<table>
<thead>
<tr>
<th><strong>Module Code</strong></th>
<th>CEU33A07</th>
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<tbody>
<tr>
<td><strong>Module Name</strong></td>
<td>3A7 TRANSPORTATION AND HIGHWAY ENGINEERING</td>
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<tr>
<td><strong>ECTS Weighting</strong></td>
<td>5 ECTS</td>
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<tr>
<td><strong>Semester taught</strong></td>
<td>Semester 1</td>
</tr>
<tr>
<td><strong>Module Coordinator/s</strong></td>
<td>Professor Margaret O’Mahony</td>
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**Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline**

On successful completion of this module, students should be able to:

**PART 1: HIGHWAY ENGINEERING**

- LO1. Select the appropriate materials for use in different road layers
- LO2. Evaluate the quality and performance of unbound and bound road materials
- LO3. Perform road pavement design and analysis
- LO4. Develop an appropriate road monitoring and maintenance programme
- LO5. Interpret geometric design fundamentals, in relation to safety and driver comfort, focusing on horizontal and vertical alignment
- LO6. Design a road alignment.

**PART II: TRANSPORT ENGINEERING**

- LO7. Design traffic signal timing programmes for junctions
- LO8. Perform the traffic studies necessary before making changes to or designing new road infrastructure
- LO9. Exposing them to interdisciplinary approaches in solving engineering problems
LO10. Assess and conceptualise driver behaviour when developing engineering solutions to improve road safety

LO11. Appreciate the need for input from other disciplines to formulate policies for dealing with urban traffic congestion problems

LO12. Discuss and debate solutions to urban congestion

Graduate Attributes: levels of attainment
To act responsibly - Attained
To think independently - Attained
To develop continuously - Introduced
To communicate effectively - Enhanced

Module Content

Please provide a brief overview of the module of no more than 350 words written so that someone outside of your discipline will understand it.

PART 1 : HIGHWAY ENGINEERING

Module Objectives
The objective of this part of the module is to enable students to analyse road pavement structures, to differentiate between the different types of materials used and to design road pavements. The introduction of the design concepts, material properties and performance criteria are used together with vehicle loading criteria to demonstrate to the students how they are combined to design and construct road pavements. Another objective is to distil the principles of geometric design, both vertical and horizontal. To give the students the satisfaction of producing for themselves a full road pavement design, they are taken through one of the available methods and they perform examples so they can see how the principles and their application come together in a design.

Module content
1. Introduction
2. Unbound Flexible Pavement Materials – Capping and subbase materials
3. Bitumen – Properties and laboratory tests for property characterisation
4. Bituminous Materials – Open textured macadam, hot rolled asphalt, mastic asphalt and dense bituminous macadam
5. Flexible Pavement Design – Principles of design, design method and examples
6. Rigid Pavements – Properties of concrete, rigid pavement design and construction
7. Geometric Design – Fundamentals of forces on vehicles travelling on curved sections of road, horizontal and vertical alignment, designed on the basis of safety and driver comfort

PART II: TRANSPORT ENGINEERING

Module description, aims and contribution to programme
The first objective of this part of the module is to enable students to formulate the fundamental principles of traffic flow, traffic characteristic measurements and their interpretation for infrastructure changes or development. Traffic signal timing design is included with a number of worked examples along with urban traffic control. Road safety and driver behaviour also feature in the module given their importance in accident prevention.

Module content

2. Traffic Signal Timing Calculations – Saturation flow, optimum cycle time, effective green period and dealing with right turning traffic.
3. Urban Traffic Control
4. Driver Behaviour and Safety – Psychology of drivers, how drivers react in different situations, how to use knowledge of driver behaviour in designing engineering solutions.
5. Urban Congestion and Solutions – Public transport, demand management, promotion of non-car modes, integrated transport policies and freight management.

Teaching and Learning Methods

e.g., lectures, seminars, online learning via VLE, field trips, laboratories, practice-based etc...
Assessment Details

Please include the following:

- Assessment Component
- Assessment description
- Learning Outcome(s) addressed
- % of total
- Assessment due date

<table>
<thead>
<tr>
<th>Assessment Component</th>
<th>Assessment Description</th>
<th>LO Addressed</th>
<th>% of total</th>
<th>Week due</th>
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<tbody>
<tr>
<td>Examination</td>
<td>2 hour written examination</td>
<td>LO1-12</td>
<td>100%</td>
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Reassessment Requirements

100% written examination

Contact Hours and Indicative Student Workload

<table>
<thead>
<tr>
<th>Contact hours: 33</th>
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<tbody>
<tr>
<td>Independent Study (preparation for course and review of materials): 55</td>
</tr>
<tr>
<td>Independent Study (preparation for assessment, incl. completion of assessment): 37</td>
</tr>
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Recommended Reading List

- Highway Engineering, M. Rogers, Blackwell Publishing
- Highway Engineering, CA O’Flaherty, Edward Arnold
- Highway Traffic Analysis and Design, RJ Salter and NB Hounsell, Macmillan
- Principles of Highway Engineering and Traffic Analysis, FL Mannering and WP Kilareski, Wiley

Module Pre-requisite

Module Co-requisite

Module Website

Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.

Module Approval Date
COVID-19 contingency statement:

While the intention is to deliver some lectures, tutorials and labs face-to-face, there is uncertainty due to the Covid-19 situation and the entire module delivery may need to change to an online delivery if required by government restrictions. In the case of a possible new lockdown scenario during teaching term:

- All lectures, tutorials and labs will be delivered online using Blackboard. Some of these sessions will be *live* sessions and your attendance at live sessions is required.
- Assignments and examinations will be conducted and submitted online.