Zał. nr 4 do ZW 64/2012

**FACULTY OF PURE AND APPLIED MATHEMATICS**

**SUBJECT CARD**

**Name in Polish WYBRANE ASPEKTY METOD PERTURBACYJNYCH**

**Name in English** Selected Aspects of 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 MAP1995**

**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) | 60 | | 60 | | |
| Form of crediting | ~~Examination /~~ crediting with grade* | ~~Examination / crediting with grade*~~ | ~~Examination / crediting with grade*~~ | ~~Examination / crediting with grade*~~ | ~~Examination / crediting with grade*~~ |
| For group of courses mark (X) final course | 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 (BK) classes | 1.5 | | 1.5 | | |

*delete as applicable

**MathematicsPREREQUISITES 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**Mathematics**

**SUBJECT EDUCATIONAL EFFECTS**

relating to knowledge:

PEK_W01 has in-depth knowledge of the methods of perturbation

PEK_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:

PEK_U01 can construct mathematical models used in concrete advanced applications of mathematics

relating to social competences:

PEK_K01 can benefit from the scientific literature in English, including reaching the source materials and make them review

**PROGRAMME CONTENT**

| **Form of classes - 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 |

| **Form of classes - class** | | **Number of hours** |
|---|---|---|
| Cl 1 | | |
| Cl 2 | | |
| Cl 3 | | |
| Cl 4 | | |
| .. | | |
| | Total hours | |

| **Form of classes - laboratory** | | **Number of hours** |
|---|---|---|
| Lab 1 | Solving problems illustrating a lecture given theory using MATLAB | 30 |

| | | |
|---|---|---|
| | Total hours | 30 |

| Form of classes - project | | Number of hours |
|---|---|---|
| Proj 1 | | |
| Proj 2 | | |
| Proj 3 | | |
| Proj 4 | | |
| … | | |
| | Total hours | |

| Form of classes - seminar | | Number of hours |
|---|---|---|
| Sem 1 | | |
| Sem 2 | | |
| Sem 3 | | |
| … | | |
| | Total hours | |

**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 EDUCATIONAL EFFECTS ACHIEVEMENT**

| **Evaluation** (F – forming (during semester), P – concluding (at semester end) | Educational effect number | Way of evaluating educational effect achievement |
|---|---|---|
| F1 | PEK_W1<br>PEK_W2 | test |
| F2 | PEK_U1<br>PEK-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)**

**Prof. dr hab. Wojciech Okrasiński** (Wojciech.Okrasinski@pwr.wroc.pl)

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT

# Selected Aspects of Perturbation Methods

AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Mathematics**
AND SPECIALIZATION **Mathematics for Industry and Commerce**

| Subject educational effect | Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)** | Subject objectives*** | Programme content*** | Teaching tool number*** |
|---|---|---|---|---|
| **PEK_W01 (knowledge)** | K2MIC_W04 | C1 | Lec1-Lec15 | 1, 3 |
| **PEK_W02** | K2MIC_W10 | C1 | Lec1-Lec15 | 1, 3 |
| **PEK_U01 (skills)** | K2MIC_U15 | C1 | Lab1 | 2, 3, 4 |
| **PEK_K01 (competences)** | K2MIC_K06 | C1 | Lec1-Lec15, Lab1 | 1, 2, 3, 4 |

** - enter symbols for main-field-of-study/specialization educational effects
*** - from table above