**FACULTY OF PURE AND APPLIED MATHEMATICS**

**SUBJECT CARD**

**Name of subject in Polish Analiza Funcjonalna i jej zastosowania**
**Name of subject in English Applied Functional_analysis**
**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 | Examination | | | | |
| 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. Student knows and can apply basic concepts of mathematical analysis
2. Student knows and can apply basic concepts of linear algebra

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**SUBJECT OBJECTIVES**

C1 Study of the classical concepts of topology, elements of optimization and functional analysis and its application to solve simple inverse problems

**SUBJECT EDUCATIONAL EFFECTS**

relating to knowledge:

PEU_W01 knows the most important theorems and hypothesis of functional analysis, topology

PEU_W02 knows basic methods of optimisation

relating to skills:

PEU_U01 knows and can apply methods of functional analysis

relating to social competences:

PEU_K01 can, without assistance, search for necessary information in the literature, also in foreign languages

| PROGRAMME CONTENT | | |
|---|---|---|
| **Lecture** | | **Number of hours** |
| Lec1 | Introduction to functional analysis – real world problems modeled by operator equations | 4 |
| Lec 2 | Elements of topology and linear spaces | 2 |
| Lec 3 | Linear normed spaces | 2 |
| Lec 4 | Hilbert spaces | 2 |
| Lec 5 | Linear operators | 4 |
| Lec 6 | Elements of spectra theory | 4 |
| Lec 7 | Fundaments of optimisation | 4 |
| Lec 8 | Role of functional analysis in solving inverse problems | 4 |
| Lec 9 | Elements of functional analysis in numerical methods | 4 |
| | Total hours | **30** |

| **Laboratory** | | **Number of hours** |
|---|---|---|
| Lab1 | Solving of problems illustrating theory given in the lectures using mathematical packages for numerical computing | 30 |
| | Total hours | **30** |

| TEACHING TOOLS USED |
|---|
| N1. Lecture – traditional method<br>N2. Computer laboratory<br>N3. Consultations<br>N4. Student's self work – preparation for the laboratory |

**EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT**

| **Evaluation** (F – forming during semester), P – | Learning outcomes code | Way of evaluating learning outcomes achievement |
|---|---|---|

| | | |
|---|---|---|
| concluding (at semester end) | | |
| F1 | PEU_W01<br>PEU_W02<br>PEU_K01 | examination |
| F2 | PEU_U01<br>PEU-K01 | oral presentations, tests, projects, raports |
| P=0.5*F1+0.5*F2 | | |

**PRIMARY AND SECONDARY LITERATURE**

**PRIMARY LITERATURE:**


[1] E. Zeidler, Applied Functional Analysis, Springer-Verlag 1995

[2] Ch.W. Groetsch, Inverse Problems in the Mathematical Science, Vieweg-Verlag 1993


**PRIMARY LITERATURE:**


[1] L. Debnath, P. Mikusiński, Introduction to Hilbert Spaces with Applictions, Academic Press 2005


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


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