



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Elements of general topology

### Course

Field of study

Mathematics in technology

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

3/5

Profile of study

general academic

Course offered in

Polish

Requirements

elective

### Number of hours

Lecture

30

Laboratory classes

Other (e.g. online)

Tutorials

15

Projects/seminars

### Number of credit points

4

### Lecturers

Responsible for the course/lecturer:

Prof. dr hab. Ryszard Płuciennik

Responsible for the course/lecturer:

### Prerequisites

Basic knowledge in domain of calculus, mathematical logic and set theory on the level of studies of the first-cycle. Ability to use the predicate calculus and quantifiers, language of the set theory, notions of convergence of sequences.

### Course objective

In-depth knowledge of topology from scratch. Gaining the ability to apply the acquired knowledge to theoretical as well as practical issues in other fields of mathematics and physics.

### Course-related learning outcomes

Knowledge

Knowledge of the most important theorems of general topology and their proofs. Understanding how to use the topology to other fields of mathematics with particular emphasis on mathematical analysis.

Skills

Ability to use notions of topological spaces, open sets, operation of closure, metric spaces, category method, separation axioms, metrizability of topological spaces. Ability to use these concepts for proving



of various properties of topological spaces. Explanation of the meaning of geometric interpretation of these notions and using other tools of topology.

Social competences

Ability to precise formulation of mathematical problems and trying of solving them. Ability to search for information single-handedly in literature, also in English.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture

Valuation of knowledge and skills during written test.

Practical Lessons

Two large tests concerning an application of knowledge from the lectures in exercises (student can use his own notes)

Systematic control of theoretical knowledge in form of short quizzes.

Valuation of student answers during lessons.

Valuation of activity during lessons.

### Programme content

Metric spaces and examples of them. The notion of topology. Methods of Metody of Topological constructions. the quotient topology. Induced topologies. Separation axioms and relationships between them. Continuity of functions in topological spaces. Conditions equivalent to continuity. The notion of compact set and connected set. Properties of compact sets. Properties of real functions defined on compact sets. Complete metric spaces. Banach fixed point theorem and its application to numerical solving of differential and integral equations. Cantor theorem. Baire theorem and its applications. Baire category methods.

### Teaching methods

Lecture:

1. The lecture conducted in an interactive way with formulating questions for a group of students or for selected students.
2. The theory presented in relation to the current knowledge of students.
3. Student activity during classes is taken into account when the final grade is considered.

Tutorials:

1. Solving sample tasks on the board.



2. Detailed reviewing of task solutions and discussions with comments.

3. Initiating discussions on solutions.

### Bibliography

#### Basic

1. R. Engelking, Topologia ogólna, Wydawnictwo Naukowe PWN Warszawa 2012.
2. K. Jänich, Topologia, PWN Warszawa 1996.

#### Additional

1. K. Kuratowski, Wstęp do teorii mnogości i topologii, Wydawnictwo Naukowe PWN Warszawa 2004.

### Breakdown of average student's workload

|  | Hours | ECTS |
|--|-------|------|
| Total workload   | 100   | 4,0  |
| Classes requiring direct contact with the teacher  | 45    | 2,0  |
| Student's own work (literature studies, preparation for tutorials, preparation for tests and the final test for lectures) <sup>1</sup> | 55    | 2,0  |

<sup>1</sup> delete or add other activities as appropriate