



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Elements of topology [S1MNT1>ET]

Course

Field of study

Mathematics of Modern Technologies

Year/Semester

2/4

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

0

Other

0

Tutorials

15

Projects/seminars

0

Number of credit points

3,00

Coordinators

dr Tomasz Kiwerski

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Lecturers

Prerequisites

Basic knowledge of logic and set theory. It may be useful, but not mandatory, to know some definitions and facts about group theory and the field of complex numbers.

Course objective

The aim of the course is to familiarize the student with the basic ideas, concepts and constructions of general topology, including elements of algebraic topology.

Course-related learning outcomes

Knowledge:

- knows and understands selected branches of mathematics to an advanced level and has detailed knowledge of the applications of mathematical methods and tools in engineering and technical sciences [K_W01(P6S_WG)];
- knows and understands advanced terminology in the field of mathematics and selected issues in the field of engineering and technical sciences related to the field of study, also in a foreign language [K_W03(P6S_WG)].

Skills:

- he can use the knowledge of higher mathematics [K_U01(P6S_UW)].

Social competences:

- is ready to critically assess the level of his knowledge in relation to research in sciences and natural sciences as well as engineering and technical sciences [K_K01(P6S_KK)].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures& Tutorials: preparation of a final project and assessment of activity and commitment in class.

Programme content

Update: 01.06.2023r.

Lectures& Tutorials:

- metric spaces;
- topological spaces;
- continuous mappings;
- basic ways of introducing topology: induced topology and quotient topology;
- product spaces and Tychonoff's topology;
- compactness;
- one-point Alexandroff's compactification and Čecha-Stone's compactification;
- Urysohn's lemma;
- Tychonoff's theorem;
- Tietze-Urysohn-Brouwer's extension theorem;
- completion of the metric space;
- connectedness and path-connectedness;
- manifolds and surfaces: a classification theorem for surfaces;
- homotopy equivalence;
- fundamental group;
- fundamental group of spheres;

Course topics

none

Teaching methods

Lectures: theory presented in connection with the current knowledge of students; initiating discussions frequently; introduction of new concepts preceded by examples and motivations; recommending materials for self-study, also in the form of problems and tasks, in order to broaden and supplement knowledge;
Tutorials: solving sample problems and tasks on the board; detailed review of problem solutions, proofs of theorems and discussion of comments; initiating a discussion on the method of solving a given task or the method of proving a given theoretical relationship.

Bibliography

Basic:

- K. Jänich, Topologia, Wydawnictwo Naukowe PWN, 1996;
- Cz. Kosniowski, Wprowadzenie do topologii algebraicznej, Wydawnictwo Naukowe UAM, 1999;
- R. Duda, Wprowadzenie do topologii, Państwowe Wydawnictwo Naukowe, 1986;
- A. W. Archangielski, W. I. Ponomariow, Podstawy topologii ogólnej w zadaniach, Państwowe Wydawnictwo Naukowe, 1986;
- S. Jackowski, Topologia I: Pomocnik studenta, zintegrowane notatki do wykładu, 2013;
http://www.mimuw.edu.pl/~sjack/Topologia_I/topologia_I_full.pdf.

Additional:

- R. Engelking, Topologia ogólna, Wydawnictwo Naukowe PWN, 2012;
- L. A. Steen, J. A. Seebach, Jr., Counterexamples in topology, Dover Publications, Inc., 1995;
- V. V. Prasolov, Intuitive topology, University Press, 1995;

- J. R. Weeks, The shape of space, Cambridge University Press, 2002;
- N. Bourbaki, Elements of mathematics. General topology: Chapters 1-4, Springer-Verlag, 1995;
- M. J. Greenberg, Wykłady z topologii algebraicznej, Państwowe Wydawnictwo Naukowe, 1980;
- J. Dieudonné, A history of algebraic and differential topology, 1900-1960, Birkhäuser, 2009;
- R. Vakil, The rising sea: Foundations of algebraic geometry, podręcznik dostępny online, 2014;
<http://math.stanford.edu/~vakil/216blog/FOAGdec3014public.pdf>.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00