COURSE DESCRIPTION CARD - SYLLABUS

Course name
Roads and motorways design [S2Bud1-BDMiK>PDA]

Course

Field of study
Civil Engineering

Year/Semester
1/1

Area of study (specialization)
Road, Bridge and Railway Engineering

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
45

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
30

Number of credit points

6,00

Coordinators

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Lecturers

Prerequisites

Knowledge: basic knowledge of design, construction, maintenance and operation of road; Skills: the ability to acquire information from literature, databases and other sources and to integrate obtained dat; The ability to interpret and draw conclusions; The ability to critically analyze and to evaluate of existing road construction technologies; Social competencies: The ability to work independently and in a team. To understand the need to transfer to the society the knowledge about road engineering; To realise that it is necessary to improve professional and personal competence entire life;

Course objective

The aim of the course is to introduce students to the detailed issues of road and motorway design. The objective of the course is to introduce the students with identification and resolving problems connected with design of roads and motorways. The aim of the course is to gain the ability of independent studing new problems and to solve them while conducting research work.

Course-related learning outcomes

Knowledge:
Student knows in detail the rules of road design.

Student knows the principles of constructing and dimensioning elements in road building structures.
Student has advanced and detailed knowledge of the theoretical principles of structure analysis and optimization as well as road design.
Student knows in detail the Act of Building Law, standards and recommendations for road design.

Skills:
Student is able to prepare a road design and technical documentation in the environment of selected CAD software.
Student can dimension complex construction road details.

Social competences:
Student takes responsibility for the reliability of working results and their interpretation.
Student is ready to autonomously complete and broaden (extend) knowledge in the field of modern processes and technologies of building engineering.
Student is aware how important is sustainable development in building engineering.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lectures: students" knowledge is assessed on the basis of a written exam which takes place during the exam session.
Grading scal:
15 ÷ 16 points - 5.0 (A)
13 ÷ 14 points - 4.5 (B)
12 points - 4.0 (C)
10 ÷ 11 points - 3.5 (D)
8 ÷ 9 points - 3.0 (E)
poniżej 8 points - 2.0 (F)
Projects and laboratories: students" skills are assessed on the basis of a projects which must be handed on last classes (according to schedule). The projects must be done according to the topic assigned during the first classes. The projects are assessed in terms of content and aesthetics.

Programme content

LECTURE:
Principles of road design in accordance with applicable technical and construction regulations.
PROJECT:
Development of design documentation concerning:
Part I - Conceptional project of section of public road;
Part II - Chosen elements of construction project of public road.
LABORATORY:
Computer support of designing the section of public road using chosen program.

Course topics

Lecture:
Legal framework, scope of design documentation, legal-administrative legalities;
Materials and input data to road and motorway desing;
Rules of roads location; geometrical elements in horizontal alignment;
Rules of vertical alignment design, geometrical elements in vertical alignment;
Coordination of road elements in the vertical and horizontal alignment;
Requirements concerning visibility on the roads;
Rules of choosing the type of cross-section; elements of road in cross-section;
Systems of road drainage; the basics of dimensionings of surface drainage elements;
Determination of earthwork volume;
Methods of analysis of road investments variants;
The development of motorways and expressways in Poland and over the world;
Directional system of motorways and expressways in Poland;

Technical rules concerning construction of toll motorways;
Elements of a road lane of motorway;
Technical Equipment of motorways;
Service areas;
Toll systems;
Systems for collecting paid on toll Motorways.
Projects:
Part I - Conceptional project of section of public road, including:
- designing of the geometrical elements in horizontal alignment;
- determining the mileage of the road in the plan + developing an orientation plan;
- preparation of a land leveling log;
- designing geometrical elements in vertical alignment + developing a longitudinal section;
- determination of the volume of excavations and fill using the simplified method;
- determining the length of substitute roads + developing charts of traffic resistance, travel time and fuel consumption;
- multi-criteria comparison of variants;
Part II - Choosen elements of construction project of public road, including:
- design of the road pavement + development of typical cross-sections;
- designing the grade of the bottom of road ditches and how to strengthen them + developing a longitudinal section with road ditches;
- development of cross-sections;
- designation of transition sections for earthworks;
- determining the volume of earth masses and developing a mass-haul diagram
- development of a table for longitudinal and transverse transport of earth masses;
Laboratories:
Computer support of designing the section of public road using choosen program, including:
- performing calculations regarding of the geometrical elements in horizontal alignment + developing an orientation plan;
- defining terrain data;
- performing calculations regarding the geometrical elements in vertical alignment + developing a longitudinal section;
- defining data regarding road elements in cross-section;
- designing the slope of the bottom of the ditches + preparing a longitudinal section with ditches;
- preparation of cross-sections;
- performing calculations regarding the volume of earth masses and topsoil;

Teaching methods

Lecture: informational lecture/problematic lecture/multimedia presentation lecture;
Project: case study;
Laboratory: presentation method;

Bibliography

Basic
1. Rozporządzenie Ministra Infrastruktury z dnia 24 czerwca 2022 roku w sprawie przepisów techniczno - budowlanych dotyczących dróg publicznych, Dz. U. z 2022 r. poz. 1518 ze zmianami
2. WR-D-21 Wytyczne wyznaczania skrajni dróg zamiejskich i ulic, Ministerstwo Infrastruktury, Departament Dróg Publicznych, 2022
3. WR-D-22 Wytyczne projektowania odcinków dróg zamiejskich, Ministerstwo Infrastruktury, Departament Dróg Publicznych, 2022/23
4. WR-D-23 Wytyczne poszerzania jezdni dróg zamiejskich i ulic o dodatkowe pasy ruchu, Ministerstwo Infrastruktury i Budownictwa, Departament Dróg Publicznych, 2017
5. WR-D-42 Wytyczne projektowania infrastruktury dla rowerów, Ministerstwo Infrastruktury, Departament Dróg Publicznych, 2022
6. WR-D-71 Wytyczne projektowania urządzeń do odwodnienia dróg zamiejskich i ulic, Ministerstwo Infrastruktury, Departament Dróg Publicznych, 2023

Additional:
1. WR-D-11-1 Wytyczne kształtowania sieci dróg, Część 1: Wymagania podstawowe, Ministerstwo

Infrastruktury, Departament Dróg Publicznych, 2022
2. PN-S-02204:1997 Drogi samochodowe - Odwodnienie dróg
3. PN-S-02205:1998 Drogi samochodowe - Roboty ziemne - Wymagania i badania
4. Datka S., Lenczewski S., Drogowe roboty ziemne, wyd. I, Wydawnictwa Komunikacji i Łączności, Warszawa 1979
5. Edel R., Odwodnienie dróg, wyd. 4, Wydawnictwa Komunikacji i Łączności, Warszawa 2008, ISBN 978-83-206- 1717-7
6. Szling Z., Pacześniak E., Odwodnienia budowli komunikacyjnych, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2004, ISBN 83-7085-777-9.

Breakdown of average student's workload

	Hours	ECTS
Total workload	160	6,00
Classes requiring direct contact with the teacher	92	3,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	68	2,50