STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Power engineering electronics and microprocessor engineering**		Code **1010314351010326013**
Field of study **Power Engineering**	Profile of study (general academic, practical) **(brak)**	Year /Semester **3 / 5**
Elective path/specialty **-**	Subject offered in: **polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **part-time**	
No. of hours Lecture: **30** Classes: **-** Laboratory: **15** Project/seminars: **-**		No. of credits **5**
Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**	
Education areas and fields of science and art **technical sciences** **Technical sciences**		ECTS distribution (number and %) **5 100%** **5 100%**

Responsible for subject / lecturer:

dr hab. inż. Ryszard Porada, prof. nadzw.
email: ryszard.porada@put.poznan.pl
tel. 48 61 665 2360
Wydział Elektryczny
ul. Piotrowo 3A 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	It has basic knowledge from physics, electrical engineering, electronics and mathematical analysis. It knows mechanisms of action and parameters of basic elements of the digital electronics and the construction of power electronics systems.
2	**Skills**	It knows to apply the knowledge from the range of physics, electrical engineering, electronics and mathematical analysis. It knows to apply the knowledge from the range of bases of computer science to the programming of microprocessor systems
3	**Social competencies**	There has the consciousness of the necessity of extending of her competences, a readiness to the collection of the cooperation within the framework of the group

Assumptions and objectives of the course:

Theoretical knowledge of propriety and basic characteristics of power electronics converters, rectifiers, AC/AC converters, AC/DC converters and inverters. Becom familiar with the operation of microprocessor systems and microcomputer, particularly used to the control of power electronics systems. The acquisition of the skill of the programming of such systems in the C language.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. to apply the knowledge on the subject constructions, operations and designings of power electronics systems in chosen branches of industry - [K_W04 ++ K_W14 +++]
2. to characterize basic criteria of the analysis and synthesis for simple power electronics systems - [K_W04 ++]
3. to circumscribe the architecture, mechanisms of action and to characterize areas of uses of microprocessor systems - [K_W01+ K_W16+]
4. to characterize basic criteria of the designing of microprocessor systems in the power electronics - [K_W17 +++]

Skills:

1. to use the knowledge within the range constructions and mechanisms of action of elements and basic power electronics systems - [K_U03 ++]
2. o use known methods and mathematical models and computer simulations to the analysis and evaluation of elements operation and power electronics systems - [K_U02 ++ K_U11 ++]
3. to apply the knowledge from the range of the technique of processors to the designing of algorithms of the real-time control of power electronics systems - [K_U01+ K_U02++ K_U12++]
4. to apply the chosen runtime environment to the programming of microcontrollers for determined uses - [K_U01++ K_U07++ K_U09++]

Social competencies:

1. Has the consciousness of the importance and the understands different aspects and results of activity of electrician engineer in this of the influence on the medium, and related to this of the responsibility for undertaken decisions - [K_K01++]

2. it can think and work enterprisingly in the area of the designing of systems power electronics and microprocessor - [K_K05++]

Assessment methods of study outcomes

Lecture

? the credit of the lecture preceded with the credit of occupations laboratory exercises and project,

Designing work and laboratory exercises:

? the test and awarding the knowledge of need-to-know to realization of placed problems

in the given area of tasks,

? verification skills on every exercises

? evaluation of the knowledge and skills related to the realization of laboratory exercise, the evaluation of the report from done exercises.

Obtaining additional points for activity during exercises, in particular way for:

? proposing to discuss additional aspects of the subject

? effective use of knowledge obtained during solving of given problem;

? comments related to improve teaching material,

? aesthetics of solved problems and reports ? within homework.

Course description

The power electronics ? targets and assignments, general characterization of the object. Semiconductor elements in the power electronics. Types of power electronics systems, the classification and basic functions. AC/DC converters ? non-controlled and controlled rectifiers. AC/AC systems - alternating voltage controllers. DC/DC converters ? DC voltage controller (thyristor and transistor). DC/AC converters ? independent transistor inverters ? systems and methods of controlled. Chosen problems of the compatibility of power electronics systems.

Structures of microcontrollers of INTEL MCS51 family. Project tools for controllers of MCS51 family and derivatives (SIEMENS, INFINEON TECHNOLOGIES). Advanced derivative microcontrollers to MCS51 family . The architecture of microcontrollers of ADuC8xx family Analogue Devices and execution tools for her. Rules of the designings of algorithms of the control with objects real-time. The specificity of the programming in the C language of microprocessor systems. The service of systems in-you on the structure of microcomputer systems with particular reference to transducers A/C and C/A. The realization of the modulation PWM and her use in the control of power electronics systems.

Basic bibliography:

1. Barlik R., Nowak M., Technika tyrystorowa, Wydawnictwa Naukowo-Techniczne, Warszawa 1997.

2. Frąckowiak L., Januszewski S., Energoelektronika. Cz. 1, Półprzewodnikowe przyrządy i moduły energoelektroniczne, Wydawnictwo Politechniki Poznańskiej, Poznań 2001.

3. Mikołajuk K., Podstawy analizy obwodów energoelektronicznych, Państwowe Wydawnictwo Naukowe, Warszawa 1998.

4. Mohan N., Undeland N., Robins W., Power Electronics, Jon Wiley & Sons Inc., New York 1999

5. Tunia H., Smirnow A., Nowak M., Barlik R., Układy energoelektroniczne. Obliczanie, modelowanie, projektowanie, Wydawnictwa Naukowo-Techniczne, Warszawa 1982.

6. P. Misiurewicz, Układy mikroprocesorowe, WNT, Warszawa, 1983.

7. T. Starecki, Mikrokontrolery 8051 w praktyce, Wydawnictwo BTC, 2002.

8. J. Majewski, Programowanie mikrokontrolerów 8051 w języku C ? pierwsze kroki.

Additional bibliography:

1. Frąckowiak L., Energoelektronika. Cz. 2, Wydawnictwo Politechniki Poznańskiej, Poznań 2000

2. Kaźmierkowski M., Krishnan R., Blaabjerg H., Control in Power Electronics, Academic Press, Amsterdam 2002

3. Piróg S., Energoelektronika, Uczelniane Wydawnictwa Naukowo-Dydaktyczne AGH, Kraków 1998.

4. Strzelecki R., Supronowicz H., Współczynnik mocy w systemach zasilania prądu przemiennego i metody jego poprawy, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2000.

5. Materiały techniczno-informacyjne dotyczące mikrokontrolerów rodzin ADuC8xx dostępne na stronie www.analog.com

6. P. Hadam, Projektowanie systemów mikroprocesorowych, Wydawnictwo BTC, 2004.

Result of average student's workload

Activity	Time (working hours)

1. participation in the lectures	30
2. participation in the laboratory exercises	15
3. participation in consultations on the lecture	10
4. participation in consultations on the laboratory exercises	10
5. preparation for the laboratory exercises	10
6. preparation for the exam	10
7. preparation for the laboratory exercises pass	10
8. participation in the exam	5

Student's workload

Source of workload	hours	ECTS
Total workload	100	5
Contact hours	50	2
Practical activities	0	0