STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Difference equations**		Code **1010342611010347258**
Field of study **Mathematics**	Profile of study (general academic, practical) **(brak)**	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				No. of credits
Lecture: **15**	Classes: **15**	Laboratory: **-**	Project/seminars: **-**	**2**

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 %**)**
	
	2 100%
	    2 100%

Responsible for subject / lecturer:

dr hab. Małgorzata Migda
email: malgorzata.migda@put.poznan.pl
tel. +48 61 665 2359
Wydział Elektryczny
ul. Piotrowo 3A 60-965 Poznań

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 appliacations in mathematical modeling. To develop students ability of solving simple difference equations and analyzing phenomena and building theirs 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 theirs 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
1. Preliminaries. Difference calculus. 2. Linear first order difference equations. 3. Dynamics of first order difference equations. Equlibrium 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. Asymptotic behavior of difference equations.

Basic bibliography:

1. D. Bobrowski, Wprowadzenie do systemów dynamicznych z czasem dyskretnym, UAM Poznań1998.

Additional bibliography:

1. S. Elaydi, An Introduction to Difference Equations, Undergraduate Texts in Mathematics, Springer, New York, NY, USA, 2005.

Result of average student's workload	
Activity	**Time (working hours)**
Student's workload	

Source of workload	**hours**	**ECTS**
Total workload	70	2
Contact hours	40	2
Practical activities	30	0