FACULTY OF PURE AND APPLIED MATHEMATICS
SUBJECT CARD

Name of subject in Polish METODY PERTURBACYJNE
Name of subject in English Perturbation Methods
Main field of study (if applicable): APPLIED MATHEMATICS
Specialization (if applicable): Mathematics for Industry and Commerce
Level and form of studies: ~~1st/~~ 2nd* level, full-time ~~/ part-time*~~
Kind of subject: ~~obligatory /~~ optional ~~/ university-wide*~~
Subject code
Group of courses YES / ~~NO~~*

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		30		
Number of hours of total student workload (CNPS)	90		60		
Form of crediting	crediting with grade				
For group of courses mark (X) final course	X				
Number of ECTS points	3		2		
including number of ECTS points for practical classes (P)	2		2		
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	1,5		1,5		

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES
1. The student knows and he is able to use the classic concepts and theorems of mathematical analysis
2. Second He knows and is able to apply basic concepts and methods in the field of differential equations

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SUBJECT OBJECTIVES
C1 Understanding the basic concepts and mastering the basic techniques used in the methods of perturbation

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SUBJECT EDUCATIONAL EFFECTS
relating to knowledge:
PEU_W01 has in-depth knowledge of the methods of perturbation
PEU_W02 know the numerical methods used to find approximate solutions mathematical problems (for example, differential equations) pose in the field of applied domain

relating to skills:

PEU_U01 can construct mathematical models used in concrete advanced applications of
mathematics

relating to social competences:
PEU_K01 can benefit from the scientific literature in English, including reaching the source
materials and make them review

PROGRAMME CONTENT		
Lecture		**Number of hours**
Lec 1	Examples of problems leading to perturbation method	2
Lec 2	Regular perturbation method	2
Lec 3	Poincare-Lindstedt method	2
Lec 4	Asymptotes	2
Lec 5	Unreliability of the regular perturbation method	2
Lec 6	Singular perturbation method	2
Lec 7	The inner and outer approximations	2
Lec 8	Analysis of shoreline layer	2
Lec 9	Inner approximation and scaling	2
Lec 10	Combining internal and external approximation	2
Lec 11	Uniform approximation	2
Lec 12	Examples of uniform approximation	2
Lec 13	Phenomena associated with the film edge	2
Lec 14	Partial differential equations and perturbation methods	2
Lec 15	Algebraic equations and perturbation methods	2
	Total hours	30

Laboratory		Number of hours
Lab 1	Solving problems illustrating a lecture given theory using MATLAB	30
	Total hours	30

TEACHING TOOLS USED
N1. Lecture - traditional method
N2. Computer laboratory
N3. Individual consultation
N4. Student's own work - to prepare for the lab

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W1 PEU_W2	test
F2	PEU_U1 PEU-K1	verbal responses, short tests, tests, reports
C=0.5*F1+0.5*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] E. J. Hinch, Perturbation Methods.
[2] J. David Logan, Applied Mathematics.

SECONDARY LITERATURE:

[1] C.C.Lin, L.A.Segel, Mathematics Applied to Deterministic Problems in the Natural Sciencec, SIAM 1988

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

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