STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Iterative Methods of Numerical Linear Algebra	**1010342621010348917**

Field of study	Profile of study (general academic, practical)	Year /Semester
Mathematics	**(brak)**	**1 / 2**
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: **-**	**2**

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 %)
technical sciences	**2 100%**

Responsible for subject / lecturer:

dr Andrzej Maćkiewicz
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Wydział Elektryczny
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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic course of linear algebra. Numerical linear algebra. Numerical methods.
2	**Skills**	Computer programming in high-level languages.
3	**Social competencies**	Ability to work in a group. Mandatory and punctuality in performing the tasks entrusted.

Assumptions and objectives of the course:

The aim of this course is to familiarize students with the most important iterative methods of solving large problems of linear algebra. Such problems arise in numerical methods of solving partial differential equations, in signal theory, machine learning, numerical optimization, multidimensional statistics, etc.

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

Knowledge:

1. He/She knows the issues of the chosen field with other branches of applied mathematics. - [K_W07]
2. He/She knows advanced numerical techniques that support math work and understands their limitations. - [K_W08]

Skills:

1. Can use algebraic methods (with special emphasis on linear algebra) in solving problems from different branches of applied mathematics . - [K_U10]
2. He/She uses the language and methods of functional analysis in mathematical analysis and its applications, in particular using the properties of classical Banach and Hilbert spaces. - [K_U09]

Social competencies:

1. He can work in teams; understands the need for systematic work on any project that has a long-term nature. - [K_K03]

Assessment methods of study outcomes

Homeworks 30%
Computer programs 30%
Final 40%

Course description

Classical iterative methods for solving large systems of algebraic linear equations.
Iterative methods of solving symmetric eigenvalue problems.
Nonnsymmetric eigenvalue problem. Francis' QR algorithm .
Conjugate gradients.
GMRS, MINRES and other Krylov subspace methods for large systems of linear equations.
Lanczos method large eigenvalue problem.

Basic bibliography:

1. Kiełbasińsk A., Schwetlick H. Numeryczna algebra liniowa: wprowadzenie do obliczeń zautomatyzowanych, Warszawa : Wydaw. Nauk. -Techn., 1992.
2. G.H, i Van Loan Ch. Matrix Computation 4ed., J. Hopkins UP., 2013
3. S. Borm, Mehl Ch., Numerical Methods for Eigenvalue Problems, de Gruyter, 2012.
4. Watkins D., Fundamentals of Matrix Computation 3rd ed., J. Wiley, 2010.

Additional bibliography:

1. A. Greenbaum, Iterative Methods for Solving Linear Systems, SIAM 2001.
2. Allaire G. Kaber S. , Numerical Linear Algebra, Springer 2002.

Result of average student's workload

Activity	Time (working hours)

Student's workload

Source of workload	hours	ECTS
Total workload	62	2
Contact hours	32	1
Practical activities	30	1