STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Mathematical methods in economic sciences	**1010342641010347416**

Field of study	Profile of study (general academic, practical)	Year /Semester
Mathematics	**(brak)**	**2 / 4**
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: **15** Classes: **-** Laboratory: **15** Project/seminars: **-**	**3**

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 %)
study effects leading to the acquisition of engineering qualifications **the sciences**	**1 33%** **2 67%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Mathematical analysis (sequences, differential and integral calculus). Matrices. Fundamentals of functional analysis. Annuities and insurances.
2	**Skills**	Freely use of derivatives, integrals and linear algebra methods. Basic calculations of credits, annuities and insurances.
3	**Social competencies**	Understanding of limitation of their own knowledge and willingness to learn.

Assumptions and objectives of the course:

Demonstration of usefulness of linear algebra methods to production planning. Choice of best projects when a budget is limited. Presentation of advanced concepts from calculus and functional analysis and their application to optimization problems.

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

Knowledge:

1. Student can identify and describe basic problems of economy planning - [K_W01+K_W03+++K_W08 ++]
2. Student can construct mathematical model for a given optimization problem. - [K_W01 +K_W12 ++]

Skills:

1. Student can state economical problems in the language of mathematics. - [K_U11 +K_U28 ++K_U37+++]
2. Student can find mathematical solution and adapt it to the original problem. - [K_U28]
3. Student uses advanced functions of a spreadsheet. - [K_U28]

Social competencies:

1. Student understands that confidence is necessary in economy. - [K_K01+K_K03 ++K_K04+++]
2. Student understands negative concequences of financialization. - [-]

Assessment methods of study outcomes

Lecture: assesment of knowledge and skills by a written classwork and activity duering lectures.
Laboratory: assesment of knowledge and skills by solving problems.

Course description

Input-output Leontief model. Capital budgeting Portfolio optimization. Functions of several variables and Lagrange multipliers. Convex stes and convex functions. Karush-Kuhn-Tucker theorem. Nonlinear optimization.

Basic bibliography:

1. D. G. Luenberger, Teoria optymalizacji, PWN 1974
2. D. G. Luenberger, Teoria inwestycji finansowych, PWN 2003
3. J. Palczewski, Optymalizacja II, http://mst.mimuw.edu.pl/wyklady/op2/wyklad.pdf, Uniwersytet Warszawski, 2014
4. B. Sozański, I. Dziedzic, Algebra i analiza w zagadnieniach ekonomicznych, Wyd. Bila, Rzeszów 2007

Additional bibliography:

1. S. I. Gass, Programowanie liniowe, PWN 1980

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures and laboratories.	30
2. Home work: preparing to lectures, work with text. Consulting the lecturer.	28
3. Preparation to the tests.	8

Student's workload

Source of workload	hours	ECTS
Total workload	66	3
Contact hours	34	2
Practical activities	36	1