SYLLABUS

Name: ***Distributed Industrial Computer Systems (InfAAu>SI5DICS19)***
Name in Polish:
Name in English: ***Distributed Industrial Computer Systems***

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=271

Short description:

The primary objective of the DICS course is to acquire knowledge in the basic theoretical design and application of industrial, distributed computer systems, including the appropriate selection of devices, networks, protocols, and programming fundamentals. It enables students to professionally design systems, understand and resolve potential problems. A secondary goal is to enhance the soft skills required for engineering work.
Form of classes: contact

Description:

ECTS: 2
Total number of hours: 60 (30 contact hours / 30 student's own work)
Lecture: 30h
Student's own work: preparation for classes, preparation for test
Form of classes: contact

This course covers computer systems operating in OT, IT, and across the two domains, providing an introduction to industrial computing. System design is discussed based on component characteristics and timing analysis of communication systems. The course covers topics related to Industry 4.0/5.0, such as digitization, the use of IT applications and systems, cybersecurity, local system integration, cyberphysical systems, models of IT systems used in factories, real-time communication, industrial controllers and their programming, and more.
Lectures place significant emphasis on understanding the DICS design cycle, followed by the implementation of an industrial IT system for visualization, reporting, monitoring, and control of industrial facilities. A key goal is to highlight the heterogeneity, complexity, multithreading, and interdisciplinary nature of this process. Initially, this requires students to possess extensive general IT knowledge (computer programming, creating and managing distributed databases, operating system software, configuring and programming computer networks, embedded systems, microinformatics, and microcontrollers). During lectures, this knowledge is further developed and expanded with new technologies and techniques from the OT and IT fields. After completing the lectures, students will be able to master the basic theoretical tasks of designing, building, deploying, operating, and maintaining distributed IT systems used in industry at the OT/IT and integration levels.

Bibliography:

Subject-oriented monographs (available from the Silesian University of Technology Library https://opac.bg.polsl.pl/):
Wybrane zagadnienia projektowania systemów informatyki przemysłowej / Piotr Gaj. - Gliwice : Silesian University of Technology Press, 2016.
Analiza przepływu informacji w komputerowych sieciach przemysłowych / Andrzej Kwiecień ; Politechnika Śląska. Instytut Informatyki. - Wyd. 2 rozsz. - Gliwice : Wydawnictwo Politechniki Śląskiej : Wydawnictwo Pracowni Komputerowej Jacka Skalmierskiego, cop. 2013.

Scientific articles on the subject (available in the e-resources of the Silesian University of Technology https://www.bg.polsl.pl/ebazy/listaebaz_s3.html)

Thematic literature available online.
IEEE Xplore: https://ieeexplore.ieee.org/search/searchresult.jsp?newsearch=true&queryText=Distributed%20Industrial%20Systems%20Networked%20Informatics
Springerlink: https://link.springer.com/search?query=Distributed+Industrial+Systems+Networked+Informatics
Sciencedirect: https://www.sciencedirect.com/

Additional literature.
1. Wilamowski B. M. and Irwin J. D., “Technologies” in The Industrial Electronics Handbook: Industrial Communication Systems, 2nd ed. CRC Press, 2011
2. Piotr Gaj, “Wybrane zagadnienia projektowania systemów informatyki przemysłowych”, Studia Informatica vol. 37, number 4B (128), Gliwice 2016
3. Popp M., Weber K.: „The rapid way to Profinet”; PNO 2004
4. EPSG Draft Standard 301, Ethernet POWERLINK Communication Profile Specification Version 1.1.0. EPSG 2008
5. IEC, “Industrial communication networks - fieldbus specifications,” in International Standard IEC 61158-x, 3rd ed. IEC, August 2010.
6. Kwiecień Andrzej: „Analiza przepływu informacji w komputerowych sieciach przemysłowych”; Studia Informatica z. 22, Gliwice 2002 lub WPKJS Gliwice
7. Kwiecień Roman „Komputerowe systemy automatyki przemysłowej” Helion 2012
8. Maczyński Andrzej, „Sterowniki programowalne PLC. Budowa systemu i podstawy programowania”
9. Solnik Włodzimierz, Zajda Zbigniew "Sieci przemysłowe Profibus DP i MPI w automatyce", Wyd. Politechniki Wrocławskiej
10. Mystkowski Arkadiusz, „Sieci przemysłowe PROFIBUS DP i PROFINET IO”

Learning outcomes:

Course-specific learning outcomes: at the completion of the course, student:
knows the mechanisms of deterministic communication, their essential features, and basic implementation examples: K1A_W08
knows the various types of computer hardware used in industrial computer systems, their roles, and the general concept of their design.

The student understands the typical architectures of industrial computer systems, industrial networks, the essential functions of RT operating systems, and the principles of designing and implementing simple industrial IT systems: K1A_W10

Assessment methods and assessment criteria:

According to SUT regulation, lecture attendance is optional (however highly recommended).
Lecture assessment is carried out in form of test. The test may be in writing or as an online form. Students need to obtain a grade at least 3.0 of maximum 5.0.
The test may be re-taken once during the examination session.
The 5th semester final grade is based on the test. Verification of learning outcomes based on the test. All grades can be adjusted by student activity assessed individually by observation and oral responses.
The syllabus is valid from academic year 2025/26 and its content cannot be changed during the semester.

Practical placement:

not applicable

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	

Informatics, full-time first degree engineering studies 7 sem. (InfAAu-SI7)

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