COURSE DESCRIPTION CARD - SYLLABUS

Course name
Modelling of transport processes and systems [S2Trans1>MPiST]

Course

Field of study
Transport

Year/Semester
1/1

Area of study (specialization)
Low-emission Transport

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
30

Laboratory classes
15

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

3,00

Coordinators

dr inż. Szymon Fierek
szymon.fierek@put.poznan.pl

Lecturers

Prerequisites

KNOWLEDGE: Student has basic knowledge of mathematical modeling of simple (basic) transport systems and optimization techniques. SKILLS: Student is able to: think analytically, interpret the phenomena. SOCIAL COMPETENCES: Student is able to set priorities important for solving specific tasks. He/she is independent while solving problems, acquiring and improving knowledge and skills.

Course objective

Gaining knowledge about modeling of transport processes and systems and the skills needed to perform traffic models, including the tools for this.

Course-related learning outcomes

Knowledge:
Has ordered and theoretically founded general knowledge related to key issues in the field of transport engineering.
Has advanced and detailed knowledge of the processes taking place in the life cycle of transport systems.
He knows advanced methods, techniques and tools used in solving complex engineering tasks and

conducting research in a selected area of transport.

Skills:
He can obtain information from literature, databases and other sources (in Polish and English), integrate them, interpret and critically evaluate them, draw conclusions and formulate and exhaustively justify opinions.
Can plan and conduct experiments, including measurements and simulations, interpret the obtained results and draw conclusions, as well as formulate and verify hypotheses related to complex engineering problems and simple research problems
Can use analytical, simulation and experimental methods to formulate and solve engineering tasks and simple research problems.

Social competences:
Understands the importance of using the latest knowledge in the field of transport engineering in solving research and practical problems.
Understands the importance of popularizing the latest achievements in the field of transport engineering.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
For discussion and activity in class. Written examination of lectures (60 minutes, 10 to 15 open and closed questions / tasks); 50% credit threshold; classes and laboratories: assessment based on partial grades from the student"s work.

Programme content

1. Basic concepts of modelling: Process vs. transport system, decision problem and its model, features of models.
2. Purpose of creating models of transport processes and systems; verbal description of the decision problem, model classification criteria.
3. Modelling with the use of graph theory (elements of the transport system model, characteristics of selected approaches).
4. Procedure for constructing models of transport processes and systems. Trip-based / travel-based modelling (four-stage and activity-based model).
5. Examples of creating stages of the model: models of trip generation, trip distribution, modal split, traffic assignment.
6. Use of advanced spreadsheet tools to create mathematical models of selected elements of complex transport systems and processes.
7. Calibration and validation of models.

Course topics

Learning how to build models of transportation systems using PTV Visum software:
- Explaining how to use the PTV Visum user interface
- Supply model - network and model of public transport services , graphical settings
- Trip generation, demand segmentation, user defined attributes, calculation procedures
- Trip distribution of traffic, utility matrices, skim and demand matrices, trip length distribution
- Modal split, logit models, formula matrices
- Traffic assignment on the network, types of assignments, impedance, VDF - Volume Delay Functions
- Scenario management: modifications, scenarios, indicators, calculation procedures, scenario comparisons

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples.
2. Exercises: auditorium exercises, classroom discussion multimedia presentation illustrated with examples.
3. Laboratories: practical classes - learning how to create models using macroscopic traffic simulation tools.

Bibliography

Basic
1. Jacyna M.: Wybrane zagadnienia modelowania systemów transportowych. Wydawnictwo: Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2009
2. Leszczyński J.: Modelowanie systemów i procesów transportowych. Wydawnictwo: Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 1999
3. Hollander Y.: Transport Modelling for a Complete Beginner. CTthink, Milton Keynes 2016
Additional
1. Hensher D.A., Button K., J. (red).: Handbook of Transport Modelling. Elsevier, Oxford, 2008.
2. Ortuzar J., Willumsen L.G.: Modelling Transport. John Wiley & Sons, New York, 2011.
3. Skorupski J.: Współczesne problemy inżynierii ruchu lotniczego. Modele i metody. Wydawnictwo: Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2014.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	15	0,50