CHAITANYA
(DEEMED TO BE UNIVERSITY)
(Approved u/s. 3 of UGC act. 1956 by MHRD, Govt. of India)

INSTITUTION'S INNOVATION COUNCIL (Ministry of Education Initiative)





17.4.2. Civil Engineering Courses Addressing Sustainability

The Department of Civil Engineering contributes to sustainability by integrating safe, resilient and environmentally responsible infrastructure concepts into teaching and learning. Civil Engineering education enables students to understand the planning, design, construction, operation and maintenance of infrastructure while considering public safety, environmental quality and the needs of communities.

The Road Safety Engineering course addresses important sustainability concerns through road accident analysis, safety in road design, traffic signs and signals, pedestrian safety and traffic management. The course also introduces students to the environmental effects of transport systems, including air quality, noise and energy impacts.

1. Elective Courses Promoting Sustainability Awareness

Professional elective courses in Civil Engineering provide opportunities for students to study specialised areas of infrastructure development and understand their relationship with sustainable communities. Road Safety Engineering (PEC-CE 702 C) promotes awareness of safe and sustainable transport systems.

- Road Safety Engineering: Covers accident investigation, road safety audits, road signs, traffic signals, pedestrian safety and traffic management.
- The course connects engineering decisions with safer roads, improved mobility, reduced accident risks and better management of transport-related environmental impacts.
- Topics such as air quality, noise and energy impacts help students recognize the environmental dimensions of road and traffic planning.

2. Interdisciplinary Learning for Sustainable Solutions

Sustainable infrastructure requires cooperation among different engineering and related disciplines. Road Safety Engineering provides opportunities to connect civil engineering principles with transportation planning, environmental studies, urban planning, public health and data analysis.

- Students can relate road design and traffic operations to urban planning and sustainable mobility.
- Accident data analysis and computer-based methods encourage the use of analytical and technological skills.
- Environmental topics such as air quality, noise and energy impacts support integrated consideration of transport and environmental concerns.

Such interdisciplinary learning encourages critical thinking, teamwork and the development of practical solutions to road safety and infrastructure challenges.

3. Research and Innovation for Sustainability

The course provides a foundation for student learning and project work in areas related to safe and sustainable transport infrastructure. The syllabus includes accident data collection and analysis, identification of hazardous road locations, road safety audits and modern traffic management techniques.

- Analysis of road accident data and identification of hazardous locations.
- Study of road safety audits, road design measures and safety performance.
- Examination of traffic signs, road markings, signals and pedestrian safety provisions.
- Study of traffic management measures and their relationship with air quality, noise and energy impacts.

These topics can support academic projects and further investigation into safer roads, sustainable urban mobility and improved infrastructure planning. Specific research projects should be documented separately when undertaken.

4. Community Engagement and Experiential Learning

Road safety is closely connected with the everyday needs of road users and local communities. The course creates scope for experiential learning through observation, case studies and practical discussion of road safety conditions.

- Observation and study of road signs, road markings, traffic signals and pedestrian facilities.
- Case studies on road accident causes and hazardous road locations.

- Discussion of road safety awareness, traffic rules and responsible road-user behaviour.
- Where organized by the department, field visits or interactions with relevant transport and local authorities can provide practical exposure.

These learning opportunities help students understand how engineering knowledge can be applied to improve public safety and the quality of community infrastructure.

Conclusion

The Civil Engineering Department supports sustainability-oriented education by connecting engineering knowledge with public safety, environmental responsibility and community needs. Road Safety Engineering (PEC-CE 702 C) contributes to this approach through its coverage of accident investigation, safe road design, traffic control, pedestrian safety and traffic management.

By encouraging analytical thinking, interdisciplinary learning and practical understanding of transport-related challenges, the course helps students develop the knowledge and skills required to contribute to safer and more sustainable infrastructure. The course also provides opportunities to examine air quality, noise and energy impacts as part of responsible transport planning.

Evidence of Course Addressing Sustainability

Department and Course Details

Particulars	Details
Department	Civil Engineering
Course Code	PEC-CE 702 C
Course Name	Road Safety Engineering
Category	Professional Elective Course (PEC-V)
Scheme and Credits	L: 3 | T: – | P: – | Credits: 3
Assessment	Internal Marks: 30 | External Marks: 70

Course Description

Road Safety Engineering deals with the principles and practices required to improve safety in road transportation systems. The course introduces students to road accident causes and investigations, safety in road design, road signs and traffic signals, road markings, pedestrian safety and traffic management techniques. It also considers air quality, noise and energy impacts associated with transport and traffic operations.

Course Objectives

The objectives of the Road Safety Engineering course are to:

- Understand the causes of road accidents and the methods used for scientific investigation and analysis of accident data.
- Explain the principles of safety in road design, highway operation and road safety audits.
- Understand the classification, location and effectiveness of road signs, road markings and traffic signals.
- Study traffic management techniques and measures for improving the safety of road users and pedestrians.
- Recognize the environmental impacts of transportation, including air quality, noise and energy impacts.

Course Outcomes (COs)

After successful completion of the course, students will be able to:

CO	Course Outcome
CO1	Investigate road accidents, analyse accident data and identify hazardous road locations.
CO2	Explain road safety principles, road safety audits and safety measures in road design.
CO3	Analyse the role of road signs, road markings, traffic signals and safety devices in road-user safety.
CO4	Apply traffic management techniques to address road safety and pedestrian safety

	issues.
CO5	Assess the air quality, noise and energy impacts associated with traffic and road transportation.

Syllabus for Road Safety Engineering

Professional Elective Course (PEC-V) | Course Code: PEC-CE 702 C | L–T–P: 3–0–0 | Credits: 3

Unit	Syllabus Content
UNIT – I	Road Accidents: Causes, scientific investigations and data collection; analysis of individual accidents to arrive at real causes; statistical methods of analysis of accident data; basic concepts of road accident statistics; safety performance function; the empirical Bayes method; identification of hazardous road locations; application of computer analysis of accident data.
UNIT – II	Safety in Road Design: Operating the road network for safety; highway operation and countermeasures; road safety audit – principles, procedures and practice; code of good practice and checklists; vehicle design factors and driver characteristics influencing road safety.
UNIT – III	Road Signs and Traffic Signals: Classification and location of signs; measures of sign effectiveness; types of visual perception; sign regulations, visibility and variables; text versus symbols. Road Marking: Role, classification and visibility. Traffic Signals: Need, signal face, illumination and location of signals, factors affecting signal design, pedestrian safety, fixed and vehicle-actuated signals, design of signals and area traffic control. Delineators, traffic impact attenuators, roadside rest areas, safety barriers and traffic aid posts.
UNIT – IV	Traffic Management Techniques: Integrated safety improvement and traffic calming schemes; speed and load limits; traffic lights; safety cameras; tests on drivers and vehicles; pedestrian safety issues; parking and parking enforcement and their influence on accidents; travel demand management; restriction of turning movements, one-way streets, tidal flow operation methods, exclusive

	bus lanes and closing side-streets; latest tools and techniques used for road safety and traffic management; road safety measures; legislation, enforcement, education and propaganda; air quality, noise and energy impacts; cost of road accidents.

CO–PO Mapping

The following is a proposed CO–PO mapping for the Road Safety Engineering course. The department should verify and approve the mapping against its officially adopted Programme Outcomes and curriculum framework before using it as formal accreditation evidence.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	–	3	2	–	–	–	–	–	–	2
CO2	3	2	3	–	–	–	–	2	–	–	–	2
CO3	2	2	3	–	–	–	–	2	–	–	–	2
CO4	2	3	3	2	2	2	–	2	2	–	–	2
CO5	2	2	–	–	–	2	3	–	–	–	–	2

Correlation levels: 3 – High, 2 – Medium, 1 – Low, – – No correlation.

Lesson Plan

The following is a suggested unit-wise teaching plan based on the 3-lecture-hours-per-week course structure. The actual dates and hours may be adjusted to the approved academic calendar and departmental teaching schedule.

Lectures	Unit	Topics / Teaching Plan
1–3	Unit I	Introduction to road accidents; causes and scientific investigation.
4–6	Unit I	Accident data collection; analysis of individual accidents and statistical methods.
7–9	Unit I	Road accident statistics; safety performance function and empirical Bayes method.

10–12	Unit I	Identification of hazardous road locations; computer analysis of accident data; unit review.
13–15	Unit II	Safety in road design; safe operation of road networks; highway operation and countermeasures.
16–18	Unit II	Road safety audit: principles, procedures, practice, codes and checklists.
19–21	Unit II	Vehicle design factors and driver characteristics; unit review.
22–24	Unit III	Classification and location of road signs; sign effectiveness and visual perception.
25–27	Unit III	Sign regulations, visibility, variables and text versus symbols; road markings.
28–30	Unit III	Traffic signals: need, design factors, illumination, location and pedestrian safety.
31–33	Unit III	Fixed and vehicle-actuated signals; area traffic control; safety devices and unit review.
34–36	Unit IV	Traffic calming, speed and load limits, safety cameras, driver and vehicle testing.
37–39	Unit IV	Pedestrian safety, parking, parking enforcement and travel demand management.
40–42	Unit IV	Traffic management measures: one-way streets, tidal flow, bus lanes and street closures.
43–45	Unit IV	Road safety measures, legislation, enforcement, education; air quality, noise, energy impacts and accident costs; course review.

Sustainability Relevance of the Course

The course is particularly relevant to sustainable cities and communities through safer road infrastructure, effective traffic management and pedestrian protection. Its treatment of air quality, noise and energy impacts provides a basis for discussing environmental considerations in transportation. Accident analysis and road safety audits develop students' capacity to identify problems and propose evidence-based improvements.

Note on Supporting Evidence

The course details and unit contents above are based on the supplied Course objectives; course outcomes, CO–PO mapping and the 45-lecture lesson plan have been prepared as a proposed Civil Engineering draft because these items were not included in the supplied course file. They should be checked and approved by the Department/Board of Studies. Add actual course files, approved syllabus pages, lesson-plan records, class photographs, project reports and field-activity evidence where available; proposed activities should not be represented as completed activities.



Chaitanya (Deemed to be University) faculty engaged in teaching Sustainable Development Goals

Conclusion:

Offering specialized courses on Road Safety and the SDGs reflects the institution's firm dedication to cultivating a well-informed, accountable, and future-oriented learning community. These courses provide students with the knowledge, analytical abilities, and values-driven outlook required to grasp intricate global issues and make meaningful contributions to sustainable development.

By integrating SDG-centered content into academic structures, the institution enhances capacity building, fosters interdisciplinary thinking, and connects educational outcomes with global priorities. Such efforts directly advance SDG 17.4.2 by establishing structured learning pathways, empowering students to apply sustainability principles in practical settings, and developing a generation of socially responsible leaders. On the whole, these specialized courses act as an essential platform for raising awareness, encouraging action, and expanding the institution's influence in promoting the SDGs at both local and global levels.