SYLLABUS

Name: ***Nanoscience and Nanosystems of Informatics (InfAAu>SM3MaMoI19)***
Name in Polish:
Name in English: ***Nanoscience and Nanosystems of Informatics***

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=1103

Short description:

The purpose of the lecture is to introduce to nanoscience issues including nanotechnology, information systems in living organisms and quantum information systems. The purpose of the lecture is also to extend to the students the concept of informatics as a science of information processing not only in electronic systems, but also in nanotechnological, biological and quantum systems, at the molecular and atomic scales.

Description:

Number of ECTS credits: 1
Total number of hours: 30 (15 contact hours / 15 student's own work hours)
Lecture: 15h
Student's own work: Preparation for classes

of which number of ECTS credits obtained through classes conducted with the direct participation of academic teachers or other lecturers and students: 0,5.

Lectures description and topics covered:
- Nanoscience, nanotechnology, nanosystems - genesis, definitions. Concepts of the atom, models of atoms, atom and quantum phenomenas, molecules.
- Biological nanosystems and its analysis as an example of informatics nanosystems, emergence.
- Organisation and processing of information at the molecular level in DNA, molecular processes in biological systems, genetic code, central dogma of molecular biology, replication process of genetic information, protein production process based on DAN information, transcription, translation. Importance of bioinformatics.
- Biological computers, the main idea of DNA computer.
- Informatics nanosystems, operating systems, self-replication, self-organization.
- Imaging of nanostructures. Electron and scanning probe microscopy, atomic force microscopy, diffraction, spectroscopy.
- Nanoengineering and nanostructures, scaling problems, nanoscales phenomenas, limitations of technical systems, basic ideas of production of nanostructures, molecular nanotechnology, atom manipulation.
- Quantum systems of informatics, fundamentals of quantum mechanics, fundamentals of quantum computer design, operation, and computing, quantum algorithms.

Bibliography:

1 Nanoscale Science and Technology. R. Kelsall (Editor), I. W. Hamley, M. Geoghegan. Willey, 2005.
2. Bioinformatics and Molecular Evolution. T. Attwood, P. Higgs. Blackwell Publishing, 2004.
3. Quantum Computing Explained. David McMahon. Wiley, 2007.

Learning outcomes:

Student knows and understands the principles of biological and quantum computing nanosystems: K2A_W08
Student knows and understands the most significant new developments and directions of biological and quantum computing systems: K2A_W09
Student is able to integrate knowledge of bioinformatics and quantum computing with necessary information from the field of biology, chemistry and physics: K2A_U10

Assessment methods and assessment criteria:

Written assessment in the form of test with open questions or multiple-choice questions.

The syllabus is valid from the academic year 2024/2025 and its content is not subject to change during the semester.

Course credits in various terms:

Informatics, full-time master degree studies 3 sem. (InfAAu-SM3)

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	1	2020/2021-Z	