COURSE DESCRIPTION CARD - SYLLABUS

Course name
Diploma project [S2Eltech2-SNPE>PD]

Course

Field of study
Electrical Engineering

Year/Semester
2/3

Area of study (specialization)
Drive Systems in Industry and Electromobility

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
0

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
15

Number of credit points

1,00

Coordinators

dr hab. inż. Mariusz Barański
mariusz.baranski@put.poznan.pl

Lecturers

Prerequisites

The student starting this subject should have knowledge of electrical engineering, electrical machinery, electrical metrology, electrical circuit theory, power controls, power electronics, and operating system support. Moreover, student should have extended knowledge of construction and design of electrical machines as wel as basic knowledge of computer science and numerical methods and knowledges from the construction, analysis and synthesis of electromechanical transducers and measurement methods used in mechatronics.

Course objective

Acquiring modern methods of design, testing and analysis of mechatronics and actuators electromagnetic and electromechanical devices. The acquisition of skills in computing package selected.

Course-related learning outcomes

Knowledge:
1. Student has an extended knowledge of advanced numerical methods used to solve complex technical problems in electrical engineering.
2. Student has knowledge of the development trends and the most important new developments in the

field of electrical engineering and - to a lesser extent - in electronics, information technology and power energy.
3. Student has knowledge about the formulation of equations describing of simple propulsion systems, application of the principles of identification, using the software to analyze the results of computer simulations, and has expertise in designing simple drive systems.

Skills:
1. Student can obtain information from literature, databases and other sources, it can integrate the information, make their interpretation and critical evaluation, as well as draw conclusions and formulate and fully justify opinions.
2. Student is able to work independently and in a team, it is able to assess the time-consuming task, it can lead a small team to ensure execution of tasks in a given period.
3. Student is able prepare and give a presentation on the implementation of the project or research task, and lead a discussion about the presentation shown.

Social competences:
1. Student recognizes the importance of knowledge in solving cognitive and practical problems and understands that in the technology knowledge and skills quickly become obsolete and therefore require continuous replenishment.
2. Student understands the need for the formulation and communication of information and opinions on the developments in the field of electrical engineering and other aspects of the electrical engineer, shall endeavor to provide such information in a manner commonly opinions clear.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Project lectures
- Evaluation based on the current progress of the projects and thesis.
Get extra points for the activity in the classroom, and in particular for:
- propose to discuss further aspects of the subject;
- the effectiveness of the application of the knowledge gained during solving the given problem.

Programme content

The project is closely linked to the topic of the thesis, which in turn affects the resolution of new problems every year.

Course topics

Simulation of operation of electrical machines and DC permanent magnet machines in Matlab. Using Maxwell to analyze of magnetic field in the selected systems with magnetic field. Using LabVIEW to create virtual instruments supporting electromagnetic and thermal measurements of electromechanical transducers. Measuring systems for the study of phenomena in transformers. Legislation allowing for the operation of power systems (Polish Standard, EU directives). Methods for measuring force, mechanical stress, torque, moment of inertia, speed and slip in electrical machines.

Teaching methods

Analysis / discussion of various methods (including nonconventional) problem solving, multimedia demonstration, teamwork.

Bibliography

Basic:
1. Control of Electrical Drives, Leonhard W., Springer-Verlag, Berlin-Heidelberg-NewYork-Tokyo, 1985
2. AUTOCAD helpdesk
3. Handbook of small electric motors, Yeadon W.H., Yeadon A.W., Mc Graw Hill, 2001
4. LabVIEW Graphical Programming, Jennings Richard, Johnson Gary W., McGraw-Hill Professional Publishing, 2006
5. Analysis of Electric Machinery, P. Krauze, McGraw Hill Book Company, New York , 1986
6. Numerical Analysis, R. Burden, J.D. Faires, PWS Publishers, Prindle, Weber&Schmidt, 1985

7. Metody Numeryczne w Turbo Pascalu, B. Baron, Wyd. Helion, Gliwice, 1995
8. Układy napędowe z silnikami synchronicznymi , Kaczmarek T., Zawirski K., Wyd. PP, Poznań, 2000
9. Environment LabVIEW w eksperymencie wspomaganym komputerowo, Tłaczała W., WNT, Warszawa, 2002
10. LabVIEW w praktyce, Chruściel M., Wydawnictwo BTC, Legionowo, 2008
11. http://www.ansys.com/products/academic
12. AC micro-machinery, Simst J., Clarendon Press, New York, 1994
13. https://www.infolytica.com/en?category=Motors%20Generators%20Brushless&page=1
14. Silniki krokowe, Wróbel T., WNT, Warszawa, 1993
15. https://www.comsol.com/videos?&sortOrder=&s

Additional:
1. Barański. M., FE analysis of current displacement phenomena in a squirrel cage motor working at cryogenic temperature, Archives of Electrical Engineering, Volume 63, Issue 2 ,pp.139-147, 2014.
2. Barański M., Idziak P., Łyskawiński W., Analiza powównawcza stanów pracy silników indukcyjnego i synchronicznego z magnesami trwałymi i klatka rozruchowa, Poznan University of Technology Academic Journals, Electrical Engineering, Issue 77, pp. 155-163, 2014.
3. Barański M.,, Jędryczka C., Knypiński Ł., Stachowiak D., Szeląg W., Analiza wpływu niesymetrii obwodu magnetycznego wirnika na parametry rozruchowe 6-biegunowego silnika magnetoelektrycznego synchronicznego, Zeszyty Problemowe - Maszyny Elektryczne, BOBRME - KOMEL, Nr 4/2015 (108), s. 43-48, 2015.
4. Barański M., Field-circuit analysis of LSPMS motor supplied with distorted voltage, Computer Applications in Electrical Engineering, Poznań 2017, Vol. 91, pp. 287-297.
5. Wojciechowski R. M., Jędryczka C., Łukaszewicz P., Kapelski D., Analysis of high speed permanent magnet motor with powder core material, The International Journal for Computation and Mathematics in Electrical and Electronic Engineering, 2012, Vol. 31, No. 5, pp. 1528 ? 1540
6. Wojciechowski R. M., Jedryczka C., Demenko A., Sykulski J. K., Strategies for two-dimensional and three-dimensional field computation in the design of permanent magnet motors, IET Sci. Meas. Techn. Vol. 9, No. 2, 2015, pp. 224-233.
7. Wojciechowski R. M., Jedryczka C., Demenko A., Sykulski J. K., Strategies for two-dimensional and three-dimensional field computation in the design of permanent magnet motors, IET Sci. Meas. Techn. Vol. 9, No. 2, 2015, pp. 224-233.
8. Wojciechowski R. M., Skumiel A., Kurzawa M., Demenko A., Designe, application and investigation of the system for generation of fast changing, rotating magnetic field causing hyperthermic effect in magnetic liquids, Measurement - 2022, vol. 194, s. 111020-1-111020-12.
9. Kurzawa M., Jedryczka C., Wojciechowski R. M., Application of Multi-Branch Cauer Circuits in the Analysis of Electromagnetic Transducers used in Wireless Transfer Power Systems, Sensors - 2020, vol. 20, no. 7, s. 2052-1-2052-10.
10. Barański M., Szelag W., Lyskawinski W., Experimental and Simulation Studies of Partial Demagnetization Process of Permanent Magnets in Electric Motors , EEE Transactions on Energy Conversion - 2021, vol. 36, iss. 4, s. 3137-3145.

Breakdown of average student's workload

	Hours	ECTS
Total workload	29	1,00
Classes requiring direct contact with the teacher	15	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	14	0,50