SYLLABUS

Name: ***Theory of Computer Science (InfAAu>SI2ToCS19)***
Name in Polish:
Name in English: ***Theory of Computer Science***

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/rau2/course/view.php?id=877

Short description:

The aim of the lecture is to provide students with information on the basic notions of computer science. The aim of the classes is for students to acquire skills in the range of creating the algorithms for Turing machine, and introduction with the basic structures of the data.
The basic issues presented in the course are:
- the concept of the Turing machine
- formal grammars and BNF notation
- basic information about M/M/1 networks
- an overview of data access methods
Classes in the subject are conducted in semesters 1 and 2 of the teaching cycle. In the second semester, there are only lectures (15 hours) and group classes (15 hours).

Description:

ECTS credits: 2
Total hours: 60h (contact hours: 30h / self-study: 30h)
Forms of contact hours:
Lecture: 15h
Classes: 15h
Student self-study: preparation for classes and tests 30h

Lectures (in the second semester):
1. Turing machine, description, Church-Turing thesis, a table of states, examples of programming algorithms for Turing machine.
2. Formal languages. Definition of grammar, examples of grammars, BNF notation, Łukasiewicz's algebra, the concept of translation, and an example of translation algorithm of arithmetic expressions from infix notation to reverse Polish notation.
3. Computer networks and their statistical models. The concept of a computer network, media, and their characteristics, network topologies, a layered model. Statistical computer model as a service station (M/M/1) and its analysis.
Computer network model as M/M/1 network. Open and closed networks. Methods for calculating load distribution in the network.
4.Data access methods. Lists, binary trees, network structures, and their analysis in terms of search time. B-tree structures and the task with optimal structure. Hashing functions and database structures based on them, collision
problem.
5. The latest trends in information technology. Parallel computers. Notation of the algorithm in a canonical form, theorem on the implementation of the algorithm, serial and parallel implementation, definition of acceleration, model of data-flow computer, and examples of algorithm implementation in such systems. Information technology and genetics, quantum information systems.

Classes (in the second semester):
The subject of classes is closely related to lectures and is an extension and illustration of selected problems presented during the lectures. Some of the tasks are solved by the students themselves, and when solving them or after solving, there is often a discussion that allows considering alternative ways of solving the problem. The topics of the classes include the following issues:
- Turing machine
- Formal grammars
- Data access methods
- Queueing system M/M1 and networks

Bibliography:

John L. Hennessy, David A. Patterson: Computer Architecture, A Quantitative Approach. Morgan Kaufmann, 2012
William Stallings: Computer Organization and Architecture, Designing for Performance. Pearson, 2016
Noam Nisan, Shimon Schocken: The Elements of Computing Systems. Building a Modern Computer from First Principles. MIT Press, 2005
Moshe Zukerman: Introduction to Queueing Theory and Stochastic Teletraffic Models. 2000-2020

Learning outcomes:

Knowledge: a graduate knows and understands
- the Turing machine model (K1A_W11) - test
- the concept of formal grammar (K1A_W11) - test
- selected data structures (including: hashing functions and B-trees) (K1A_W09) - discussion
- the idea of operation of systems controlled by the flow of arguments and quantum computers (K1A_W13) - discussion

Skills:
The student is able to:
- write a simple program by selecting appropriate algorithms and data structures (K1A_U21) - test,
- calculate parameters networks of mass service stations M/M/1 (K1A_U12) - test

Assessment methods and assessment criteria:

Classes:
- in the second semester - a positive grade from the 3 announced tests (formal grammars, Turing machines, networks of M/M/1 queue) which are rated on a scale of 2 to 5 and the mean of the grades must be at least 3.0

A retake test is organized for students who do not obtain credit in this way.

Class grade for average:
≥ 4,6 very good (5,0)
≥ 4,2 and < 4,6 good+ (4,5)
≥ 3,8 and < 4,2 good (4,0)
≥ 3,4 and < 3.8 satisfactory+ (3,5)
≥ 3,0 and < 3.4 satisfactory (3,0)

In the second semester, the final grade of the course is equal to the positive grade for completing group classes.

The syllabus is valid from academic year 2024/25 and its content cannot be changed during the semester.

Element of course groups in various terms:

Course group description	First term	Last term
Informatics S1 semester 2 common subjects (InfAAu>SI2-19-WSP)	2020/2021-L	
Informatics sem. 2 (InfAAu>SI_2)	2024/2025-Z	

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	2	2020/2021-Z	