



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Construction and Operation of Road, Motorway

### Course

Field of study

Building Engineering

Area of study (specialization)

Road, bridge and railway engineering

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

1/2

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

### Number of hours

Lecture

30

Laboratory classes

15

Other (e.g. online)

0

Tutorials

0

Projects/seminars

15

### Number of credit points

4

### Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

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### 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 data. 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 building 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 maintenance and operation of road as a very important area of road engineering, concerning issues related to the use of roads, road management, diagnostics of road pavement and impact of roads on the environment.

The objective of the course is to introduce the students with identification and resolving problems connected with diagnostics of road pavement.

The aim of the course is gain skills of analysing new problems and solving them in the research work.

### Course-related learning outcomes

#### Knowledge

Student knows in detail currently utilised construction materials and products, their properties and testing methods as well as production and assembly technologies.

Student knows in detail the rules of design, construction and operation of road construction object

Student has structured and theoretically based knowledge of the processes in the full life cycle of building structures and their management rules. He/she also knows and understands the need for systematic evaluation and maintenance of roads technical condition.

Student has detailed knowledge of the impact of building investments on the environment and understands the need to implement the rules of sustainable development.

#### Skills

Student is able to identify the road pavement faults and determine the probable cause of them.

Student is able to determine repair needs of road pavement and suggest the proper maintenance works for roads.

Student is able to predict the change in time of the parameters describing the pavement condition.

Student is able to obtain information from literature, databases and other properly selected information sources; can integrate the obtained information, interpret and evaluate it as well as draw conclusions, formulate, justify, discuss and present opinions.

#### 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:

Lectures: students' knowledge is assessed on the basis of a written exam which takes place during the exam session.

Projects and laboratories: students' skills are assessed on the basis of a projects which must be handed on last classes. 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

Lectures:

Issues related to the use of roads, including the characteristics of road users, traffic, traffic management systems, ITS traffic management, road safety.

The impact of exploitation of roads on the environment, traffic noise, air pollution, water pollution and soil, threats to fauna and flora.

Road management, tasks of road administration, rules for keeping records of roads, reference systems, road management system elements including: road data banks, systems of assessment of road elements, models and analysis, criteria and optimization, analysis of the consequences.

Pavement management system (PMS), kinds and aims of the road pavement diagnostics, factors influencing the road pavement condition, genesis of the road pavement faults, diagnosis of the road pavement technical condition, prediction of the road pavement condition, diagnostics of roads pavement in the existing legislation, assessment system of pavement condition DNS system and HDM-4 system.

Technical Equipment of motorways and expressways.

Safety in motorways and expressways operation.

Evaluation of technical state of motorways and expressways pavements.

Capacity and stability of earth objects and pavement construction of motorways and expressways.

Act on Toll Motorways and the National Road Fund.

The tender procedure for construction and operation of toll motorways.

The contract for the construction and operation of toll motorways.

Projects:

Part I - description of the road pavement faults, which affect the given parameter of the technical road pavement condition with giving the probable causes of their origin (genesis)



Part II - term of the class of the road pavement condition for the given parameter and identification of the required repairs for the given section of road (diagnosis)

Part III - appointment of trend model of changes of the given parameter and choice of the term of repair (prediction)

Laboratories:

Part I - introduction to assessment of the road pavement technical condition (DSN system), presentation of diagnostic tools commonly used in Poland

Part II - presentation of prototype apparatus ZiSPON including demonstrational measurements with in-situ conditions

Part III - determination of the rate value SCI300 for results from ZiSPON database

### Teaching methods

Lecture: informational lecture/problematic lecture/multimedia presentation lecture

Project: case study

Laboratory: presentation and experience method

### Bibliography

Basic

1. Praca zbiorowa: Eksploatacja dróg, Instytut Badawczy Dróg i Mostów, Warszawa 2011
2. Praca zbiorowa: Zagadnienia utrzymania i modernizacji dróg i ulic, Wydawnictwa Komunikacji i Łączności, Warszawa 1995
3. Podemska M., Utrzymanie dróg - Technologia robót i sprzęt, Wydawnictwo KaBe, Krosno 2015
4. Gaca S., Suchorzewski W., Tracz M.: Inżynieria ruchu drogowego, Wydawnictwa Komunikacji i Łączności, Warszawa 2008
5. Katalog Przebudów i Remontów Nawierzchni Podatnych i Półsztywnych KPRNPP-2013, Generalna Dyrekcja Dróg Krajowych i Autostrad, Instytut Badawczy Dróg i Mostów, Warszawa 2014
6. Rozporządzenie Ministra Infrastruktury z dnia 16 stycznia 2002 roku w sprawie przepisów techniczno-budowlanych dotyczących autostrad płatnych, Dz. U. Nr 12, poz. 116 ze zmianami
7. Ustawa z dnia 27 października 1994 r. o autostradach płatnych oraz o Krajowym Funduszu Drogowym, Dz.U. 2020 poz. 72

Additional

1. Praca zbiorowa: Zasady uspokajania ruchu na drogach za pomocą fizycznych środków technicznych, Biuro Ekspertyz i Projektów Budownictwa Komunikacyjnego, EKKOM Sp. z o.o., 2008



2. Płatkiewicz A., Sztukiewicz R., Zastosowanie metody prognozowania szeregów czasowych do przewidywania zmian równości poprzecznej nawierzchni asfaltowej, Pięćdziesiąta Konferencja Naukowa KILiW PAN - KN PZITB, Krynica 2004, t. V, s. 217 - 224.
3. Płatkiewicz A., Sztukiewicz R., Określenie horyzontu prognozy dla wybranych modeli zmian równości poprzecznej nawierzchni asfaltowej, Zeszyty Naukowe Politechniki Gdańskiej, Nr 603/2006, Pięćdziesiąta Druga Konferencja Naukowa KILiW PAN - KN PZITB, Gdańsk-Krynica 2006, t. IV, s. 239-245.
4. Sztukiewicz R., Diagnostyka warstwy wierzchniej podatnej nawierzchni drogowej, Drogownictwo, 1991, nr 7-8, s.113-115.
5. Rydzewski P., Sztukiewicz R., Diagnoza nawierzchni jako podstawa wyboru zabiegów utrzymaniowych, Autostrady, Nr 5/2007, s. 110-113.

### Breakdown of average student's workload

	Hours	ECTS
Total workload	120	4,0
Classes requiring direct contact with the teacher	65	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	55	2,0

<sup>1</sup> delete or add other activities as appropriate