GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Drives Supplied by Power Converters, PG_00016900		
Field of study	Electrical Engineering		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	2	ECTS credits	5.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department Of Electric Drives And Energy Conversion -> Faculty Of Electrical And Control Engineering -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Marcin Morawiec	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	30.0	0.0	0.0	60

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	60	7.0	58.0	125

Subject objectives

Study of advanced electrical machine control systems with taking under consideration a sensorless control.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_K03] can interact and work in a group assuming various roles and identify priorities for the achievement of a specific task		
[K7_U07] is able to analyse, calculate, design, program and test converters, drive systems, control systems and state observers		
[K7_W06] has an in-depth knowledge of industrial electronics, microprocessor control systems and in the field of power electronics and drive systems, their control and diagnostic methods		

Subject contents

Transformation of phase systems to orthogonal systems. Space vector. Methods for generation of voltage inverter output voltage. Control systems for a voltage source inverter output current. Structures of field oriented control and direct torque control of induction motor. Induction motor control principle of a fixed ratio U / f. High-power drive systems with induction motor. Control systems for double fed induction machine. Control systems for synchronous machine. Control systems for synchronous machines with permanent magnets. Construction of switched reluctance motors. Power suppliers for switched reluctance motors. Start-stop and synchronous control of stepper motor. Principles of controllers based on fuzzy logic. The use of neural networks and fuzzy logic in the control drives.

Prerequisites and co-requisites

Ability to program in C.Knowledge of power electronics, electronics and digital technology.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Egzam	60.0%	60.0%
Laboratory	60.0%	40.0%

<table>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. Krzemiński Z.: Digital control of induction machines. Wydawnictwo Politechniki Gdańskiej. PAN, Komitet Elektrotechniki, Seria Wydawnicza "Postępy Napędu Elektrycznego i Energoelektroniki" Tom 45. 2001.
2. Orłowska-Kowalska T., Sensorless drive systems with induction motors, Oficyna Wydawnicza Politechniki Wrocławskiej, Seria Wydawnicza Komitetu Elektrotechniki PAN Postępy Napędu Elektrycznego i Energoelektroniki T. 48, Wrocław 2003.</td></tr>
<tr><td>Supplementary literature</td><td>1. T. Raghu, J. Srinivas Rao, and S. Chandra Sekhar: Simulation of Sensorless Speed Control of Induction Motor Using APFO Technique. International Journal of Computer and Electrical Engineering, Vol. 4, No. 4, August 2012.
2. Dušan Graovac, Marco Pürschel: IGBT Power Losses Calculation Using the Data-Sheet Parameters. Infineon. Application Note, V 1.1, January
3. Tobias Geyer and Georgios Papafotiou: Direct Torque Control for Induction Motor Drives: A Model Predictive Control Approach Based on Feasibility. M. Morari and L. Thiele (Eds.): HSCC 2005, LNCS 3414, pp. 274290, 2005. Springer-Verlag Berlin Heidelberg 2005.
4. Bhoopendra Singh, Shailendra Jain, and Sanjeet Dwivedi: Direct Torque Control InductionMotor Drive with Improved Flux Response. Hindawi Publishing Corporation. Advances in Power Electronics. Volume 2012, Article ID 764038, 11 pages. doi: 10.1155/2012/764038.
5. Atul Kumar Dewangan, Durga Sharma, Shikha Mishra: PID Controller Based Chopper-Fed DC Motor Drive Using Fuzzy Logic. Atul Kumar Dewangan, Durga Sharma, Shikha Mishra/ International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com. Vol. 2, Issue 3, May-Jun 2012, pp.1073-1081.
6. Qiang Ling, Jing Li, and Haojiang Deng: Robust Speed Tracking of Networked PMSM Servo Systems with Uncertain Feedback Delay and Load Torque Disturbance. Hindawi Publishing Corporation Journal of Applied Mathematics Volume 2012, Article ID 65923, 17 pages. doi:10.1155/2012/365923.
7. J. Liang, L. Jian, G. Xu, and Z. Shao: Analysis of electromagnetic behavior in switched reluctance motor for the application of integrated air conditioner onboard charger system. Progress In Electromagnetics Research, Vol. 124, 347{364, 2012.</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">1. Sensorless control of the induction motor.

2. Control system of the double-fed machine.

3. The control system of the DC machine with armature current limitation.

4. Control of the rotor angular speed of the synchronous machine.

5. Direct torque control of induction motor</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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