STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Complex analysis		**1010342611010347252**

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

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

No. of hours				No. of credits
Lecture: **30**	Classes: **30**	Laboratory: **-**	Project/seminars: **-**	**5**

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

Education areas and fields of science and art	ECTS distribution (number and %)

Responsible for subject / lecturer:

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Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge in domain of calculus and topology on the level of studies of the first degree.
2	**Skills**	Using of basic notions of topology. Mastery of evaluation of derivatives, multiply integral, line integral and surface integral.
3	**Social competencies**	Understanding of limitation of own knowledge and motivation for further education.

Assumptions and objectives of the course:

Deep knowledge in complex analysis 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 and mathematics.

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

Knowledge:

1. master complex analysis with definitions, theorems and proofs. - [K_W05]
2. understand in subject of complex analysis open problems and problems at the stage of study. - [K_W06]
3. understand connections of complex analysis with other subjects of classical analysis. - [K_W07]

Skills:

1. handle tools of complex analysis such as differential and integral calculus, elements of complex analysis and Fourier analysis. - [K_U01]
2. present content connected with complex analysis and verify correctness of deduction in mathematical proofs. - [K_U02, K_U03, K_U04]
3. distinguish the difference between complex analysis and real analysis. - [K_U08]

Social competencies:

1. He is able to formulate a problem precisely and try to solve it. - [K_K02]
2. He understand the need for adducing intuition to his own understanding as well as to popularization of abstract mathematics. - [K_K05]
3. He is able search out some information In literature (also English), by oneself. - [K_K06]

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

Complex numbers and their properties. An application of complex numbers in the planimetry to solving problems and proving theorems. Elementary complex functions. Cauchy-Riemann equations on a derivatives of a complex function. Differentiation of elementary functions. Integral of complex function along a curve lying in complex plane. Cauchy integral formula. Liouville Theorem. Morera? Theorem. Maximum Principle for harmonic functions and Schwarz Lemma. Sequences and series of analytic functions. Power series and Taylor?s Theorem. Laurent series. Singularities and their classification. Calculus of residues. Residue Theorem and its application to evaluation of real definite integrals. Conformal mappings. Fourier transformation and its applications.

Basic bibliography:

1. T. W. Gamelin, Complex Analysis, Springer Verlag 2001.
2. J. Krzyż, J. Ławrynowicz, Elementy analizy zespolonej, Warszawa WN-T 1981.
3. J. Krzyż, Zbior zadań z funkcji analitycznych, Warszawa PWN 2005.
4. J.E. Marsden, Basic Complex Analysis, W.H. Freeman and Company San Francisco 1998.

Additional bibliography:

1. J. Chądzyński, Wstęp do analizy zespolonej, Warszawa PWN 1999.
2. J. Długosz, Funkcje zespolone - teoria, przykłady, zadania, Oficyna Wydawnicza GiS
3. W. Rudin, Analiza rzeczywista i zespolona, Warszawa PWN 1998.

Result of average student's workload

Activity	Time (working hours)

Student's workload

Source of workload	hours	ECTS
Total workload	210	8
Contact hours	60	6
Practical activities	40	2