

(faculty stamp)

COURSE DESCRIPTION

Z1-PU7

WYDANIE N1

Strona 1 z 2

1. Course title: Operation of Energy Systems		2. Course code		
3. Validity of course description: 2012/2013				
4. Level of studies: 1 st cycle of higher education				
5. Mode of studies: intramural studies				
6. Field of study: Power Engineering		(FACULTY SYMBOL)		
7. Profile of studies: academic (ogólnoakademicki)				
8. Programme: Sustainable Energy Engineering				
9. Semester: 5				
10. Faculty teaching the course: Faculty of Energy and Environmental Engineering				
11. Course instructor: Wojciech Kosman				
12. Course classification: expert course (przedmiot kierunkowy)				
13. Course status: compulsory				
14. Language of instruction: English				
15. Pre-requisite qualifications: thermodynamics, fluid mechanics, technical mechanics, fundamentals of machinery design				
16. Course objectives:				
Learn the optimal operation of power generating machines and devices. Develop skills to assess the conditions of operation and health state of power generating systems.				
17. Description of learning outcomes:				
Nr	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1.	Ability to determine the effects of the machine operation in various conditions.	test	lecture	K_W11 K_W15 K_W17
2.	Understanding of the optimization principles in the field of power generating machines.	test	lecture	K_W18 K_U22
3.	Knowledge of the assessment procedure of a health state in the field of power generating systems.	test	lecture	K_U22 K_U23 K_W17
4.	Knowledge of the methods to supervise the operation of power generating systems.	test	lecture	K_W11 K_U22
5.	Knowledge of the fundamental diagnostic methods.	laboratory reports	laboratory	K_W18 K_U22
6.	Knowledge of the dynamic measurements methods.	laboratory reports	laboratory	K_W18 K_U22
18. Teaching modes and hours				
Lecture 30 / BA /MA Seminar / Class / Project 30 / Laboratory				
19. Syllabus description:				
<u>Lecture:</u>				
Principles of the theory of the operation				
<ul style="list-style-type: none"> Standard terminology. States of operation. Optimal operation of energy systems. Criteria for the assessment of the operation: the efficiency and the durability. Matching of machines and devices within an energy system. The influence of the conditions of operation on the performance of the machines. 				
Principles of diagnostics				
<ul style="list-style-type: none"> Health state. Assessment of the health state. Measurable and immeasurable health indices. The components wear. 				
Measurements in energy systems				
<ul style="list-style-type: none"> The range and types of measurements. Standard measurement systems for chosen machines and devices. Safety sub-systems. Measurement data processing and storage. 				
Operating indices				
<ul style="list-style-type: none"> General performance maps. Matching of machines and devices in parallel and serial systems. Operating point. Performance maps of chosen machines and devices. 				
Protection against structural failures				
<ul style="list-style-type: none"> Verification of stress and strain levels. Creep process. Fatigue wear. Creep and fatigue maps. 				

Monitoring of thermal and strength states

- Monitoring of the strength states in stable and unstable periods of operation. Temperature criteria. Start-up curves.

Laboratory:

- Diagnostic tests: penetration tests, magnetic tests, ultrasound tests and metalographic replicas.
- Diagnostics of vibrations: assessment of a dynamic state of operation, balancing of bearings.

20. Examination: yes

21. Primary sources:

- Laudyn D., Pawlik M., Strzelczyk F. „Elektrownie” WNT Warszawa 2000
- Rusin A. „Awaryjność, niezawodność i ryzyko techniczne w energetyce cieplnej” Wydawnictwo Politechniki Śląskiej, Gliwice 2008
- Krzyżanowski J., Gluch J. „Diagnostyka cieplno-przepływowa obiektów technicznych” Wydawnictwo Instytutu Maszyn Przepływowych PAN, Gdańsk 2004

22. Secondary sources:

- Niziński S. „Eksploatacja obiektów technicznych” Wydawnictwo Instytutu Technologii i Eksploatacji, Radom 2002
- Legutko S. „Podstawy eksploatacji maszyn” Wydawnictwo Politechniki Poznańskiej, Poznań 1999
- Bucior J. „Podstawy teorii i inżynierii niezawodności” Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów 2004r.

23. Total workload required to achieve learning outcomes

Lp.	Teaching mode :	Contact hours / Student workload hours
1	Lecture	30 / 30
2	Classes	/
3	Laboratory	15 / 15
4	Project	/
5	BA/ MA Seminar	/
6	Other	/
	Total number of hours	45 / 45

24. Total hours: 90

25. Number of ECTS credits: 3

26. Number of ECTS credits allocated for contact hours: 2

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects): 1

26. Comments:

Approved:

.....
(date, Instructor's signature)

.....
(date, the Director of the Faculty Unit signature)