SYLLABUS

Name: ***Numerical Methods (TIAu>SM1-NumM-19)***
Name in Polish:
Name in English: ***Numerical Methods***

Information on course:

Course offered by department: Faculty of Automatic Control, Electronics and Computer Science
Course for department: Silesian University of Technology

Default type of course examination report:

ZAL

Language:

English

Course homepage:

https://platforma2.polsl.pl/rau3/course/view.php?id=489

Short description:

The aim of the course is for the student to acquire knowledge and skills in the theoretical basis and examples of applications in engineering and scientific practice of advanced numerical methods. The student will learn the assumptions of implementation of numerical methods in advanced applications. The course is also aimed at shaping an appropriate attitude of the student characterized by activity and independence in conducting activities in the field of searching and applying modern numerical methods, as well as criticism, independence of thinking, decision-making, planning and organizational abilities organizational skills.

Form of classes: contact (in-person).

Description:

ECTS: 2
Total workload: 60 hours (32 contact hours, 28 students' own work hours)

Forms of contact hours:
- Lecture 15h
- Laboratory 15h
- other (e.g. test and report revision, discussion): 2 hours.

Students' own work: preparation for classes, writing reports, preparation for tests.

Lecture
Operations and calculations on matrices, special types of matrices, spline interpolation, reducing errors of interpolation, clustering methods: classical and fuzzy, linear discriminant analysis and its use for classification, data modeling – statistics and features of data sets, data mining - drawing knowledge from data, family of alpha-stable distribution.

Laboratory topics
1) Matrix operations, determinant and tridiagonal matrices
2) Spline interpolation
3) Clustering methods,
4) Linear discriminant analysis,
5) Data modeling
6) Householder's transformation and matrix deflation.

Bibliography:

1. W. H. Press, S. A. Teukolsky, W. T. Vetterling, B. P. Flannery, Numerical Recipes in C: the Art. of Scientific Computing, Cambrideg Univ. Press, 2000
2. A. Ralston, P. Rabinowitz – The first course in numerical analysis, Dover Publications 2001
3. Duda, R. O.; Hart, P. E.; Stork, D. H., Pattern Classification, Wiley Interscience, 2000
4. George W. Collins, Fundamental Numerical Methods and Data Analysis II , Harvard Educational Books, 2003
5. E. Straszecka & oth. – Laboratorium metod numerycznych, skrypt Politechniki Śląskiej nr 2197, (in Polish)

Learning outcomes:

Course-specific learning outcomes: at the completion of the course, student:

knows various numerical methods applied for classification, matrix operation and data analysis (test) K2A_W01
knows various software environment used to support engineering engineering calculations (test) K2A_W04

is able to prepare a detailed documentation of the results of an experiment, project or research task (test) K2A_U03
can properly formulate and solve tasks related to modeling and design of various systems (laboratory report) K2A_U03
can take into account non-technical aspects (laboratory report) K2A_U15
can extend the capabilities of the selected engineering computing environment by writing their own subroutines and optimize the subroutines time-wise (laboratory report) K2A_U21

Assessment methods and assessment criteria:

Course consists of two components: lecture and laboratory. According to SUT regulations, lecture attendance is optional (however highly recommended), whereas laboratory exercises are obligatory.

Documented laboratory work
There are 6 obligatory laboratory exercises, carried out by one or two people sections. Students have to complete all exercises and prepare reports (one per section), containing processed information (results, plots or diagrams) and conclusions. If for some reason the labs are done remotely, all students must do the remote labs, but a report must be prepared one per section.Each report should be completed within two weeks period. Reports can be prepared in the electronic form. Teachers may verify obtained results.

Laboratory exercises (reports) are graded on a scale from 2.0 to 5.0, in increments of 0.5. The final laboratory grade (L) is calculated as

the arithmetic mean of the grades obtained for individual laboratory tasks.

Final course grade (FCG) is determined based on the laboratory grade
rounded to the university grading scale.

Making up missed laboratory work is possible on the dates specified in the course schedule
The syllabus is valid from academic year 2025/2026 and its content cannot be changed during the semester.

Course credits in various terms:

Information and Communications Technology, full-time master degree studies 3 sem. (TIAu-SM3)			
Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	2	2020/2021-L	