

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Difference equations		Code 1010342611010347258
Field of study Mathematics	Profile of study (general academic, practical) general academic	Year /Semester 1 / 1
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: 15 Classes: 15 Laboratory: - Project/seminars: -		No. of credits 2
Status of the course in the study program (Basic, major, other) other		(university-wide, from another field) university-wide
Education areas and fields of science and art		ECTS distribution (number and %)
Responsible for subject / lecturer:		
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Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge from linear algebra and mathematical analysis
2	Skills	Ability to solve elementary problems from linear algebra and mathematical analysis by using acquired knowledge, ability to prepare and give presentation
3	Social competencies	Understanding necessity of broadening ones competences, readiness to working and cooperating in team and taking responsibility for jointly realized task
Assumptions and objectives of the course:		
To pass on to students knowledge from difference equations and its applications in mathematical modeling. To develop students ability of solving simple difference equations and analyzing phenomena and building their mathematical models. To form students ability of team working.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. one knows most basic definition and theorems and their proofs from general linear difference equations theory - [K_W01, K_W04] 2. one can explain goal and meaning of simple discrete models - [K_W02] 3. one knows connections between issues from difference equations theory and other theoretical and applied mathematics sections - [K_W07]		
Skills:		
1. to solve simple difference equations - [K_U06] 2. to construct discrete mathematical models, used also in other sections of mathematics - [K_U13] 3. to carry out proofs, also using, if need it, tools from other sections of mathematics - [K_U14] 4. to define ones interests and developing them, to understand lectures directed to young mathematicians from difference equations - [K_U13, K_U10]		
Social competencies:		
1. the ability to cooperate in team, to fulfill obligations entrusted by devanning work in team, understanding necessity of systematic work - [K_K03] 2. independency in looking for information in literature, also in different language - [K_K06] 3. acting in coherence with basic ethical principals - [K_K04]		

Assessment methods of study outcomes		
Evaluation of written test, the direct activity during the classes and preparation of presentation.		
Course description		
<p>1. Preliminaries. Difference calculus. 2. Linear first order difference equations. 3. Dynamics of first order difference equations. Equilibrium points. Criteria of asymptotic stability of equilibrium points. 4. General theory of linear difference equations. 5. Linear homogeneous equations with constant coefficients. 6. Linear nonhomogeneous equations: method of undermined coefficients. 7. Nonlinear equations transformable to linear equations. 8. Applications of difference equations in biology, and economics.</p> <p>Applied methods of education: - lecture with multimedia presentation accompanied with examples presented on the blackboard and with questions to the group of students - classes: solving problems on the board, initiating discussion about the solutions, preparing presentations in groups.</p> <p>UPDATE: 2017</p>		
Basic bibliography:		
1. D. Bobrowski, Systemy dynamiczne z czasem dyskretnym, zagadnienia deterministyczne, Wydawnictwo PP, 1994.		
Additional bibliography:		
1. S. Elaydi, An Introduction to Difference Equations, Undergraduate Texts in Mathematics, Springer, New York, NY, USA, 2005. 2. H. Levy, F. Lessman, Równania różnicowe skończone, PWN 1966.		
Result of average student's workload		
Activity	Time (working hours)	
1. Active participation in meetings (lectures)	15	
2. Active participation in meetings (classes)	15	
3. Preparation of presentation	12	
4. Preparation to classes	12	
5. Meetings with the lecturer	6	
6. Preparation to test	10	
Student's workload		
Source of workload	hours	ECTS
Total workload	70	2
Contact hours	36	2
Practical activities	34	0