

Warsaw University of Technology | Doctoral School No. 3

Course offered in the Doctoral School No. 3
– Spring semester of the 2021/2022 academic year

TITLE
Automatics of electric transport systems
CONDUCTING UNIT
Doctoral School No. 3
SCIENTIFIC DISCIPLINE
Automation, electronic and electrical engineering
IMPLEMENTING UNIT
104000 - Faculty of Electrical Engineering
SUMMARY DESCRIPTION
The main object of the subject is to get knowledge on basic elements, devices and automatic and control systems applied in mass transit (railways, trams, underground vehicles and infrastructure). Preparation for analysis of current literature and standards. Presentation of current research areas led by Electr. Eng. Faculty in area of electric traction systems. Presentation of selected methods and solutions applied in research on electric traction.
FULL DESCRIPTION
<p>Ground transportation systems in Poland and world. Ecological aspects of electrified transport. Transport policy of EU. Interoperability of railways in Europe. Technical Specifications of Interoperability. Characteristics and movement of traction vehicles. Maximum traction force during starting and braking. Energy consumption and energy savings. Recuperation of energy. Traction motors and drives. Energy conversion on board of traction vehicles. Regulation of speed of traction vehicles. Parameters of modern traction vehicles for urban and long-distance traffic. High speed rolling stock. Signalling and control of vehicles. Traction power supply systems -AC and DC. Compatibility of vehicles, power supply and control systems. Perspectives for development of new electrified means of transport (non-conventional vehicles, autonomous, hybrid vehicles, electric cars, maglev, people movers, industry transport).</p> <p>Optimization of traffic and duty-cycle of vehicles. Systems and devices of automatics and control of transport systems. Systems supporting a driver and traffic safety. Track circuits. Devices used for checking occupancy of tracks. Automatic running and braking of trains. Compatibility of automatic and control systems and traction power systems. Basic functions of ERTMS (European Railway Traffic Management Systems).. Levels of ERTMS/ETCS. (European Train Control System). System ERTMS and its components.</p>

ERTMS/ETCS, GSM-R (3h) Interoperability of trains' movement. . Radio Center Control in ERTMS/ETCS. Applications of ERTMS in Europe. Automatic Train Control in underground systems.

LITERATURE

1. Szelaĝ A. - Electric traction - basics, OW PW, 2019
2. Szelaĝ A., Mierzejewski A. - Ground transportation systems. (w: The Encyclopedia of Electrical and Electronic Engineering. Supplement I, John Wiley & Sons, Inc., NY, USA,1999) s.169-194
3. Andreas Steimel - Electric traction - motive power and energy supply. Basics and Practical Experience. Oldenburg Industrierlag Munchen,2008
4. Krzysztof Karwowski (Ed.) and Adam Szelaĝ (Ed.): Modern electric traction: vehicles, Gdańsk, 2009
5. Krzysztof Karwowski (Ed.) and Adam Szelaĝ (Ed.): Modern electric traction : power supply, Gdańsk, 2009
6. Andreas Steimel: Electric traction - motive power and energy supply. Deutscher Industrieverlag, Munchen, Germany 2014
7. Morris Brenna, Dario Zaninelli and Federica Foadelli: Electrical Railway Transportation Systems. John Wiley and Sons Ltd, Hoboken, United States, 2018
8. Gonzalo Abad: Power Electronics and Electric Drives for Traction Applications. John Wiley & Sons. Ltd., 2017

LEARNING OUTCOMES

The main object of the subject is to get knowledge on basic elements, devices and automatic and control systems applied in mass transit (railways, trams, underground vehicles and infrastructure). Preparation for analysis of current literature and standards. Presentation of current research areas led by Electr. Eng. Faculty in area of electric traction systems. Presentation of selected methods and solutions applied in research on electric traction.

ASSESSMENT METHODS AND CITERIA; COURSE COMPLETION FORM

The required condition to have this course passed is:

- to pass an exam (oral or written form, to be decided with the students), assessed maximum 30 points,

- 1 presentation in a form of PowerPoint slides, which must be b sent to the tutor's e-mail for acceptance (at least 3 days before the scheduled presentation). Next it should be presented in front of the group of students attending the course.

The elements which are taken into account during assessment of the the each presentation are as follow:

Formal criteria concerned the presentation(10 points)

- agenda of the presentation and its structure (introduction, development, conclusions),
- construction of slides (readability, attractiveness - animation, graphs etc., underlining important points),

Way of presentation (10 pts)

- presence during the presentation and timing (20-25 minutes, 1-1,5 min. per slide)
- body language during the presentation,
- usage of a pointer to point out important elements in the slide (figures, main statement),
- contact with the audience,
- reaction of the audience to the presented issues,
- observed knowledge of the presented material and free speech with usage of slides as support
- to the description of presentation (not reading text in slides),

- reserving 3-5 min. for questions,

Merits (10 pts)

- following the agenda,
- introduction to the problem,
- proper level of the presented material (usage of formulas, tables, graphics to presents results of research),
- development of the topic from general to detailed issues, important from the point of view the topic,
- answering the questions,
- conclusions

The presentation is marked maximum 30 points, globally 60 points could be obtained for the course.

LANGUAGE OF THE COURSE		ECTS CREDITS
English		4
TYPE OF CLASSES	NUMBER OF HOURS	COURSE INSTRUCTOR
Lecture	30	Adam Szeląg, prof. dr hab. inż.