SYLLABUS

Name: ***Intelligent computing methods (EiTAu>SM1-23-ICM-grB)***
Name in Polish:
Name in English: ***Intelligent computing 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://platforma.polsl.pl/rau3/course/view.php?id=80238

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 intelligent computing methods. The student will learn the assumptions of implementation of intelligent computing 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 (30 contact hours, 30 students' own work hours)

Forms of contact hours:
- Lecture 14h
- Laboratory 14h
- 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, normalization and standardization, 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, outliers removing.

Laboratory topics
1) Principles of using data in matrix, tables. Normalization, standardization.
2) Spline interpolation. Data supplementation.
3) Clustering methods,
4) Linear discriminant analysis - Fisher linear analysis
5) Data modeling
6) Householder's transformation and matrix deflation.
7) Outliers treatment.

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. Fundamental Numerical Methods and Data Analysis, George W. Collins, II ,
Harvard Educational Books, 2003
5. E. Straszecka & oth. – Laboratorium metod numerycznych, skrypt Politechniki Śląskiej nr 2197, (in Polish)
6. A.Artasanchez, P.Joshi, Artificial I ntelligence with Python, 2 nd Edition, Packt
7. J.Brownlee, Basics of Linear Algebra for Machine Learning Discover the Mathematical Language of Data in Python, 2018
8. G. Strang, Introduction to linear algebra, Wellesley Cambrdige Press 2009

Learning outcomes:

At the completion of the course, student:

knows how to implement numerical algorithms for artificial intelligence methods (test) K2A-W08

is able to plan and carry out experiments and computer simulations, interpret the obtained results (laboratory report) K2A-U02
can use intelligent methods to solve engineering problems (laboratory report) K2A-U07

is ready for:
critically evaluate his/her knowledge and recognize the importance of knowledge in solving cognitive and practical problems K2A_K03

Assessment methods and assessment criteria:

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

If Final Lecture Grade (FLeG) is determined then
Written test with open questions or multiple choice questions
Passing criteria: minimum 50% of correct answers

There are 7 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 calculated as follows:
FCG = L or FCG = (FLeG+L)/2
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:

<without a specific program>			
Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	2	2023/2024-L	