Applied mathematics

Faculty of	**Mechanical and Power Engineering**
Name in English	**Applied mathematics**
Name in Polish	**Matematyka stosowana**
Main field of study	**Power Engineering**
Specialization	**-**
Level of studies	**II level**
Form of studies	**full-time**
Kind of subject	**obligatory**
Subject code	**W09ENG-SM2331**
Group of courses	**NO**

	Wykład	Ćwiczenia	Laboratorium	Projekt	Seminarium
Number of hours of organized classes in University (ZZU)	30	30			
Number of hours of total student workload (CNPS)	50	50			
Form of crediting	Egzamin	Zaliczenie			
For group of courses mark final course with (X)					
Number of ECTS points	2	2			
including number of ECTS points for practical (P) classes		2			
including number of ECTS points for direct teacher-student contact (BU) classes	1,44	1,28			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1.	Basic knowledge from differential and integral calculus
2.	Basic knowledge from algebra and vector analysis
3.	Basic knowledge from numerical methods

SUBJECT OBJECTIVES

C1	Presentation of selected ordinary and partial differential equations necessary to understand the mathematical description of physical phenomena occurring in devices and technical processes.
C2	Familiarization with the techniques of solving selected ordinary and partial differential equations with the use of analytical and numerical methods.

SUBJECT LEARNING OUTCOMES

relating to knowledge:	
PEU_W01	Student understands how the physical aspect of processes occurring in technology is described mathematically in the form of algebraic and differential equations.
PEU_W02	When dealing with a mathematical problem (e.g. an algebraic or differential equation), student distinguishes between exact and approximate solutions and understands the relationships between them.
relating to skills:	
PEU_U01	Student can indicate equations (algebraic or differential) describing physical phenomena in the studied technical processes.
PEU_U02	Student is able to select a correct tools to solve an identified mathematical problem.

PEU_U03	Student is able to solve ordinary or partial differential equations using appropriate analytical and numerical methods, assess their accuracy and interpret the physical and technical meaning of the obtained results.
relating to social competences:	
PEU_K01	-

PROGRAMME CONTENT

Form of classes - lecture		Number of hours
Wy1-Wy4	Ordinary differential equations of the first order. Analytical methods of solving them. Selected numerical methods used to solve first order ordinary differential equations - examples of application.	8
Wy5-Wy7	Ordinary linear differential equations of the second order. Analytical methods of solving them. Selected numerical methods used to solve ordinary differential equations of the second order - examples of application.	6
Wy8	Second order partial differential equations. Canonical form. Fourier series.	2
Wy9-Wy10	Parabolic equations. Analytical methods of solving them. Selected numerical methods used to solve parabolic equations - examples of application.	4
Wy11-Wy12	Elliptic equations. Analytical methods of solving them. Selected numerical methods used to solve elliptic equations - examples of application.	4
Wy13-14	Hyperbolic equations. Analytical methods of solving them. Selected numerical methods used to solve hyperbolic equations - examples of application.	4
Wy15	An example of solving ordinary and partial differential equations using the functions available in the Matlab software.	2
Suma godzin		30

classes		Number of hours
Cw1-Cw4	Ordinary differential equations of the first order - methods of solving them and examples of their application.	8
Cw5-Cw7	Linear ordinary differential equations of the second order - methods of solving them and examples of their application.	6
Cw8	Canonical form - solving tasks. Fourier series - examples of application.	2
Cw9-Cw10	Parabolic equations - examples of application.	4
Cw11-Cw12	Elliptic equations - examples of application.	4
Cw13-Cw14	Hyperbolic equations - examples of application.	4
Cw15	Written test	2
Suma godzin		30

TEACHING TOOLS USED	
N1	Lecture with the use of multimedia (presentation - slides).
N2	Calculation exercises supported by software.
N3	Consultation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F– forming (during semester), C– concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P1	PEU_W01- PEU_W02	Written exam
P2	PEU_U01- PEU_U03	Written test

PRIMARY AND SECONDARY LITERATURE

Primary literature	
1	M. Abell, J. Braselton: *Differential Equations with Mathematica*, Elsevier 2004
2	J. Mathews, K. Fink: *Numerical Methods Using MATLAB*, Pearson Education 2004
3	W. Cheney, D. Kincaid: *Numerical Mathematics and Computing*, Thomson Brooks 2008
Secondary literature	
1	G. Dahlquist, A. Bjorck: *Numerical Methods in Scientific Computing*, SIAM 2007

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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