



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Monitoring and Control in Environmental Engineering [N2Inf1-AMiWdIP>MIS]

### Course

Field of study

Computing

Year/Semester

2/3

Area of study (specialization)

Mobile and Embedded Applications for the Internet of Things

Profile of study

general academic

Level of study

second-cycle

Course offered in

Polish

Form of study

part-time

Requirements

elective

### Number of hours

Lecture

16

Laboratory classes

16

Other

0

Tutorials

0

Projects/seminars

0

### Number of credit points

3,00

### Coordinators

prof. dr hab. inż. Andrzej Urbaniak  
andrzej.urbaniak@put.poznan.pl

### Lecturers

### Prerequisites

A student starting the course should have basic knowledge of automation, embedded systems and intelligent control systems. He/she should also have the ability of obtain information from the indicated sources and be willing to cooperate within the team.

### Course objective

The aim of the course is to present the information about the design and exploitation of monitoring process systems (software and hardware structures" characteristics). The course shows the solutions of embedded and mobile systems and analyses an application of monitoring and control systems for choosen objects and processes in environmental engineering.

### Course-related learning outcomes

Knowledge:

A student:

1. has an orderly, theoretical knowledge of computer system architectures, network technology, operating systems especially real time operating systems and SCADA systems - [K2st\_W2, K2st\_W6]

2. has basic knowledge about architecture and programming of microprocessor systems, communication interfaces and peripheral modules of computer control systems, especially in environmental engineering [K2st\_W4]
3. is familiar with PLC and its applications for industrial control systems [K2st\_W3]

#### Skills:

##### A student:

1. is able to find the information from different sources in Polish and other languages and to utilize the new computing methods [K2st\_U1, K2st\_U6, K2st\_U10]
2. is able to conduct simulation research for chosen processes [K2st\_U3, K2st\_U16]
3. is able to design a general conception of monitoring and control systems [K2st\_U11]
4. is able to suggest a structure of control system using PLC and prepare an algorithm for simple process of environmental engineering [K2st\_U4, K2st\_U5]

#### Social competences:

##### A student:

1. understands that computer science, knowledge and skills quickly become obsolete [K2st\_K1]
2. understands the importance of non-technics aspects of engineering activity, its impact on the environment and one's own decision responsibility [K2st\_K2]
3. has a professional approach towards technical problems, represents professional ethics and respects various opinions and different culture [K2st\_K4]

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:

Lecture: written test of knowledge

- theoretical quiz: about 10 questions with different value of points

Evaluation: scale of points - proposition of a grade; possibility of test inspection; possibility of an oral exam (only with minimum 33% of points)

Final points result:

to 50% - insufficient (F)

51% - 60% - sufficient (E)

61% - 70% - satisfactory plus (D)

71% - 80% - good (C)

81% - 90% - good plus (B)

over 91% - very good (A)

Laboratory: activity during exercises" realization, evaluation of preparation for solving the problems, written protocols from exercises.

### Programme content

Programme content - lecture

Utilizing computer systems for modelling and control. Computer Control Systems: classification, PLCs, microcontrollers, embedded systems. Monitoring of centralized and distributed processes (examples of different solutions). Hardware and software of monitoring systems. SCADA systems. Control systems of water purification and wastewater treatment processes. The conception and solution of Intelligent Building Systems.

- laboratory

Utilization of MATLAB/Simulink for modeling and simulation

PLC programming for chosen physical laboratory models

### Course topics

none

### Teaching methods

1. Lecture - multimedia presentation showing basic knowledge and new Polish and foreign examples in use.
2. Laboratory - the simulation exercises using MATLAB/Simulink and practical exercises by using control

algorithms for physical model examples (pump station, reservoirs, ventilation and air conditioning elements)

## Bibliography

### Basic

1. Urbaniak A., Komputerowe wspomaganie eksploatacji obiektów i procesów w inżynierii środowiska, Wyd. PAN, Warszawa 2016
2. Sroczan E.M., Nowoczesne wyposażenie techniczne domu jednorodzinnego, Pow. Wyd. Rolnicze i Leśne, Warszawa 2019
3. Poradnik eksploatatora oczyszczalni ścieków, Dymaczewski Z., Sozański M. (red.), Wydawnictwo PZiTS, Poznań, 2011
4. Olsson G., Piani G., Computer systems for automation and control, Prentice Hall, 1992
5. Łukaszewski T., Urbaniak A., Informatyka w ochronie środowiska, Wydawnictwo Politechniki Poznańskiej, Poznań, 2001

### Additional

1. Olszanowski A., Sozański M., Urbaniak A., Voelkel A., Remediacja i bioremediacja zanieczyszczonych wód i gruntów oraz wykorzystanie modelowania i technik informatycznych w inżynierii środowiska, Wydawnictwo Politechniki Poznańskiej, Poznań, 2001
2. Byłka H. i in., Wodociągi i kanalizacja w Polsce: tradycja i współczesność, Wydawca: Polska Fundacja Zasobów Wodnych, Poznań-Bydgoszcz, 2002
3. Koczyk H., Antoniewicz B., Sroczan E., Nowoczesne wyposażenie techniczne domu jednorodzinnego, Państw. Wyd. Rolnicze i Leśne, Poznań 1998

## Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	32	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	43	1,50