation, Research Board, Washington D C, 2000.
7. IRC Special Publications (SP) on Highway Engineering
8. Standard Specifications and Code of Practice for Road Bridges, 2014.
9. Pline, James L., Traffic Engineering Handbook, 4<sup>th</sup> edition, New Jersey Prentice Hall, 1992.
10. Davies, Ernest , Traffic Engineering Practice-Spon's civil engineering series, Publisher- E. & F. N. Spon, 1968.

**INSTRUCTIONS:** There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt five questions in all.

## SEMESTER-I

Paper Code: 18IMT21C3

Credits: 3

Fundamentals of Traffic Management and Road Safety

Max. Marks: 80

Time: 3 Hours

(Core Paper)

**Course Objectives:** This course provides insights in to the different types of Traffic Management techniques, developing road safety measures and improving road safety for urban and rural environment. This papers also seeks to equip the students with the logistics involved in traffic management.

<b>Unit I</b>	<b>Traffic Management Techniques</b> Traffic segregation Techniques- Pedestrian grade-separation, pedestrian malls, sidewalks, central dividers, footpaths and central railings, storage lanes, bus bays, bicycle lanes, off- street loading/unloading facilities; Exclusive Bus Lanes; Speed control and Zoning; Parking Control; Traffic Channelization; Route and Network Management, Area Traffic Management, Arterial corridor management, City wide Traffic Control and Management.
<b>Unit II</b>	<b>Introduction to Road Safety</b> Definition, domain; Principles and systems of Coordination in traffic management, Road Safety as a subset of a scientific traffic management system, Global & National Road Safety scenario, Economic loss on account of Road Crashes and their implications Road Safety Policy: Developing a Road Safety Policy, corporate approach to road safety, Road safety functions of the Police, Road safety education in schools, Road safety for vulnerable road users, Road safety management strategies
<b>Unit III</b>	<b>Road Safety measures</b> Road safety in urban environment, road safety in rural environment, Traffic safety and human behaviour, Active road safety-prevention of crashes, passive road safety-prevention of injury and death. Measures to improve road safety: road safety planning, the road safety team and their role in casualty reduction Traffic Management Schemes, Integration of safety into traffic management schemes
<b>Unit IV</b>	<b>Logistics for Traffic Management</b> Definition, domain, role and responsibility of traffic management agencies, Principles and systems of coordination in Traffic management; Intelligent transport system- concept, Traffic Management logistics - equipment's, vehicles and traffic control centre; Centralized Data Processing and Monitoring, Traffic personnel- skills & deployment systems.

### Suggested Readings:

- Simon Cohen and George Yannis, Traffic Management, John Wiley & Sons, 2016.
- Laurence Olivo, Traffic Management, Edmond Montgomery Publications, Limited, 2007.
- Jane's Information Group Road traffic management, Edited by Anthony Wyatt, Publisher: Jane's Information Group, 1998.

**INSTRUCTIONS:** There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt five questions in all.

## SEMESTER-I

Paper Code: 18IMT21C4

Credits: 3

Quantitative Analysis and Information Management

Max. Marks: 80

Time: 3 Hours

(Core Paper)

**Course Objectives:** The objective of this course is to impart to the students the various techniques of performing a traffic survey and its analysis using statistical methods. The course also imparts knowledge to the students concerning the Operational Research and different types of Information systems needed for managing the data.

Units	Topics
Unit I	<b>Traffic Surveys and Studies</b> Traffic surveys: Traffic Volume Count, origin destination survey, speed and delay study, parking surveys, road network inventory, accident study - need, design of survey proforma, methods of conducting surveys, analysis and interpretation; Collection and recording of the road accident data using A1 and A4 accident form, Accident Investigation, Analysis & Prevention, Black spot study, Statistical Analysis.
Unit II	<b>Statistical Analysis</b> Measures of central tendency; measures of absolute dispersion. Probability distribution- binomial, distribution, Poisson distribution and normal distribution. Application of Statistical Programme for Social Sciences (SPSS); Correlation analysis:- correlation co-efficient, co-efficient of rank correlation, simple Linear and nonlinear regression, lines of regression, coefficient of regression; Multiple Regression Analysis; Statistical inference:- Testing of hypothesis, null hypothesis, level of significance, two tailed and one tailed tests, large and small sample tests, Chi-square distribution.
Unit III	<b>Fundamentals of Operations Research</b> Evolution, methodology and role in managerial decision making; Linear Programming: Meaning, assumptions, advantages, scope and limitations; Formulation of problem and its solution by graphical and simplex methods; transportation problems including transshipment problems; special cases in transportation problems; assignment problems including travelling salesman's problem.
Unit IV	<b>Information Management</b> Planning Information Systems- National Natural Resources Management System (NNRMS), National Urban Information System, National Urban Observatory, Municipal Information Systems, Land Information Systems: Global Navigation Satellite Systems; NUIS Guidelines and Design Standards; Data base management system; big data analytics and applications, Internet of Things (IOT) and its application in urban sector; management of tabular data, spread sheets, introduction to statistical packages with advantages and limitations; municipal information system-definition, need scope, limitations

### Suggested Readings:

- G. Charlesworth, Methods of making traffic surveys especially "before and after" studies, Institution of Highway Engineers, Institution of Highway Engineers, 1950.
- Kamaldeo Narain Singh, Abhinav Publications, India, 1978.
- D. K. Kulshrestha, Management of State Road Transports in India, Mittal Publications, 1989.
- Paneerselvam, Operations Research, Prentice Hall of India, N. Delhi. 2012.
- Taha, Operations Research: An Introduction, Prentice Hall of India, N. Delhi, 2007.

- Vohra, N.D.; Quantitative Techniques in Management; Tata McGraw Hill Publishing Company Ltd., New, 2006.
- Kapoor, V.K., Operations Research; Sultan Chand & Sons, New Delhi, 2014.

**INSTRUCTIONS:** There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt five questions in all.

## SEMESTER –I

Paper Code	TRAFFIC MANGEMENT LAB -I	Credits
18IMT21C5	(Traffic Data)	4
Time: 8 Hours	Practical	Max. Marks: 100

**Course Objectives:** The students are given practical exposure as to how to collect Traffic data and further to analyse them. The students are hence first sent for field work under the faculty supervision and the data concerning traffic volume count, intersection studies and spot and journey speed studies are done. After collection of the data the students learn to analyse the data in the lab through statistical means.

### Field Work

1. Traffic Volume Count (mid-block)
2. Turning movement survey at intersection
3. Spot speed studies
4. Journey speed studies

### Lab Analysis

5. Analysis of Traffic Volume Count (mid-block)
6. Analysis of Turning movement survey at intersection
7. Analysis of Spot speed studies
8. Analysis of Journey speed studies

## SEMESTER –I

Paper Code	TRAFFIC MANGEMENT LAB–II	Credits
18IMT21C6	(Traffic Engineering)	4
Time: 8 Hours	Practical	Max. Marks: 100

**Course Objectives:** The students are given hands-on-experience, covering road geometric designs and alignment studies, Study of cross sections and intersections, traffic signal studies and parking analysis and design.

**Course contents:**

1. Traffic fundamentals: Speed, Density, Concentration etc.
2. Road Alignment studies
3. Horizontal and Vertical Curves
4. Road Geometric Design studies
5. Study of Road Cross Section
6. Intersection Design (T-Junction, Staggered Junction, Four arm Signalized Intersection, Roundabout)
7. Traffic Signal studies
8. Parking (On Street and Off Street)-Analysis and design

## SEMESTER-II

Paper Code: 18IMT22C1

Credits: 3

### Road Safety Audit

Max. Marks: 80

Time: 3 Hours

(Core Paper)

**Course Objectives:** The students are given an insight in to the safety issues related to road designs, the need and concept of road safety audits and the various stages of road safety audit. The students are also acquainted with the road safety audit process and its implementation.

Unit	Topics
Unit-I	<b>Principles for Safe Road Design</b> Principles of Road Safety; Safety Issues Related to Road Designs- users, Design speed, Horizontal and vertical curves, Intersections, Access control, Cross-section, Trees, Road signs, Merges, Sight distance, Night visibility, Parked vehicles; Safety Issues for Non-Motorised Traffic- Pedestrian walking facilities, Pedestrian crossings, Lay-byes/bus bays, Bicyclists, rickshaws and animal drawn carts; Safety Issues on High Speed Corridors.
Unit-II	<b>Overview of Road Safety Audit</b> Road Safety Situation in India, Need and Concept of Road Safety Audit; Road Safety Audit and Quality Assurance; Organisations Involved in Road Safety Audit- designer, client, auditor; type of project to be audited; way of organizing a Road Safety audit, Road Safety auditors and key personnel in RSA.
Unit-III	<b>Stages of Road Safety Audit</b> Stage 1 Audit (During Feasibility Study); Stage 2 Audit (Completion of Preliminary Design); Stage 3 Audit (Completion of Detailed Design); Stage 4 Audit (During Construction Stage); Stage 5 Audit (Completion of Construction) (Pre-opening); Stage 6 Audit-Audit on Existing Roads and During Operation and Maintenance of Concessionaire Projects; Safety Issues; Data Requirements for RSA.
Unit-IV	<b>Road Safety Audit Process</b> Audit of New Roadway Sections- Selecting road safety audit team, background information, Commencement meetings, Assessing the documents, Site Inspecting, Preparation of safety audit report, completion meeting, Responding to the audit report, Implementing the agreed recommendations; Audit of Existing Roadway Sections- Road inventory, Classified volume counts, Speed surveys, First information reports from police stations.

### Suggested Readings:

1. Evans S.K., Traffic Engineering Handbook, Institute of Traffic Engineers, USA, 2009.
2. Wohl M., Martin B.V., Traffic system analysis of Engineers & Planners, McGraw Hill, New York, 1967.
3. Babkov V.F., Road conditions & Traffic Safety, MIR Publishers, Moscow, 1975.
4. Little A.D., The state of art of Traffic Safety, Paraeger Publishers, New York, 1970.
5. Indian Roads Congress, Highway Safety Code, IRC: SP-44:1996,
6. Indian Roads Congress, Road Safety Audit Manual, IRC:SP-88-2010.
7. American Association of State Highway and Transportation Officials (AASHTO).
8. Highway Safety Manual, 1st Edition, AASHTO, 2010.

**INSTRUCTIONS:** There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt five questions in all.



## SEMESTER-II

Paper Code: 18IMT22C2

Credits: 3

### Road Crash Scene Management

Max. Marks: 80

Time: 3 Hours

(Core Paper)

**Course Objectives:** This course seeks to introduce the students to manage a road accident site or a crash site. It would help the students to understand the various evidences that needs to be collected and the different ways in which it is to be evaluated for reconstruction of the crash.

Unit	Topics
Unit-I	<b>Road Crash Investigation</b> Process and Provisions- Objectives, Responsibilities of the Investigation Officer at the Scene, series of events description, Legal provisions of MV Act with recent amendments and Judicial pronouncement in case of accidents. Drafting of FIR in Accident cases Investigation Procedures: Expert Response required at the scene and their specific roles. Protecting the scene, caring for the injured, searching the scene and vehicular, recording the scene: photography and measuring and sketching the accident scene, collection of evidences. Questioning and interviewing the Drivers and witnesses; Types of personal protective equipment (PPE) and its applications in road collision investigations.
Unit-II	<b>Introduction to Forensic Engineering</b> Introduction to Forensic Science and Forensic Engineering, Application of Forensic Science to Road Accident related cases, Identifying Contributory and Precipitating Factors; Scientific Analysis of Physical Evidences like, Tyre marks, skid marks, Foot prints, Tool marks, Fingerprints, soil, paint, glass and blood.
Unit-III	<b>Evidence Evaluation</b> Evaluation of Road environment, vehicle and human being, Highway damage, Vehicle damage, tire marks, skid marks, sideslip marks, yaw marks, debris, and mechanical inspection of the vehicle: examination of accelerator, brake system, body damage of vehicle, exhaust system, gear shift lever, horn, lights, loads, mirrors, safety restraint systems, air bags, steering and suspension systems, tires, wheels, windshield, windows and wiper conditions, Assessing the injury patterns in accident cases, victim identification and post mortem findings.
Unit-IV	<b>Reconstruction of road crashes</b> Types of reconstruction, Assessing Primary cause of accidents, tools used for evaluating accidents, Converting scene data in to event sequence, basic energy method and basic momentum method, 3-D animation procedures/PC-Crash for Reconstruction, Auto CAD- for forensic investigation, Estimation of speed, Introduction to speed estimates, coefficient of friction, speed from skid marks.

#### Suggested Readings:

1. Carper, K. (ed.), Forensic Engineering, 2<sup>nd</sup> Edn. CRC Press, Boca Raton, Florida, 2001.
2. James, S.H. and Nordby, J.J. Eds., Forensic Science An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
3. Nickolls, L.C., Scientific Investigation of Crime, Butterworths, London, 1956.
4. R. Saferstein, Forensic Science Handbook, Vols. I, II, (Ed), Prentice Hall, Eaglewood Cliffs, NJ; 1988.
5. Rivers, R.W. Traffic Accident Investigators' Manual, Second Edition, Charles C. Thomas Publisher, Springfield, Illinois, USA, 1995.

6. John F. Brown, Kenneth S. Obenski and Thomas R. Osborn, Forensic Engineering Reconstruction of Accidents, Second Edition, Charles C. Thomas Publisher, Springfield, Illinois, USA, 2002.
7. Arun Mohan, Road Accidents-Prevention, Attention, and compensation, Universal Law Publishing Co. Pvt, Ltd., 2014.
8. Bodziak, W., Footwear Impression Evidence (2nd Edn.) CRC Press, Boca Raton, Florida, 2000.
9. DeForest, P., Gaensslen, R., and Lee, H., Forensic Science - An Introduction to Criminilastics, McGraw Hill, New York, 1983.
10. Fisher, B., Techniques of Crime Scene Investigation (6<sup>th</sup> Edn.) CRC Press, Boca Raton, Florida, 2000.
11. Wojciech Wach, Simulation of Vehicle Accidents using PC- Crash, Institute of Forensic Research Publishers, Krakow, Poland, 2011.

**INSTRUCTIONS:** There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt five questions in all.

## SEMESTER –II

Paper Code: 18IMT22C3

Credits: 3

Traffic Legislation & Regulation

Max. Marks: 80

Time: 3 Hours

(Core Paper)

**Course Objectives:** This course aims to equip the students with the knowledge of Traffic Legislation and Regulations. It encompasses the Motor Vehicles Act 1988, CMVR 1989 and Rules of the Road Regulations, 1989.

Unit	Topics
Unit-I	<b>Introduction to Traffic Legislation</b> History of Motor Vehicle Legislation in India Types of legal instruments dealing with roads and the movement of road traffic Introduction to National and State Legislations Key terms and definitions used in our Legislations Introduction to the Police Acts, The Indian Penal Code, Cr. PC and IEA.
Unit-II	<b>Motor Vehicles Act 1988 (Section 3 to Section 111) and CMVR 1989 (Rule 3 to Rule 137)–I</b> Licensing of Drivers of Motor Vehicles and conductors of Stage Carriages, Registration of Motor Vehicles, Control of Transport vehicles, Special provisions relating to state Transport Undertaking, Construction Equipment and Maintenance of Motor Vehicles,
Unit-III	<b>Motor Vehicles Act 1988 (Section 112 to Section 215) and CMVR 1989 (Rule 139 to Rule 164)–II</b> Control of traffic, Insurance of Motor Vehicles, No Fault Liability, Motor Vehicle Claims Tribunal (MACT) and award of Compensation, MACT Rules and Claims Tribunal Agreed Procedure in Delhi offences, penalties and Procedures; Composition of Offences Legislations dealing with Non-Motorised Traffic Vehicular Standards and Global NCAP International Scenario of Road Traffic Legislation Motor Transport Workers Acts National Highway Acts & Rules Multi Modal Transportation of Goods Act Standing orders issued by MoRTH Supreme Court/High Court Orders and EPCA
Unit-IV	<b>Traffic Regulations</b> Rules of the Road Regulations, 1989 :Short Title and Commencement, Keep Left, Turning to the Left and Right, Passing to the Right, Passing to the Left: Overtaking prohibited in certain cases, Overtaking not to be obstructed, Caution at road junction, Giving way to traffic at road junction, Free Passage to Fire Service Vehicles And Ambulances, Right of way, Caution for Cyclists, Caution to pedestrians, Caution for School Children, Caution for Drivers

### Suggested Readings:

- 1 Motor vehicles Act, Government of India, 1989.
2. The Central Motor vehicle Rules, Government of India, 1989.
3. Universal's Legal Manual Motor Vehicle Laws (Act and regulation), Universal Law Publishing Co. Pvt Ltd, 2018
4. Dr. L.P.Gupta, Insurance claims solutions, ISBN- 978-9383303038, 2015.

**INSTRUCTIONS:** There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt five questions in all.

## SEMESTER –II

Paper Code	TRAFFIC MANGEMENT LAB–III	Credits
18IMT22C4	(Road Crash Scene Management)	4
Time: 8 Hours	Practical	Max. Marks: 100

**Course Objectives:** This course is designed to give practical exposure to the students in managing a crash site, the type of evidences that needs to be picked up, their collection preservation and packing methods and the methods by which the analysis of these evidences can be done in the laboratory.

**Course Contents:**

1. Processing and Investigation of road traffic accidents
2. Photography of crash site
3. Methods of sketching the crash site
4. Collection, packing and forwarding of evidences from the crash site
5. Calculation of speed of the vehicle from skid marks
6. Reconstruction of crash site using PC Crash software
7. Development and lifting of foot prints, fingerprints, and tyre marks from crash site
8. Comparison and analysis of tool marks and other pattern evidences

## SEMESTER –II

Paper Code	TRAFFIC MANGEMENT LAB –IV	Credits
18IMT22C5	(Road Safety Audit)	4
Time: 8 Hours	Practical	Max. Marks: 100

**Course Objectives:** This course seeks to give practical exposure to students on the various road safety audits meant for different category of road users such as cyclists and pedestrians. Additionally they are also exposed to road safety procedures at work zones, residential zones, near schools and intersections

### Course Contents:

1. Road safety at mid blocks road section
2. Road safety at intersections
3. Road safety for pedestrians
4. Road safety for cyclists
5. Road safety at work zones
6. Road safety near schools
7. Road safety audit of major corridor
8. Road safety audit in residential neighbourhood

## SEMESTER-II

Paper Code: 18IMT22D1

Credits: 3

Time: 3 Hours

Max. Marks: 80

### Road Safety Crisis Management

#### (Discipline Specific Elective Paper (D))

**Course Objectives:** This course seeks to equip the students with the knowledge to manage a road safety crisis situation. The crisis can arise due to accidents and Vehicular fires. The paper also deals with the providing post-crash care to victims of trauma also managing their emotional and psychological trauma.

Unit	Topics
Unit-I	<b>Crisis Management in Road Accidents</b> Objectives, The Golden Hour, The Platinum Ten; The extrication process- Initial Operation Procedures/size up, scene safety, Stabilization-of scene, of vehicle and of patient; patient access; disentanglement, extrication, treatment and transport; Tools Used for Extrication-Hydraulic & Pneumatic Understanding Glasgow Coma Scale; Damage Control Extrication; Hazard Mitigation, Developing Crash Report.
Unit-II	<b>Crisis Management in Vehicular Fires</b> Principles and Procedures of fighting Vehicular fires, Tools needed, Health hazards of Toxic Gases released in vehicular fires, Vehicular fire incident reporting.
Unit-III	<b>Post-Crash Care</b> Clinical and pathological aspects of trauma: First aid to victims at the site, victim transportation, injury patterns, trauma while intoxicated, resuscitation techniques, transfusion, ventilation. Head injuries: Understanding the mechanisms of head injuries, their clinical effects and the pathological findings: circumstances of head injuries in road traffic accidents
Unit-IV	<b>Emotional and Psychological Trauma</b> Trauma: Definition, causes, Risk factors associated with vulnerability to trauma, Symptoms of emotional and psychological trauma Rehabilitation: methods of recovery from physical Trauma, counselling and treatment from Emotional and Psychological Trauma.

#### Suggested Readings:

- John Dolce, Fleet Management, Mcgraw-Hill, 1984.
- Joel Levitt, Basics of Fleet Maintenance, Reliabilityweb.com; 1st edition, 2010.
- John Dolce, Analytical Fleet Maintenance Management, Society of Automotive Engineers Inc, 2nd Edition, 1998.
- Sean Lockhart, Fleet: A Guide to Simplifying Vehicle Fleet Management for Small Business, 90-Minute Books, USA, 2016.
- "Accident Prevention Manual for Industrial Operations", NSC, Chicago, 1982.
- Pasricha, "Road Safety guide for drivers of heavy vehicle" Nasha Publications, Mumbai, 1999.
- K.W.Ogden, "Safer Roads – A guide to Road Safety Engineering", 1996.

**INSTRUCTIONS:** There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt five questions in all.

## SEMESTER-II

Paper Code: 18IMT22D2

Credits: 3

Time: 3 Hours

Max. Marks: 80

### Traffic Psychology and Driver Training

#### (Discipline Specific Elective Paper (D))

**Course Objectives:** The course aims to teach the students about traffic psychology which includes the behaviour patterns of different category of road users. The course also attempts to understand and assess the fitness of the drivers and the role of various factors in determining the driver behaviour.

Unit	Topics
Unit-I	<b>Traffic Psychology</b> Road Users: Drivers - Professional drivers, Private drivers, Young drivers, Older drivers and Children, Pedestrians, Motorcyclists, Cyclists. Traffic psychology - Concepts, Key factors - Safety (objective and subjective) , Traffic psychology : models and theories (the theory of planned behaviour, the homeostasis theory) Traffic-psychology assessment - Process, Exploration, anamnesis, and interview. Ethical issues, Assessment of cognitive functions and the assessment methods - Attention and resilience to monotony, Memory, IQ, Peripheral visual perception, Reaction time. Assessment of personality traits and the assessment methods , Sensation seeking , Anger and hostility, Hazard perception assessment
Unit-II	<b>Driver Behaviour</b> Driver's cognition, personality, behaviour, motivation, and emotions , Driver's behaviour – theories (Gadget, subjective risk, self-regulation), Drivers' abilities (incl. visual attention and other senses) , Driver's personality, Emotions and motivation , Driver's performance – hierarchical task levels , Drivers' individual differences  Main types of risky behaviour - Safety belt and child restraint use, Driving under the influence of alcohol and drugs, Speeding, Aggressive driving, Driver's distraction and inattention, Driver's fatigue, Driver's stress and anger, Running traffic lights, Work-related road risk, Eco-driving  Determinants of behavior, Risk factors associated with driving, Accident risk associated with neuropsychological and general medical diseases, Adaptive driving Programme and medical decisions, Assessment issues
Unit-III	<b>Driver Fitness:</b> physical condition age, fatigue, coordination, vision, disabilities, hearing; and mental condition alertness, awareness, emotions. Fitness to drive - Assessing mental fitness to drive
Unit-IV	<b>Driver Training</b> Maintaining the Vehicle: vehicle inspection; preventive maintenance brakes, tires, steering/suspension, under the hood; and fuel economy vehicle choice and maintenance, driving habits. Alcohol and driving, Medical condition and medication of drivers, Driver demographic trends, driver distractions, Driving simulations, drowsy driving, night vision systems, pedestrian/road worker visibility. Post License Training and Defensive Driving: Need for post licensing training. Goals of driver education, Need for defensive driving, Identifying and preparedness for potential Hazards on roads, use of safety equipment while driving(seat belts and helmets)

	Speed management :Laws: related to issue of License, RRR23, RRR24, Seat belt law, Laws in case of emergency (Sec,134 MVA 1988), Good Samaritan Law
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**Suggested Readings:**

1. Graham J. Hole, The Psychology of Driving, Psychology Press, 2014.
2. Gert Weller, The Psychology of Driving on Rural Roads, Edn.1, Springer VS., 2010.
3. Bryan E. Porter, Handbook of Traffic Psychology, Elsevier Inc. (Edited), 2011.
4. Dixit, V. and Felix, A., One Split Second: The Distracted Driving Epidemic, Wisdom Editions, First edition, 2016
5. M. L. Johnson, F. R. Mottola, A. A. Opfer, O. Crabb and R. R. Thiel, Drive Right, 10th Edition Revised, Prentice Hall, 2002.

**INSTRUCTIONS:** There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt five questions in all.



**SEMESTER –II**

**Paper Code:**

**Credits: 3**

**Time: 3 Hours**

**Max. Marks: 80**

**(Open Elective/Interdisciplinary Course)**

Each student will opt one course from the pool of Open Elective Courses Provided by the University.

**SEMESTER –II**

**Paper Code:**

**Credits: 2**

**Time: 3 Hours**

**Max. Marks: 40**

**(Foundation Elective Course)**

Each student will opt one course from the pool of Open Elective Courses Provided by the University.

## SEMESTER-III

Paper Code: 19IMT23C1

Credits: 3

**Intelligent Transport System (ITS)**

**Max. Marks: 80**

**Time: 3 Hours**

**(Core Paper)**

**Course Objective:** The course aims to expose the students to the recent advancements in Transport System that is the Intelligent Transportation Systems (ITS), its functional areas and its role in traffic management.

Unit	Topics
Unit-I	<b>Introduction to Intelligent Transportation Systems (ITS)</b> – Definition of ITS , ITS Objectives, Historical Background, Benefits of ITS , ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection.
Unit-II	<b>Telecommunications in ITS</b> – Importance of telecommunications in the ITS system, Information Management, Traffic Management Centres (TMC), Vehicle – Road side communication – Vehicle Positioning System
Unit-III	<b>ITS functional areas</b> – Advanced Traffic Management Systems (ATMS), Advanced Traveller Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS)
Unit-IV	<b>ITS User Needs and Services</b> – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management, maintenance and construction management

### Suggested Readings:

1. ITS Hand Book, Recommendations for World Road Association (PIARC) by Kan Paul Chen, John Miles, 2000.
2. Sussman, J. M., Perspective on ITS, Artech House Publishers, 2005.
3. National ITS Architecture Documentation, US Department of Transportation, 2007 (CD-ROM).

**INSTRUCTIONS:** There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt five questions in all.

## SEMESTER-III

Paper Code: 19IMT23C2

Credits: 3

Traffic Control and Enforcement

Max. Marks: 80

Time: 3 Hours

(Core Paper)

**Course Objective:** The Objective of this course is to impart knowledge to the students in the area of traffic control and enforcement. The course also seeks to explain the various software available for traffic control and the methods, systems and technologies that can be adopted for enforcement of the Regulations.

Unit	Topics
Unit-I	<b>Traffic Control</b> – Area traffic control, urban traffic control system technology, transportation system management, highway control and incident management, intelligent vehicle highway system, highway surveillance , Speed control methods- School speed zones, variable speed zones, shared zones, Traffic Calming
Unit-II	<b>Software Applications in Traffic Control</b> – Application of software such as TRANSYT, SCOOT etc. for traffic control and management, Traffic regulation, Data Collection using Radar Guns, Cameras, TIRTL, etc.
Unit-III	<b>Traffic Enforcement</b> – objectives and process of traffic enforcement, Institutions for traffic enforcement, Role and Importance of Traffic Police Department, Main Police Tasks, Manpower requirement , Cost of managing Enforcement, Road Traffic Acts
Unit-IV	<b>Intelligent Traffic Enforcement Systems</b> – Purpose, Benefits, Available Technologies- Surveillance , Incident Detection Cameras, Speed Detection cameras, Traffic Control and command Centre, e-challans, etc.

Suggested

Readings:

1. L R Kadiyali, Traffic Engineering and Transportation planning, Khanna Publishers. Delhi, 2003.
2. Khanna and Justo, Highway Engineering, Nem Chand & Sons, 2017.
3. Sussman, Joseph S, Perspectives on Intelligent Transportation Systems (ITS), Springer, 2005.
4. MoRTH – Road Safety Manual
5. Pradip Kumar Sarkar and Amit Kumar Jain, Intelligent Transport Systems, PHI Learning Private Limited, 2017.

**INSTRUCTIONS:** There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt five questions in all.

## SEMESTER-III

Paper Code: 19IMT23C3

Credits: 3

Highway Asset Management

Max. Marks: 80

Time: 3 Hours

(Core Paper)

**Course Objectives:** The course aims to explain to the students the types of assets on a Highway, the expenditure involved managing these assets.

Unit	Topics
Unit-I	<b>Introduction to Highway Asset Management</b> –Types of Assets, Concept of Asset Management, use of asset management approach, types of expenditure for management of highway assets
Unit-II	<b>Highway Asset Management Plan (HAMP)</b> – Defining HAMP, Philosophy adopted for a plan, objectives of HAMP, Structure of HAMP, Scope of the Plan, Interface with Network Management Plans (NMPs)
Unit-III	<b>Service Management</b> – Policy Framework & Context, Levels of Service: Service Management Hierarchy, Scope of level of service statements in the HAMP, Derivation of level of service statements, Listing of outcomes, Measurement of Outcomes
Unit-IV	<b>Capital Renewal &amp; Operational Management of Highways</b> : Assets (Carriageways & Pedestrian Paths, Highway Structures, Bridges & Tunnels, Lightings & Other Assets) – Capital Renewal, Operational Management, Decision-making

### Suggested Readings:

1. Transport for London, “Highway Asset Management Plan” , London, 2007.
2. County Surveyors Society, “Framework for Highway Asset Management”
3. World Bank, “Project: National Highway Asset Management” Argentina, 2011.
4. Abu-Samra Soliman, “Integrated Asset Management System for Highways Infrastructure”, LAP Lambert Academic Publishing , 2015.
5. Ralph Haas, W. Ronald Hudson, Lynne Cowe Falls; “Pavement Asset Management”, Wiley-Scrivene, 2015.
6. Zongzhi Li, “Highway Asset Management Under Risk and Uncertainty”, VDM Verlag, 2009.
7. Waheed Uddin, W. Ronald Hudson, Ralph C.G. Haas, “Public Infrastructure Asset Management”, McGraw-Hill Education, 2013.

**INSTRUCTIONS:** There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt five questions in all.

## SEMESTER –III

Paper Code	TRAFFIC MANGEMENT LAB –V	Credits
<b>19IMT23C4</b>	(ITS & Enforcement)	4
Time: 8 Hours	Practical	Max. Marks: 100

**Course Objectives:** The objective of this course is to give hands-on-experience to the students in using ITS for parking management, traffic control, incident management and terminal management.

**Course Contents:**

1. ITS application in Parking Management
2. ITS Application in Traffic Control ( Command and Control centre)
3. ITS Application in Arterial corridor management/ Incident Management
4. ITS Application in Public Transport Management
5. ITS Application in Shared Mobility ( App based cab services)
6. ITS application in Real time passenger information system
7. ITS Application in Terminal Management
8. ITS Application Traffic enforcement and regulation

### SEMESTER –III

<b>Paper Code</b>	<b>SUMMER VACATION TRAINING REPORT</b>	<b>Credits</b>
<b>19IMT23C5</b>	(Report based on Summer Vacation Training)	3
		Max. Marks: 100

## SEMESTER-III

Paper Code: 19IMT23D1

Credits: 3

Transport Logistics and Fleet Management Max. Marks: 80

Time: 3 Hours

(Discipline Specific Elective Paper)

**Course Objectives:** The objective of the course is to equip the students with the knowledge of transport logistics, the challenges involved in it and the storage facilities. It also highlights the multi modal transport logistics and transportation of hazardous goods. The course also highlights the fleet management process involving vehicle and driver.

Unit	Topics
Unit-I	<b>Logistics and Distribution</b> Concept of Logistics, supply chain management, integrated logistics and supply chain, third and fourth party logistics (3 PL/4PL), Distribution channels, storage facilities- warehouses, transport carriers, distribution costs, technology in logistics, key challenges in logistics
Unit-II	<b>Multimodal transport logistics</b> Multimodal Transport System: Types of intermodal movements, multi modal carriers – trucking, rail, air, shipping; export and import cargo movement, documentation, facilitators, Freight transport facilities- inland container depot, container freight station, multi-modal logistics hub; traffic impacts of multi-modal transport logistics in urban areas, energy and environment implications
Unit-III	<b>Transportation of Hazardous Goods</b> Hazard goods Classification , Key responsibilities of different parties involved in transportation of hazardous goods, Hazard Preparedness: The Hazchem Code, Emergency information panel, Special requirements for inflammable materials, Preventive Programs for Road Transport Hazards, Transport emergency card (TREM), driver training, lorries responsibilities of driver ,communication.
Unit-IV	<b>Vehicle and Driver Management</b> Vehicle Management: Selection and maintenance personal, hired, leased and company owned cars; Vehicle details: Insurance and legal requirements, maintenance and defect rectification, mileage, provisions in a vehicle Driver Management: Recruitment and induction, training and monitoring, supervision, training interventions and development Programs, Trainers, Driver well-being, Fleet safety standards for drivers, Driver Handbook

### Suggested Readings:

- The Handbook of Logistics and Distribution Management: Understanding the Supply Chain, 1989.
- John Dolce, Fleet Management, McGraw-Hill, 1984.
- Joel Levitt ,Basics of Fleet Maintenance, Reliabilityweb.com; 1st edition, 2010.
- John Dolce, Analytical Fleet Maintenance Management, Society of Automotive Engineers Inc, 2nd ed Edition, 1998.

**INSTRUCTIONS:** There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt five questions in all.



## SEMESTER-III

Paper Code: 19IMT23D2

Credits: 3

Road Accident Insurance and Compensation

Max. Marks: 80

Time: 3 Hours

(Discipline Specific Elective Paper)

**Course Objectives:** This course is designed to provide in depth understanding of Vehicle Insurance, liability and the motor insurance policies. The course also provides knowledge concerning the Investigating procedures involved in Claims.

Unit	Topics
Unit-I	<b>Vehicle insurance and Liability</b> Vehicle Insurance: history and development of insurance; Act liability only; Third party only; Comprehensive policy; Policies with Zero Depreciation Option; Policy term and condition Liability: Types of motor vehicles- private cars, motor cycle/ scooters, commercial vehicles, trailers, miscellaneous and specific types of vehicles- Legal aspects, Requirements for compulsory third party insurance certificate of insurance – Liability without fault – Compensation on structure formula basis—Hit and Run Accidents Solatium fund – Motor accident claims tribunals – Lok Nayalaya- Jald Rahat Yojana- International practice in third party insurance.
Unit-II	<b>Motor Insurance Policies</b> Types of motor policies – Liability only and package policies and coverages there under- Policy conditions – Motor trade policies, Motor insurance practice- Rules and regulations- Add on covers- Documents- Proposal form - Certificate of insurance and cover note- Policy forms – Endorsements and renewal notice, Underwriting and rating – No claim discount.
Unit-III	<b>Insurance Surveyor and Investigation of Claim</b> Role of surveyor and loss adjustor; Licensing authority and controller of insurance; Empanelment of surveyor; Claim Procedure Intimation, Site visit, Garage visit, Checking of documents (Paper pertaining to claim), Photography, Estimate and claim form, Passing of estimate (i) Cost of parts (ii) Cost of repairing (iii) Labour, Preparation of survey reports and submission; Various types of loss assessment; Important aspects of survey; Fraud claims; Connected to MACT
Unit-IV	<b>Insurance Claims-</b> Claim (own damage) Documents and procedures- Types of losses – Claims (third party liability) – Legal and procedural aspects- Control of frauds , Motor third party pool- Objectives and procedures.

### Suggested Readings:

1. Motor vehicles Act, Government of India, 1989.
2. The Central Motor vehicle Rules, Government of India, 1989.
3. Universal's Legal Manual Motor Vehicle Laws (Act and regulation), Universal Law Publishing Co. Pvt Ltd, 2018
4. Dr. L.P.Gupta, Insurance claims solutions, ISBN- 978-9383303038, 2015
5. Sharma, B.R., Forensic Science in Criminal Investigation and Trials (3rd Edn.) Universal Law Publishing Co. Ltd. New Delhi, 1990.
6. Modi, Jaishing P, Textbook of Medical Jurisprudence & Toxicology, M.M. Tripathi Pub. 2001.
7. Parikh, Textbook of Medical Jurisprudence & Toxicology, 2001.

**INSTRUCTIONS:** There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt five questions in all.

## SEMESTER-III

Paper Code: 19IMT23D3

Credits: 3

Transport Economics

Max. Marks: 80

Time: 3 Hours

(Discipline Specific Elective Paper)

**Course Objectives:** Provides knowledge in economic evaluation and Public private partnership in developing road infrastructure projects and application of systems simulation techniques in modeling transport economic systems.

Unit	Topics
Unit-I	<b>Transport Demand and Supply :</b> Demand for transport, factors influencing demand, elasticity of demand, Sensitivity of Travel Demand Elasticities , supply of transport, -Consumer Surplus
Unit-II	<b>Transport Costing and Pricing</b> Costing : Fixed and variable cost, joint and common cost, cost allocation, user cost, internal cost, external cost, economic cost, financial cost, social cost, Depreciation Cost, accounting Methods, Salvage Value Estimation. Pricing : Principles of pricing, marginal cost pricing, revenues, transport subsidies, congestion pricing
Unit-III	<b>Financing Transport :</b> Approaches for financing , transport budgetary provision, PPP models - Concepts of BOO, BOT, BOOT, Innovative methods of transport financing, case studies
Unit-IV	<b>Cost Benefit Analysis:</b> Benefits of Transport projects, Basic Methods of cost benefit analysis- BCR, NPV,IRR etc., Illustrative Comparison of the Methods of Analysis, Characteristics and Limitations of the Different Methods of Economic Analysis, Financial Analysis

### Suggested Readings:

1. R. Paneer Selvam "Engineering Economics" PHI Learning Pvt. Ltd., New Delhi 2009.
2. Jotin Khisty and Kent Lall, 'Introduction to Transportation Engineering' PHI, New Delhi,2001.
3. Kadiyali.L.R.' Traffic Engineering and Transport planning', Khanna Publications, New Delhi, 2000.
4. Relevant IRC Codes and Practices
5. James L Riggs, 'Engineering Economics' 4 th Edition, Tata McGrawhill, New Delhi, 2005.
6. Prasanna Chandra, 'Financial Management' 5<sup>th</sup> Edition,Tata McGrawhill, New Delhi, 2005

**INSTRUCTIONS:** There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt five questions in all.

**SEMESTER –III**

**Paper Code:**

**Credits: 3**

**Time: 3 Hours**

**Max. Marks: 80**

**(Open Elective/Interdisciplinary Course)**

Each student will opt one course from the pool of Open Elective Courses

Provided by the University.

## SEMESTER-IV

Paper Code: 19IMT24C1

Credits: 3

Transport Demand Management

Max. Marks: 80

Time: 3 Hours

(Core Course)

**Course Objectives:** The course aims to provide the students' knowledge regarding the Implementation and Effectiveness of Transport Demand Management Measures. It also would help the students to understand the Planning, Development and Implementation policies involved in Transport Demand Management.

Unit	Topics
Unit-I	<b>Introduction to TDM</b> – Concept and need of TDM, Types of TDM, Problems addressed by TDM, Benefits, Sustainability & TDM, Application areas - Congestion Reduction, Energy Conservation and Emission Reductions, Health and Fitness, Improving Equity, Liveability Strategies, Parking Solutions, etc.
Unit-II	<b>TDM Measures</b> – Push & Pull Measures, Pull measures – City planning measures, Public transport improvement measures; Push measures – vehicle ownership and control methods, vehicle usage control methods
Unit-III	<b>TDM Strategies</b> - Types of TDM strategies – Parking management, land use management, improved transport options, carpooling /ridesharing, flexi work schedules, HOV lanes etc., Steps to formulate TDM strategies, identification of potential TDM strategies, screening, assessment, complimentary TDM measures, impacts, evaluation of alternate TDM packages
Unit-IV	<b>TDM Programs</b> – Developing and marketing of TDM Programs - Access Management, Emergency response transport management, Freight Transport Management, School Transport Management, Special event transport Management etc. ,

### Suggested Readings:

1. Victoria Transport Policy Institute, "Online TDM Encyclopaedia", [WEB] <http://www.vtppi.org/tdm/>
2. Stephen Ison, Tom Rye, "The Implementation and Effectiveness of Transport Demand Management Measures: An International Perspective", Ashgate Publishing, Ltd. (2008)
3. Erik Ferguson, "Transportation Demand Management: Planning, Development and Implementation", Journal of the American Planning Association (1990)
4. Dominic Stead & Yusak Octavius Susilo, "Transport Demand Management", SAGE Knowledge Database

**INSTRUCTIONS:** There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt five questions in all.

## SEMESTER-IV

Paper Code: 19IMT24C2

Credits: 3

Safe Systems Approach

Max. Marks: 80

Time: 3 Hours

(Core Course)

**Course Objective:** The course aims to introduce the safe system approach to road safety. The safe systems implementation encompassing safer vehicles and safer infrastructure are to be imparted to the students so that they can appreciate and understand the challenges faced by the road users and devise methods and strategies to save human life from serious consequences on the roads.

Unit	Topics
Unit-I	<b>Introduction to the Safe System Approach</b> – Definition, Past approaches, Scientific safety principles, Safety & Current Transport System, Ethical Approach for Safe System, Vision, Long-term Goals, Crash Causation Factors, Crash Types, Alignment of Safe System with other policies & societal goals
Unit-II	<b>Scientific Safety Principles and their Application</b> – Development of the Safe Systems Approach, International Case Studies for Sustainable Safety Principles, Best Practices, Understanding the Safe System Model, Critical role of Travel Speed, Mean Speed & Crash Risk, Influencing Kinetic Energy Level in Crashes, Alternative Road Infrastructure Design Approach
Unit-III	<b>Safe System Elements &amp; Application</b> – Role of safer Infrastructure, Role of Speed Management, Crash Types & Critical Travel Speeds, Role of Vehicles, Compliance & Human Error
Unit-IV	<b>Safe System Implementation</b> – Understanding of the System, Making Progress, Consolidating Activity, Concept of Shared Responsibility, Role of System Providers

### Suggested Readings:

1. World Road Association, "Road Safety Manual: A Manual for Practitioners and Decision Makers on Implementing Safe System Infrastructure", [WEB] <https://roadsafety.piarc.org/en/road-safety-management/safe-system-approach>
2. National Road Safety Strategy, "The Safe System approach" – (2018)

**INSTRUCTIONS:** There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt five questions in all.

### SEMESTER –IV

Paper Code	Project Work	Credits
19IMT24C3		12
		Max. Marks: 200

### SEMESTER –IV

Paper Code	Comprehensive Viva Voce	Credits
19IMT24C4		3
		Max. Marks: 100

## SEMESTER-IV

Paper Code: 19IMT24D1

Credits: 3

Time: 3 Hours

Max. Marks: 80

### Sustainable Transport Planning and Policies

#### (Discipline Specific Elective Paper (D))

**Course Objective:** The aim of the course is help the students in understanding the basic concept of Sustainable Urban and Transport Development and its influence on region, city and built environment.

Unit	Topics
Unit-I	<b>Sustainable Transport Development Context :</b> Urbanisation patterns, Vehicular growth patterns, transport demand and mobility patterns, challenges in urban transport , Transport Dependent GHG emissions, health impacts, need for sustainable mobility, Concept of Sustainable Development , concept and benefits of sustainable transport development
Unit-II	<b>Sustainable Urban Transport Planning :</b> Conventional Transport Planning, Emerging Sustainable Transport Planning practice, Sustainable Urban Transport Planning Goals and Principles, Sustainable urban transport Planning approaches - A-S-I framework, Integrated land use transport planning, smart growth, Transit oriented Development , Transport Demand Management, climate resilient transport planning
Unit-III	<b>Sustainable Urban Transport Systems :</b> Sustainable Transport concept- environmental , social and economic perspective, Characteristics of sustainable transport systems - mass transit systems – types of rail, road and water based systems and their features, NMT modes, technology aspects, costs and benefits, performance measures
Unit-IV	<b>Policies for Sustainable Transport Development :</b> National urban transport policy (NUTP), Green transport policy, Transit Oriented Development Policy, Metro rail policy, Electric mobility policy, Climate resilient policies in transport sector- policy instruments, mitigation, adaptation , national and international best practices in sustainable transport development

#### **Suggested Readings:**

1. Module 5e – Sustainable Transport: A Sourcebook for Policy-Makers in Developing Cities, “Urban Transport & Climate Change”, GIZ (2014)
2. Ronald M. Dell, Dr. Patrick T. Moseley, Dr. David A. J. Rand, “Towards Sustainable Road Transport, 2014.
3. P. Anbalagan, “Urban Development and Sustainable Transport”, Bookwell Publications (2012)
4. Måns Nilsson, Karl Hillman, Annika Rickne, Thomas Magnusson, “Paving the Road to Sustainable Transport: Governance and innovation in low-carbon vehicles”, Routledge (2016)

**INSTRUCTIONS:** There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt five questions in all.

## SEMESTER-IV

Paper Code: 19IMT24D2

Credits: 3

Time: 3 Hours

Max. Marks: 80

### Planning and Design for Vulnerable Road Users

#### (Discipline Specific Elective Paper (D))

**Course Objectives:** The objective of this course is to equip the students with various safety measures designed for non-motorised transport users, pedestrians, cyclists and the various accessibility measures for the transport disadvantaged group.

Unit	Topics
Unit-I	<b>Planning &amp; Design for Non-Motorized Transport users</b> – Classification of NMT (Walking, Cycling, etc.), Safety concerns for NMT users, importance of NMT infrastructure, NMT Facility Planning & Strategies, , NMT Policy Framework
Unit-II	<b>Planning &amp; Design for Pedestrians</b> – Definition & Classification of Pedestrians, Pedestrian Safety, Concept of Walkability and its consideration in Land Use Planning, Pedestrian characteristics, Planning & Design Guidelines , Pedestrian Paths, Pedestrian crossing elements, pedestrian guidance measures, pedestrian safety measures
Unit-III	<b>Planning &amp; Design for Cyclists</b> – Definition & classification of cycle users, Cycling Characteristics, Behaviour and Trends, Benefits of Cycling, Current condition and challenges, planning & design guidelines, Legal & regulatory context for Cycling, Planning cycle networks, cycle infrastructure, promoting cycles, monitoring & evaluation of Cycling Schemes.
Unit-IV	<b>Universal Accessibility</b> – Planning for transport disadvantaged, Transport Accessibility – concept and measures, mobility needs for disadvantaged, Transport Infrastructure Design for persons with special abilities, Universal Design in plan & placement of bus stops, terminals and interchanges, parking lots, etc. ; vehicles design etc.

#### **Suggested Readings:**

1. Pretorius, L. and Bester, C.J., "A Proposed Strategic Plan for Non-Motorised Transport (Nmt) For Cape Town", University of Stellenbosch
2. MoHUA, "Guidance Documents for Non-Motorized Transportation Planning NMT" [WEB] <http://mohua.gov.in/cms/sustain-sutp-NMT.php>
3. "Planning and designing for pedestrians: guidelines", [WEB] [https://www.transport.wa.gov.au/mediaFiles/active-transport/AT\\_WALK\\_P\\_plan\\_design\\_pedestrians\\_guidelines.pdf](https://www.transport.wa.gov.au/mediaFiles/active-transport/AT_WALK_P_plan_design_pedestrians_guidelines.pdf) Creating Universal
4. Access to Safe, Clean & Transport - A Status Report on the Contribution of Sustainable Transport to the Implementation of Rio+20, 2013.

**INSTRUCTIONS:** There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt five questions in all.