

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Mathematical modelling in technical sciences		Code 1010342531010347414
Field of study Mathematics	Profile of study (general academic, practical) general academic	Year /Semester 2 / 3
Elective path/specialty -	Subject offered in: polish	Course (compulsory, elective) obligatory
Cycle of study: Second-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 2 Classes: 2 Laboratory: - Project/seminars: -		No. of credits 6
Status of the course in the study program (Basic, major, other) major		(university-wide, from another field) from field
Education areas and fields of science and art the sciences Mathematical sciences		ECTS distribution (number and %) 6 100% 6 100%
Responsible for subject / lecturer: Dr hab. inż. Paweł Kolwicz, prof. nadzw. email: pawel.kolwicz@put.poznan.pl tel. 61 665 2239 Wydział Elektryczny ul. Piotrowo 3A 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge with range of differential and integral calculus, functional analysis, complex analysis and theory of differential equation (from 1 degree studies)
2	Skills	The skills of finding derivatives, integrals and analyzing the function of real variable, the skills of solving differential equations.
3	Social competencies	He has consciousness of need of broadening his competences, readiness to undertaking of co-operation.
Assumptions and objectives of the course: The recognizing of notion of Laplace transform, inverse Laplace transform, the getting known of algorithm of solving differential equation by Laplace transform. Process modelling by its description by integral equations and finding minimum of functional.		
Study outcomes and reference to the educational results for a field of study		
Knowledge: 1. explain notions and understand properties of Laplace transform and inverse Laplace transform - [X2A_W01++, X2A_W03++,X2A_W02+++,X2A_W06+] 2. explain the notion of functional, minimum of functional, know analogies between minimum of functional and minimum of function, understand and describe examples of variational problems, explain question of variational problem with fixed and movable ends, explain principle of smallest acting - [X2A_W01+++, X2A_W03+++,X2A_W02+++,X2A_W06+]		
Skills: 1. calculate Laplace transform and inverse Laplace transform, apply properties of integration and differentiation of originals and transforms, apply Laplace transforms to solving differential equations - [X2A_U01+, X2A_U02+, X2A_U05+, X2A_U03+++] 2. apply Euler-Lagrange equation to solve question of necessary condition for integral functional, use principle of smallest acting - [X2A_U03+++, X2A_U01++, X2A_U02++, X2A_U06++]		
Social competencies: 1. can think and behave in good mathematical manner in the area of calculus of variation and Laplace transform - [X2A_K01++,X2A_U07++,X2A_K02+++,X2A_K05+]		
Assessment methods of study outcomes		

<p>The lecture: -written exam concerning mainly the theoretic part of the subject. Classes : evaluation of written tests and the direct activity during the classes (solving problems and preparing of reports) -continuous evaluation during each meeting - taking into account the activity in discussion and in cooperation concerning practical exercises. Getting extra points related with activity, in particular: -presenting reports concerning applications of theory in different branches or putting the theory in history of mathematics -notes concerning the improvement of basic materials; -active participation in consultations.</p>		
Course description		
Calculus of variation. Laplace transforms.		
Basic bibliography:		
1. I. M. Gelfand i S.W. Fomin, Rachunek wariacyjny, Państwowe Wydawnictwo Naukowe, Warszawa 1975 2. D. Bobrowski, Z. Ratajczak, Przekształcenia Laplacea i jego zastosowania, Wydawnictwo Politechniki Poznańskiej, 1990. 3. W. Krysicki i L. Włodarski, Analiza matematyczna, część II, Państwowe Wydawnictwo Naukowe, Warszawa 2011.		
Additional bibliography:		
1. R. Leitner, Zarys matematyki wyższej dla studentów, część II, Wydawnictwo Naukowo-Techniczne, Warszawa 2009. 2. R. Weinstock, Calculus of variations, McGraw-Hill Book Company Inc., New York Toronto London, 1952. 3. E. Kącki i L. Siewierski, Wybrane działy matematyki wyższej z ćwiczeniami, Państwowe Wydawnictwo Naukowe, Warszawa 1974.		
Result of average student's workload		
Activity	Time (working hours)	
1. Active participation in meetings (lectures and classes)	60	
2. Active participation in consultations with posing questions	20	
3. Solving exercises designed for independent work	35	
4. Independent studying theoretical questions (notions, algorithms, theorems, proofs)	35	
Student's workload		
Source of workload	hours	ECTS
Total workload	150	6
Contact hours	80	3
Practical activities	70	3