5.3 CE0530 – Road Geometric Design

(1) **GENERAL**

| SCHOOL | ENGINEERING | SCHOOL | | | |
|---|---|-----------------------------|---------|---|--|
| ACADEMIC UNIT | CIVIL ENGINEERING DEPARTMENT | | | | |
| LEVEL OF STUDIES | UNDERGRADUATE | | | | |
| COURSE CODE | CE0530 SEMESTER 5 | | | 5 | |
| COURSE TITLE | Road Geometric Design | | | | |
| 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 | Special Backgr | ound | | | |
| 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/CIV187/ | | | | |

(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, the basic principles and methods related to geometric road design .

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

- 1. Perceive the design process and the degree of detail per stage of a road design project
- 2. Apply basic principles and methods related to safe and operational road design
- 3. Undrestand the limitations and commitments underlying the control values of critical geometric parameters
- 4. Tackle common problems during road geometric design process
- 5. Obtain adequate knowledge in the field of road geometric design that will allow them to continue their studies

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, | Project planning and management | |
|---|---|--|
| with the use of the necessary technology | Respect for difference and multiculturalism | |
| Adapting to new situations | Respect for the natural environment | |
| Decision-making | Showing social, professional and ethical responsibility and | |
| Working independently | 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

- 1. Introduction. Fundamental concepts of horizontal, vertical and cross-sectional design.
- 2. Road functional classification.
- 3. Road design stages. Feasibility study, preliminary design, pre-final design, detailed design.
- 4. Forces applied on the vehicle, braking forces, longitudinal and lateral friction.
- 5. Critical speed values. Road geometric parameters. Determination of minimum horizontal radius.
- 6. Horizontal design. Tangent, Transition curve, Circular arc. Safety criteria.
- 7. Vertical design. Longitudinal grades, crest-sag vertical curves, road longitudinal profile.
- 8. Cross-sectional design. Crown-sloped and single-sloped pavements. Cross sectional and pavement edge-line diagrams.
- 9. Cross sections. Typical cross sections. Cross sections elements, lateral configurations-Road side equipment. Pavement widening-enlargements.
- 10. Visibility. Geometric slight distance (stopping, passing, decision). Psychological slight distance. Visibility diagrams.

Series of independent exercises in the main subject areas of the theory, the synthesis of which is the design of a road section at pre-final stage.

(4) TEACHING and LEARNING METHODS - EVALUATION

| DELIVERY Face-to-face, Distance learning, etc. | Fac | ce-to-face | |
|---|--|---|---|
| USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students | Teaching using ICT. Communication with students through email and the website of the course (Open e-class). The course's notes, the project, the exercises, as well as ressolved examples are uploaded on the course website. | | |
| 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 | | Activity | Semester workload |
| | | Lectures | 39 |
| | | Classwork | 13 |
| | | Personal study | 33 |
| | | Project | 30 |
| | | Educational VIsit | 10 |
| | | Course total | 125 |
| STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure | Wr sho pai | itten final examination (70%) which ort answer questions, multiple an rticular cases the examination is ora | ch includes problem-solving, d open-ended questions. In Il. |

| 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. | Project (30%). Students also submit written projects during the semester which are assessed for deriving the final performance score in the course. |
|--|---|
| | The evaluation criteria are presented to the students prior to the 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. |

(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. Apostoleris.Road Design. 1st Edition Apostoleris publishing, 2013, Athens.
- 3. Pietzsch Wolfgang. Design of Roads. 2nd Edition. Giourdas publications, 1976, Athens.

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. Hassan, Y., Easa, S. M. and Abd El Halim, A.O. Analytical Model for Sight Distance Analysis on Three-Dimensional Highway Alignments, Transportation Research Record, Vol. 1523, 1996.
- Zimmermann, M. Increased Safety Resulting from Quantitative Evaluation of Sight Distances and Visibility Conditions of Two-Lane Rural Roads. Proceedings of the 3rd International Symposium on Highway Geometric Design, TRB, Chicago, USA, 2005.
- 6. Dixon J.C. Tires, Suspension and Handling. Second Edition. Society of Autimotive Engineers, Inc Warrendale, Pa., United Kingdom 1996.
- 7. Gillespie T.D. Fundamentals of Vehicle Dynamics. Society of Mining Metallurgy and Exploration Inc.1992.
- 8. Heisler H. Advanced Vehicle Technology. Edward Arnold. A Division of Hobber & Stoughton, Germany 1993.
- 9. Jazar R. Vehicle Dynamics, Theory and Application, Third Edition. Springer International Publishing AG, Switzerland 2017.

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