

Course unit title:	Highway Engineering		
Course unit code:	CE425		
Type of course unit:	Compulsory		
Level of course unit:	Bachelor (1st Cycle)		
Year of study:	4		
Semester when the unit is delivered:	8		
Number of ECTS credits allocated :	6		
Name of lecturer(s):	Dr Antonis Michael		
Learning outcomes of the course unit:	<ol style="list-style-type: none"> 1. Explain the concepts of Relaxations and Departures in road geometric design standards, justify the selection of an appropriate Road Class, Cross Section, and assess the Design Speed for a given road alignment. 2. Determine suitable geometric design parameters including horizontal and vertical curvature, transition lengths, superelevation, for a given Design Speed. 3. Summarise the available junction types, justify the selection of an appropriate Junction type for given traffic conditions / environment, justify the selection of an appropriate roundabout type and apply the normal roundabout design checks. 4. List the available street furniture and fencing, explain the importance of the above features with regards to road safety, and apply appropriate clauses of a European Standard in order to select appropriate safety fencing. 5. Summarise the methods for determining the subgrade strength for road pavement design, list the methods of subgrade stabilisation and explain the effect of moisture changes in expansive clays encountered in Cyprus, and its importance with regards to pavement failures. 6. Assess the sizing of closed storm sewers, gully spacing and the sizing of cross drainage structures. 7. Justify the selection of appropriate pavement materials, apply the methods and techniques behind the design of Flexible Pavement as per the DMRB requirements and compare them with the PWD Pavement Design Manual design requirements. 8. Summarise the pavement testing and restoration techniques. 		
Mode of delivery:	Face-to-face		
Prerequisites:	None	Co-requisites:	None
Recommended optional program components:	None		
Course contents:	<p>Highway Planning and Design: Road Network and Hierarchy. Road Classes, Cross Sections and associated Road Capacity. The procedures and stages in the development of road schemes. The concepts of Relaxations and Departures in road geometric design standards.</p> <p>Road Alignment Design: -Design Speed / Sight Distance / Superelevation / transitions. Horizontal and Vertical alignment, Roundabout Design, Priority Junctions, Layouts of Grade Separated Junctions.</p> <p>Highway Economics and Finance: An introduction to the Economic evaluation of a road scheme. How the results of an economic evaluation are expressed. Cost Benefit Analysis.</p>		

	<p>Roadside Features / Road Safety: Street furniture and fencing (traffic signs, guardrails, safety barriers, anti-dazzle fences, crash cushions) and associated road safety.</p> <p>Highway Soil Engineering: Methods of determining the subgrade strength for pavement design. Materials used for capping layer / backfilling / filter drains. Methods of subgrade stabilisation. Expansive clays in Cyprus and associated pavement failures. Safe cut / fill slopes and methods of stabilising cut surfaces.</p> <p>Highway Drainage and Hydraulics: How surface water is conveyed, diverted and removed from the highway corridor. Different types of drainage facilities / structures. Distinction between open channel and closed conduit drainage.</p> <p>Flexible Pavement Analysis and Design: Methods and techniques behind the design of Flexible Pavement and relevant regulations. Stress analysis of flexible pavements. Design of flexible pavements using various methods.</p> <p>Concrete Pavement Analysis and Design: The alternative to asphalt pavement. Its advantages and pitfalls. Stress analysis of concrete pavements. Design of concrete pavements.</p> <p>Pavement Maintenance: The testing of the pavement and restoration techniques. Traffic Mgmt during construction / maintenance works.</p>
Recommended and/or required reading:	
Textbooks:	P.H. Wright, R.J. Paquette, <i>“Highway Engineering”</i> C. A. O’ Flaherty <i>“Highways, Vol 2 – Highway Engineering”</i>
References:	<ul style="list-style-type: none"> • Highways Agency (UK), <i>“Design Manual for Roads & Bridges (DMRB)”</i> • Cyprus MoCW - PWD <i>“Geometric Design standards for Inter-Urban and Rural Roads in Cyprus”</i> • AASHTO, <i>“A Policy on Geometric Design of Highways and Streets”</i> • <i>“The Shell Bitumen Handbook”</i>
Planned learning activities and teaching methods:	The course is delivered to the students by means of lectures. The lecturer presents to the student the course content and allows for questions. The material is presented using computer presentations incorporating photos/diagrams. Presentation Handouts, homework assignments, and additional material such as relevant magazine articles are made available to students at any time on the e-learning Moodle platform. The learning process is enhanced with the requirement from the student to submit assessments.
Assessment methods and criteria:	<ul style="list-style-type: none"> • Coursework 50% • Final Exam 50%
Language of instruction:	English
Work placement(s):	No