

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B Tech (All Except Civil Engineering)
Course Code:	
Course Title:	Road Safety and Management
Course Type:	Open Elective
Year of Introduction:	2025-2026

L	T	Practical Component				C
		LPW	PW	W	S	
3	1	-	-	-	-	4

Course Learning Outcomes (CLOs):

At the end of the course, the student will be able to –

1. appraise the overall design parameters of road geometrics. (BL5)
2. classify traffic characteristics observed on various roadways. (BL4)
3. discover the causes of road accidents for comprehensive road safety audit. (BL4)
4. apply established traffic regulations and construct functional traffic management systems. (BL3)

Unit	Contents	Teaching Hours (Total 45)
Unit-I	Introduction to Road Safety and Geometrics Introduction to road safety, importance and scope, road characteristics and cross section elements, sight distance, concept of horizontal and vertical alignment, road intersections and types. Introduction to Safe System Approach – Understanding the proactive philosophy in road design and safety focusing on human error and injury tolerance.	8
Unit-II	Traffic Characteristics Importance and scope of traffic engineering, traffic characteristics, human factors governing road user characteristics, vehicular characteristics, overview of traffic surveys, traffic stream flow characteristics, concept of passenger car unit and level of service.	7
Unit-III	Road Accidents Causes and prevention, scientific investigations and data collection, analysis of individual accidents to arrive at real causes, cost of road accidents, statistical methods of analysis of accident data, use of accident data in planning reconstruction of roads, surrogate safety assessment.	7
Unit-IV	Road Safety Audit Principles and procedure, code of good practice and checklists, road safety issues, engineering, education and enforcement measures for improving road safety, blackspot identification and analysis.	7
Unit-V	Traffic Regulation and Control Regulations and controls on driver, vehicle and flow, parking regulations, enforcement of regulations, traffic signs and types, road markings, signal systems, parking studies, channelizing islands, one-way streets.	10

Unit-VI Traffic Management Techniques

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Integrated safety improvement and traffic calming measures, speed and load limit, traffic lighting, use of intelligent transportation systems (ITS) for traffic management, economic evaluation of road improvements.

Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings/
References:

- Roess, R. P., Prassas, E. S. & McShane. W. R., *Traffic Engineering*. Pearson/Prentice Hall.
- Slinn, M., Matthews, P., Guest, P., *Traffic Engineering Design*, Taylor & Francis.
- Garber, N. J., & Hoel, L. A. (2019). *Traffic and highway engineering*. Cengage Learning.
- Mannering, F. L., & Washburn, S. S. (2020). *Principles Of Highway Engineering And Traffic Analysis*. John Wiley & Sons.
- Kadiyali, L. R., *Traffic Engineering and Transport Planning*, Khanna Publishers.
- Khanna, S. K., Justo, C. E. G., Veeraragavan, A., *Highway Engineering*, Nem Chand Publishers.
- IRC Manuals – IRC 53, IRC 62, IRC 65, IRC 70, IRC 64, IRC 106, IRC 79, IRC 93, IRC 99.

Suggested List of Tutorial: Tutorial work will be based on the above syllabus with minimum of 04 tutorials.

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B Tech (All Except Civil Engineering)
Course Code:	
Course Title:	Sustainable and Smart Cities
Course Type:	Open Elective
Year of introduction:	2025-2026

L	T	Practical Component				C
		LPW	PW	W	S	
3	1	-	-	-	-	4

Course Learning Outcomes (CLOs):

At the end of the course, the student will be able to –

1. examine planning criteria and parameters affecting smart cities (BL4)
2. design sustainable and efficient smart cities (BL6)
3. utilize suitable construction materials and technology for smart cities (BL3)
4. choose energy conservation measures and strategies for sustainable smart cities. (BL3)

Unit	Contents	Teaching Hours (Total 45)
Unit-I	Introduction to Smart Cities Definition, concept and focus, introduction to city planning, smart city philosophy and goal, dimensions of smart cities, green field, brownfield, concept of digital twin city.	8
Unit-II	Development of Smart Cities and Smart Infrastructures Genesis of Smart cities: Criteria for selection and development of smart cities, contemporary issues of urban planning- Indian and global perspectives, urban patterns and trends, factors affecting the development of smart cities, Elements of smart infrastructures: ICT, energy, transportation, buildings, people, water, waste management; smart city/infrastructure design principle, challenges and issues, inclusiveness; communication and security systems; interaction and integration between building structure, systems, services, management, control and information technology, case studies on smart cities.	12
Unit-III	Sustainability in Urban Areas Concept, need for sustainable development, SDGs, climate change: mitigation and adaptation to climate change - plans, policies and strategies, energy management, rating systems, city information modelling, Pillars of sustainable cities- human, social, economic and environmental.	10

Unit-IV	Construction Materials, Technologies and Efficient Smart Structures Smart materials, sustainable construction materials, smart construction technology, additive manufacturing, concept of healthy buildings. Quality of life in smart cities, smart healthcare systems and telemedicine, smart education, social inclusion and thematic planning, emergency response systems, PPPs implementation, Protection of environment and safety.	10
Unit-V	Energy Conservation Energy conservation for smart cities, strategies for reliable, economical and efficient energy systems, promotion of renewable energy.	05

Self-Study: The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study content.

- Suggested Readings/References:**
- Kumar, A., *Introduction to Smart Cities*. Pearson.
 - Singh, B. & Parmar, M., *Smart City in India. Urban Laboratory, Paradigm or Trajectory?* Routledge India.
 - Barlow, M. and Levy-Bencheton, C., *Smart Cities, Smart Future: Showcasing Tomorrow*. Wiley.
 - Saravanan, K. & Sakthinathan, G., *Handbook of Green Engineering Technologies for Sustainable Smart Cities (Green Engineering and Technology)*. CRC Press.
 - Mani, N., *Smart Cities and Urban Development in India*. New Century Publications
 - Cardullo, P., *Citizens in the 'Smart City': Participation, Co-production, Governance*, Routledge.
 - Bosselmann, P., *Urban Transformation: Understanding City Form and Design*, Island Press.
 - Willis, K. & Aurigi, A., *Digital and Smart Cities*, Routledge.

Suggested List of Tutorial: Tutorial work will be based on the above syllabus with minimum of 04 tutorials.

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B Tech (All Except Civil Engineering)
Course Code:	
Course Title:	Disaster Management
Course Type:	Open Elective
Year of Introduction:	2025-2026

L	T	Practical Component				C
		LPW	PW	W	S	
3	1	-	-	-	-	4

Course Learning Outcomes (CLOs):

At the end of the course, the student will be able to –

1. discover various types of disasters, administrative structure and policies (BL4)
2. outline different stages of disaster risk assessment and management (BL3)
3. appraise tools of management for meteorological and geophysical disaster (BL5)
4. evaluate the effect of climate change on biodiversity (BL5)

Unit	Contents	Teaching Hours (Total 45)
Unit-I	Fundamental to Disaster Management Importance and significance, classification, disaster management cycle, major disasters in India, disaster and development, institutional framework for disaster management in India, disaster management act, legislation and policy.	10
Unit-II	Disaster Risk Assessment and Management Risk, vulnerability, hazard, risk assessment, hazard mapping, disaster communication, monitoring and early warning system, capacity building, training and public awareness in disaster risk reduction. disaster safe designs and constructions, structural and non-structural mitigations, rehabilitation of structures, role of geoinformatics in disaster management.	14
Unit-III	Meteorological Disaster Introduction, identification of factors, effects on land and sea, risk assessment, damage assessment, hazard prone area, risk reduction and management, tools and systems for monitoring and management, case studies.	07
Unit-IV	Geophysical Disaster Introduction, causative factors, monitoring instruments, regional and site-specific risk assessments, hazard zonation maps, vulnerability analysis and mitigation measures, risk mitigation plans, case studies	07
Unit-V	Biodiversity Disasters Introduction, resource exploitation, ecological degradation, biodiversity loss, invasive species, Impact of mining, warfare and nuclear hazard, natural resource depletion due to climate change. Geomatics tools for preparation maps etc., case studies	07

Self-Study:

The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings/
References:

- Modh, S., *Introduction to Disaster Management*, Macmillan.
- Piers B, Cannon T., Davis I., & Ben W., *At Risk: Natural hazards, People's Vulnerability and Disasters*, Routledge.
- Sinha, P.C., *Disaster Relief: Rehabilitation and Emergency Humanitarian Assistance*, SBS Publishers.
- Singh R.B. (Ed.), *Natural Hazards and Disaster Management Vulnerability Mitigation*, Rawat Publications.
- Robert B., & Edwards K., *Natural Hazards: Earth's processes as hazards disasters and catastrophe*, Pearson Prentice Hall.

Suggested List of Tutorial:

Tutorial work will be based on the above syllabus with minimum of 04 tutorials.