POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)
pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

COURSE DESCRIPTION CARD - SYLLABUS

Course name
Selected topics in mathematics

Course

Field of study	Year/Semester
Mathematics in Technology	1/1
Area of study (specialization)	Profile of study
Level of study	Course offered in
Second-cycle studies	polish
Form of study	Requirements
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30		
Tutorials	Projects/seminars	
30		

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

dr Leszek Wittenbeck

Responsible for the course/lecturer:

Prerequisites

1. The elementary knowledge from the calculus and the ordinary differential equations.
2. The efficient ability to derivate, analyse function of one variable, integrate, solve ordinary differential equations.
3. The awareness of the importane of skills and the ability to cooperate with the others.

Course objective

The understanding of the elementary aspects of the calculus of variation. The familiarising with examples of the variational problems and making intelligible about about the necessary and sufficient conditions for the extremum of a functional.

Course-related learning outcomes

Knowledge

1. The student understands the basic concepts and methods of proving important theorems, knows the analogy between the extremum of a functional and the extremum of a function [K_W01].

2. The student knows the advanced calculation techniques which improve the work of a matematician and undestand their constraints [K_W02, KW03].

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Skills

1. The student can use knowledge of the calculus and ordinary differential equations [K_U01].

2. The student can use various forms of mathematical reasoning in the field of the calculus od variation [K_U05].

3. The student can show the natural examples of the variational problems [K_U10]

Social competences

1. The student is aware of the need to deepen and expand his knowledge [K_K02].

2. The student is aware of the social role as a graduate of a technical university, is ready to pass on popular science content to the public and to identify and resolve basic problems related to the field of study [K_K05].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:

1. Evaluation of knowledge and shills on the written test.

<50% - ndst, >51-60% - dst, >61-70% - dst plus, >71-80% - db, >81-90% - db plus, >91% - bdb

Tutorials:

1. Two written test.

2. Engagement in discussion and cooperation in solving exercises.

<50% - ndst, >51-60% - dst, >61-70% - dst plus, >71-80% - db, >81-90% - db plus, >91% - bdb

Programme content

1. Examples of the variational problems defined by functional integral .

2. The necessary condition for the extremum of a functional - Euler-Langrange equation.

3. Analogy between the extremum of a functional and the extremum of a function.

4. Special cases of the Euler-Lagrange equation.

Teaching methods

Lecture:

1. Interactive lecture with formulation questions to a group of students or to specific students indicated.

2. Initiation of discussion during lecture.

3. Theory presented in connection with current knowledge students.

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Tutorials:

1. Solving example tasks on the board.

2. Detailed review of task solutions and discussions on comments.

3. Initiate discussion on solutions.

Bibliography

Basic

1. I. M. Gelfand i S. W. Fomin, Rachunek wariacyjny, Państwowe Wydawnictwo Naukowe, Warszawa, 1972.

2. J. Musielak, Wstęp do analizy funkcjonalnej, Państwowe Wydawnictwo Naukowe, Warszawa, 1989.

Additional

1. R. Weinstock, Calculus of Variations, McGraw-Hill Book Company Inc., 1952

Breakdown of average student's workload

	Hours	ECTS
Total workload	105	4,0
Classes requiring direct contact with the teacher	65	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	40	2,0

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[1] delete or add other activities as appropriate