STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Mathematical analysis II		**1010341721010342225**
Field of study: **Mathematics in Technology**	Profile of study (general academic, practical): **(brak)**	Year /Semester: **1 / 2**
Elective path/specialty: **-**	Subject offered in: **Polish**	Course (compulsory, elective): **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time): **full-time**	
No. of hours: Lecture: **60** Classes: **60** Laboratory: **-** Project/seminars: **-**		No. of credits: **8**
Status of the course in the study program (Basic, major, other): **(brak)**	(university-wide, from another field): **(brak)**	
Education areas and fields of science and art: **the sciences**, **Mathematical sciences**		ECTS distribution (number and %): **8 100%**, **8 100%**

Responsible for subject / lecturer:

dr Marian Liskowski
email: marian.liskowski@put.poznan.pl
tel. 61 665 28 42
Faculty of Electrical Engineering
ul. Piotrowo 3A 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Being familiar with the knowledge of 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. The student is able to prove an important theorems of mathematical analysis and to support it by examples. - [K_W02]
2. The student is able to use the advanced differential and integral calculus, among others theory of functions of several variables. - [K_W03]
3. The student knows the fundamentals of the single and multivariable calculus, he understands the way of using it in various areas of mathematics. - [K_W04]
4. The student has knowledge of algebra, analytic geometry, differential and integral calculus, theory of probability, complex numbers indispensable to describing and analysis of the action of elements and electrical systems (analog and digital) and basic phenomena appearing in them. - [K_W08]

Skills:

1. The student can interpret and explain functional relationships given in the form of formulas, tables, graphs, schemes and use them in practical problems. - [K_U05]
2. The student can apply theorems and methods of the single and multivariable calculus in optimization problems. He is able to find the global and local extrema and analyse of functions in order to construct the graph of them. He can explain the correctness of his reasoning. - [K_U06]
3. The student uses the definition of the integral of one real variable and real multivariable functions. He can explain the analytical and geometric sense of these notion. He is able to integrate one variable and multivariable functions. He can interchange the order of integration and can evaluate areas of smooth surfaces and areas as well as volumes of solids by using suitable integrals. - [K_U07]

Social competencies:
1. The student knows the limitations of its own knowledge and understands the need of further education. - [K_K01]
2. The student can formulate questions precisely in order to deepen his own understanding of a given subject or to find the missing elements of reasoning. - [K_K02]
3. The student is able to find information in literature on one?s own including literature written in foreign languages. - [K_K05]

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.
Systematic control of theoretical knowledge in form of short quizes.
Valuation of student answers during lessons.
Valuation of activity during lessons.

Course description
Update 2017/2018:
Indefinite integral. Methods of integration functions. Define integral and its geometric and mechanical applications. Improper integrals. Criteria of convergence of improper integrals. Application of improper integrals. 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. Minimum property of the partial sums of Fourier series. Bessel?s and Parseval?s inequality. Criteria for uniform convergence of Fourier series. An application of Fourier series to describing of oscillatory phenomenon.
Applied methods of education.
Lecture:
1. Interactive lecture with formulation questions to a group of students or to specific students indicated.
2. Theory presented in connection with current knowledge students.
3. The activity of the students is taken into account during the classes when giving a final grade.
Practical lessons:
1. Solving example tasks on the board.
2. Detailed review of task solutions and discussions on comments.
3. Initiate discussion on solutions.

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)**
1. Taking part in lectures (15x4 h.)	60
2. Taking part in practical lessons (15x4 h.)	60
3. Preparing for practical lessons	40
4. Prepating for tests	20
5. Preparing for the exam and taking part in it (18 + 2 h.)	20

Student's workload

Source of workload	**hours**	**ECTS**
Total workload	200	8

Contact hours	122	8
Practical activities	0	0