COURSE DESCRIPTION CARD - SYLLABUS

Course name
Real-time systems

Course

Field of study
Automatic Control and Robotics

Year/Semester
2/4

Area of study (specialization)

Profile of study

Level of study
First-cycle studies

Course offered in
english

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
	30	
Tutorials	Projects/seminars	

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:

Prerequisites

1 Knowledge

Student has knowledge in mathematical fields of logic and discrete mathematics necessary to description and analysis of sequential and discrete systems, description of control algorithms and stability analysis of dynamical systems. [K1_W01 (P6S_WG)]

Has also systematized knowledge of methods and technics of procedural and object programming. [K1_W10 (P6S_WG)]

2 Skills

Is able to obtain information from bibliography, databases and other sources; has the ability to self-educate in order to improve and update professional competences. [K_U01 (P6S_UU)]

Is able to document and present the results of an engineering task. Is able to communicate using specialized terminology. Can take part in a debate - present, assess and discuss various opinions and positions. [K_U03 (P6S_UK)]

3 Social competencies

The graduate is ready to critically evaluate his or her knowledge. The graduate understands the need for and knows the possibilities of continuous learning - improving professional, personal and social competences, the graduate is able to inspire and organize the learning process of others. [K_K01 (P6S_KK)]

The graduate is aware of the need for a professional approach to technical issues, meticulous familiarization with the documentation and environmental conditions in which the equipment and its components can operate. The graduate is ready to observe the rules of professional ethics and to demand it from others, to respect the diversity of opinions and cultures. [K_K04 (P6S_KR)]

Course objective

Acquaintance of the basic knowledge about real-time applications and supporting them real-time operating systems

Course-related learning outcomes

Knowledge

1. The graduate knows and understands in advanced level the methods of signal processing in the time and frequency domain. The graduate has an orderly knowledge of signal and information theory. [K1_W05 (P6S_WG)]

2. The graduate has a basic knowledge of metrology, knows and understands to an advanced level the methods of measuring electrical and non-electrical quantities; knows and understands to an advanced level the computational methods and IT tools necessary to analyse the results of the experiment. [K1_W11 (P6S_WG)]

3. The graduate knows and understands to an advanced level the theory and methods of computers, computer systems networks and operating systems architecture, including real-time operating systems. [K_W13 (P6S_WG)]

4. The graduate knows and understands to an advanced level the theory and methods of architecture and programming of microprocessor systems, knows and understands selected languages of high and low level microprocessor programming, knows and understands the principle of operation of basic peripheral modules and communication interfaces used in microprocessor systems. [K_W15 (P6S_WG)]

5. The graduate is familiar with the current state and the latest development trends in the field of automation and robotics. The graduate knows and understands the fundamental dilemmas of modern civilization connected with the development of automation and robotics. [K_W21 (P6S_WG P6S_WK)]

Skills

1. The graduate can construct an algorithm for a simple engineering task and implement, test and run it in a selected development environment on a PC for selected operating systems. [K1_U10 (P6S_UW)]

2. The graduate is able to select the type and parameters of the actuator system, measurement system, control unit and peripheral and communication modules for the selected application and to integrate them in the form of the final measurement and control system. [(K1_U17 (P6S_UW)]

3. Can plan, prepare and simulate the operation of simple automation and robotics systems. [K_K06 (P6S_KO)]

Social competences

. The graduate is aware of the importance and understands the non-technical aspects and effects of engineering activities, including its impact on the environment and the associated responsibility for decisions taken. The graduate is ready to take care of the achievements and traditions of the profession. [K_K02 (P6S_KR)]

2. The graduate is ready to fulfil social obligations and co-organise activities for the benefit of the social environment. The graduate is aware of the social role of a graduate of a technical university and understands the need to formulate and convey to the public (in particular through the mass media) information and opinions on the achievements of automation and robotics and other aspects of engineering activities; the graduate makes efforts to communicate such information and opinions in a generally understood manner. [K_K06 (P6S_KO)]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Laboratories: In-depth checking of reports on the exercises carried out. Discussing comments and mistakes. Verification of written software.

Programme content

Laboratory: Creation of process scheduler simulators for real-time scheduling algorithms: RMS, EDF, LLF, MLLF, MUF, MMUF. Research of the scheduling algorithms properties. Building real-time applications: Interprocess communications. Message-passing. Process Synchronization. Principles of constructing client-server applications. Basic system management functions.

Teaching methods

Laboratories:

verification of assumed learning outcomes is carried out by:

i. assessment of student's preparation for individual laboratory exercises (a given series of laboratory exercises is preceded by a test, i.e. the so-called entrance ticket),

ii. continuous assessment, for students group (oral answers), rewarding the increase in the ability to use known principles and methods,

iii. getting extra points for activity during classes, especially for:

i. discusson on additional aspects of the issue,

ii. effectiveness of applying the acquired knowledge for solving a given problem,

iii. comments related to participation

iv. indicating students' perceptive difficulties enabling ongoing improvement of the didactic process

Bibliography

Basic

1. Alan Burns, Andy Wellings: Analysable Real-Time Systems: Programmed in ADA. Createspace Independent Pub. 2016.

2. Gupta, A., Chandra, A.K. Luksch, P.: Real-Time and Distributed Real-Time Systems: Theory and Applications. CRC Press, 2016.

3. Chetto, M. (Editor): Real-time Systems Scheduling 1. Fundamentals. J. Wiley & Sons, 2014.

4. Silberschatz, A., Galvin, P.B., Gagne, G.: Operating System Concepts Essentials, 2nd Edition. J. Wiley & Sons, 2010

2. Ben-Ari, M.: Principles of Concurrent and Distributed Programming 2nd Edition, Addison Wesley, 2005..

Additional

1. Cottet, F., Delacroix, J., Mammeri, Z., Kaiser, C.: Scheduling in real-time systems J.Wiley &Sons, 2002.

2. Luca Aceto, Anna Ingolfsdottir, Kim G. Larsen, Jiri Srba. Reactive Systems: Modeling, Specification, and Verification. Cambridge Press, 2007.

3. Buttazzo, G. "Hard Real-time Computing Systems: Predictable Scheduling Algorithms and Applications", Second Edition, Springer, 2005.

4. Jane W. S. Liu: Real-time systems. Pearson, 2000.

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	25	1

[1] delete or add other activities as appropriate