STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Calculus		**1010341521010344916**

Field of study	Profile of study (general academic, practical)	Year /Semester
Mathematics	**general academic**	**1 / 2**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
First-cycle studies	**full-time**

No. of hours				No. of credits
Lecture: **4**	Classes: **4**	Laboratory: **-**	Project/seminars: **-**	**9**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
basic	**from field**

Education areas and fields of science and art	ECTS distribution (number and %)
the sciences	**100 9%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Being conversant with calculus from the first semester.
2	**Skills**	Skills of efficient evaluating limits of sequences, derivatives of functions. Using method of calculus in concrete practical situations.
3	**Social competencies**	Understanding of limitation of own knowledge and motivation for further education.

Assumptions and objectives of the course:

Deep knowledge in advanced differential and integral calculus to a degree which is necessary to study mathematics. Skills for application of acquired knowledge to theoretical as well as practical problems in other subjects as chemistry, physics, engineering, economy.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Use the advanced differential and integral calculus, among others theory of functions of several variables ant theory of ordinary differential equations. - [K_W07]

2. present fundamental theorems of advanced calculus and their proofs, Moreover, he will be familiar with examples illustrating concrete notions of calculus and find counterexamples that are necessary to exclude some situations. - [K_W05 K_W04]

3. understand partially the structure of mathematical analysis as a research theory. He is able to use mathematical formalism to construction and analysis of simple mathematical models describing phenomenon in others research branches. - [K_W07]

Skills:

1. present in a clear manner in words and writing mathematical deduction, formulate theorems and definitions and use quantifications and sentential calculus in proving theorems. - [K_U01 K_U02 K_U04]

2. use (in different context) notions of partial derivatives and to apply selected elements of differential equations. - [K_U10]

Social competencies:

1. He is able to formulate precisely questions which lead to go deeply his own understanding of given problem or finding of missing elements of deduction. - [K_K02]

Assessment methods of study outcomes

Lecture

Valuation of knowledge and skills during oral and written exam.

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 quizes. Valuation of student answers during lessons. Valuation of activity during lessons.

Course description

Partial derivatives and their application to search of extrema of functions of several variables. Theorem on inverse function and on involved functions. Integrals depended on parameters. Beta and Gamma functions and their application in others branches of mathematics. Multiply integral, line integral and surface integral and their applications. Fundamental formulas for integration. Fourier series. An application of Fourier series to describing of oscillatory phenomenon. Elements of ordinary differential equations. Systems of linear differential equations. A survey of classical partial differential equations in mathematical physics. Basic numerical algorithms for problems of differential and integral calculus.

Basic bibliography:

1. G. M. Fichtenholz, Rachunek różniczkowy i całkowy, PWN, Warszawa 2007.

2. F. Leja, Rachunek różniczkowy i całkowy, PWN, Warszawa 1971

3. H. J. Musielakowie, Analiza matematyczna, Wydawnictwo Naukowe UAM 2000.

Additional bibliography:

1. W. Rudin, Analiza rzeczywista i zespolona, PWN, Warszawa 1998.

2. A. Sołtysiak , Analiza matematyczna? cz. I , cz. II. WN UAM, Poznań 2004.

3. W. Swokowski, Calculus with analytic geometry, Prindle, Weber & Schmidt Publishers 1998.

Result of average student's workload

Activity	Time (working hours)

Student's workload

Source of workload	hours	ECTS
Total workload	240	9
Contact hours	60	5
Practical activities	60	4