8.5 CE0814 – Road Design (Computer Aided Design – Junctions)

(1) GENERAL

SCHOOL	ENGINEERING SCHOOL		
ACADEMIC UNIT	CIVIL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**CE0814**	**SEMESTER**	**8**
COURSE TITLE	**Road Design (Computer Aided Design – Junctions)**		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
	4	5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialisation Course
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes, if requested.
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/CIV321/

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The aim of the course is to present to the students the fundamental concepts of road geometric design of intersections and interchanges, as well as to familiarize students with contemporary road design processes through PC software in digital environment and aspects related to the budget and costing of road projects.

Upon completion of the course, students will be able to:

- Perceive the inter-scientific character of road constructions, the road design processes in digital environment and aspects related to the budget and costing of road projects.
- Understand the basic elements for the design and operation of intersections and interchanges
- Participate in the computer aided road and intersection design.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?;.

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*

Specifically, students will be able to perform:

- Search, analysis and synthesis of data and information, using the necessary technologies.
- Adapting to new situations
- Decision Making
- Autonomous work
- Team work
- Project planning and management

(3) **SYLLABUS**

Theoretical part

- Introduction
  - Road design stages
- Cross sections
  - Lateral formations
  - Area measurement
- Volumes and Earthworks
  - Diagram of areas
  - Table of earthworks
  - Volume estimation
  - Bruckner diagram
- Intersections (conventional)
  - Basic design principles
  - Types of intersections
  - Horizontal and longitudinal design
  - Visibility
  - Islands
  - Small and large intersection types
- Roundabouts
  - Types of roundabouts
  - Horizontal and longitudinal design
  - Visibility
- Interchanges
  - Types and selection criteria
  - Lane equilibrium
  - Horizontal, vertical and cross sectional geometric design
- Road side equipment
  - Vehicle restraint systems EN1317

Practical Part

Design of a road project at pre-final stage including intersection and basic interchange design using mainly EXCEL and CAD software, as well as the relevant road design software FM19. The project includes: functional classification of roads, selection of typical cross-sections, design on given DTM, horizontal – vertical – cross sectional geometric design, visibility assessment, road safety criteria assessment, bill of quantities.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Teaching using ICT. Communication with students through email and eclass online platform. The course's notes, the project, the exercises, as well as related examples are uploaded on course website.</td></tr>
<tr><td>TEACHING METHODS
The manner and methods of teaching are described in detail.
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.

The student's study hours for each learning activity are given as well as the hours of non- directed study according to the principles of the ECTS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Laboratory practice</td><td>13</td></tr>
<tr><td>Study and analysis of bibliography</td><td>40</td></tr>
<tr><td>Preparation for Project</td><td>33</td></tr>
<tr><td>Course total</td><td>125</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure

Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open- ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</td><td>Final written examination (70%) which includes problem-solving, short answer questions, multiple and open-ended questions. In particular cases the examination is oral.

Project (30%). Students also submit a written project during the semester which is assessed for deriving the final performance score in the course.

Specifically-defined evaluation criteria are given and they are presented to students before the final written examination. The partial score of each question of the written exam is included in the exam questions paper and the final grade is available to the students through the platform of the university. Students reserve the right to ask the examiner to provide comments on the assessment of their written exam concerning the score of each question and may also ask the examiner to explain their mistakes, if any.

The evaluation language is Greek. For Erasmus students English is the evaluation language.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

Greek Bibliography:

1. Ministry of Environment, Regional Planning and Public Works. Guidelines for the Design of Road Projects, Part 3, Alignment (OMOE-X), Greece, 2001.
2. Henning Natzchka. Design and Construction of Roads, 3rd edition. Klidarithmos publications, 2014, Athens.
3. Apostoleris. Road Design. 1st Edition Apostoleris E, 2013, Athens.
4. Pietzsch Wolfgang. Design of Roads. 2nd Edition. Giourdas publications, 1976, Athens
5. Ministry of Environment, Regional Planning and Public Works. Guidelines for the Design of Road Projects, Alignment (OMOE-AK), Greece, 2005.
6. Ministry of Environment, Regional Planning and Public Works. Guidelines for the Design of Road Projects, Alignment (OMOE-IK), Greece, 2005.
7. Ministry of Environment, Regional Planning and Public Works. Guidelines for Tunnel Geometric Designs, (OMOE-TU), Greece, 2003.
8. Ministry of Environment, Regional Planning and Public Works. Guidelines for Vehicle Restraint Systems, (OMOE-VRS), Greece, 2010.

9. Nikolaidis A. Road design: Pavements – materials – quality control. Nikolaidis publications, 2011.

Foreign Bibliography:

1. American Association of State Highway and Transportation Officials (AASHTO). A Policy on Geometric Design of Highways and Streets, Fifth Edition. Washington, DC., 2011.
2. Ed.German Road and Transportation Research Association, Committee. Geometric Design Standards. Guidelines for the Design of Roads, (RAA), Germany, 2008.
3. Austroads. Guide to Road Design Series. Austroads, Australia, 2009.
4. National Cooperative Highway Research Program (NCHRP). Report 672, Roundabouts: An Informational Guide (Second Edition), Washington D.C., 2010.
5. Brilon, W. Studies on Roundabouts in Germany: Lessons Learned, 3rd International TRB Roundabout Conference, Carmel, Indiana, 2011.
6. AASHTO. Guide for Design of pavement structures, 1993.
7. FHWA. Distress Identification Manual for the Long-Term Pavement Performance Program, June 2003.
8. Huang, Y.H. Pavement Analysis and Design, Practice Hall, Inc., 2004.

Related academic journals:

1. Transportation Research Record
2. Journal of International Transportation
3. European Transportation Research Record
4. Journal of European Transport
5. Transport Reviews
6. Transportation Journal