COURSE DESCRIPTION CARD - SYLLABUS

Course name
Numerical linear algebra [S1MNT1>NAL]

Course

Field of study
Mathematics of Modern Technologies

Year/Semester
2/4

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

A student starting this course should have the knowledge and skills of the courses Linear algebra with analytical geometry I and II, Mathematical software, Introduction to programming, Programming, Numerical methods and Information technology I and II from previous semesters. They should know the limitations of their own knowledge and understand the need for further education.

Course objective

Gaining knowledge and skills of effective application of numerical linear algebra algorithms.

Course-related learning outcomes

Knowledge:
• knows and understands selected areas of mathematics to an advanced degree and has detailed knowledge of the applications of mathematical methods and tools in engineering and technical sciences [K_W01(P6S_WG)];
• knows and understands to an advanced degree terminology in the field of mathematics and selected issues in the field of engineering and technical sciences related to the field of study, also in a foreign language [K_W03(P6S_WG)];

• knows and understands issues in computer science, including numerical methods; knows at least one software package, programming language [K_W07(P6S_WG)].

Skills:
• can use knowledge of higher mathematics [K_U01(P6S_UW)];
• is able to construct an algorithm to solve a simple engineering task and to implement and test it in a selected programming environment [K_U04(P6S_UW)];
• can use mathematical tools to support and develop modern technologies used in engineering and technical sciences [K_U06(P6S_UW)];
• is able to operate devices, tools, etc. in accordance with the general requirements and technical documentation; knows how to apply the rules of occupational health and safety [K_U11(P6S_UW)];
• can use a foreign language at a sufficient level to communicate, as well as to read and understand mathematical texts, technical documentation and similar documents [K_U15(P6S_UK)];
• can independently plan and implement self-education in order to improve and update their competences [K_U17(P6S_UU)].

Social competences:
• is ready to deepen and expand knowledge to solve new technical problems [K_K02(P6S_KK)];
• is ready to think and act in a creative and entrepreneurial way, taking into account safety, ergonomics and economic aspects of work; is aware of the need to initiate activities for the benefit of the public interest and responsibility for the effects of the work of the team and its individual participants [K_K03(P6S_KO)].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures& Laboratory classes: the knowledge acquired during the lecture is verified by a 45-minute colloquium consisting of variously scored questions (test and open); passing threshold: 50% of points.

Programme content

Update: 01.06.2023r.
Lectures& Laboratory classes:
• matrix Algebra;
• solving Systems of Linear Equations;
• orthogonal Factorizations and Least-Squares Problems;
• singular-Value Decomposition and Pseudoinverses;
• eigenvalues and eigenvectors.

Course topics

none

Teaching methods

Lectures:
• lecture with presentation supplemented with examples given on the board;
• alectureconductedinaninteractivewaywithformulatingquestionstoagroupofstudentsortospecific students indicated;
• the activity of students during classes is taken into account when issuing the final grade;
• initiating discussion during the lecture;
• theory presented in close connection with practice;
• theory presented in connection with the current knowledge of students;
• presenting a new topic preceded by a reminder of related content, known to students from other subjects.
Laboratory classes:
• laboratories supplemented with multimedia presentations;
• detailed review of reports by the laboratory operator and discussion of comments;
• using tools that enable students to complete tasks at home;
• demonstrations;
• work in teams;

• computational experiments.

Bibliography

Basic:
• Kincaid D., Cheney W., Analiza numeryczna, WNT, Warszawa 2006
• Maćkiewicz A., Algorytmy algebry liniowej. Metody bezpośrednie, Wydawnictwo Politechniki Poznańskiej, Poznań 2002.

Additional:
• Kiełbasińsk A., Schwetlick H., Numeryczna algebra liniowa: wprowadzenie do obliczeń zautomatyzowanych, WNT, Warszawa, 1992.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	1,50