

## SYLLABUS

**Name:** Control of biotechnical systems (BioAIS-BF>SMs2CBp4O)

**Name in Polish:**

**Name in English:** Control of biotechnical systems

### Information on course:

**Course offered by department:** Faculty of Energy and Environmental Engineering

**Course for department:** Silesian University of Technology

**Term:** Winter semester 2022/2023

**Cordinator of course edition:** Dr hab. inż. Witold Nocoń

### Default type of course examination report:

ZAL

### Language:

English

### Short description:

The objective of this course is to present topics concerning design and implementation of control systems for biotechnological plants, selection of measurement devices and actuators and integration of control systems. The objective of laboratory exercises is to teach students the practical aspects of control algorithms implementation, controller tuning and programming of PLCs (Programmable Logic Controllers)

### Description:

#### Lectures

- The control system: measurement, control algorithm, actuators(examples)
- Measurements in biotechnology (description of the commonly used measurements in biotechnology, for example level, flow, temperature, ion selective measurements etc.)
- Actuators (pumps, valves, mixers etc..)
- Industrial controllers (processor units, I-O modules, A-D converters etc.)
- Controllers programming foundations (in a selected language)
- PID controller (algorithm, implementation)
- Selected control systems (level, flow, temperature dissolved oxygen, pH etc.,)
- Supervisory Control and Data Acquisition Systems (SCADA).
- Selected advanced control systems topics (redundancy, identification, advanced control algorithms etc..)

#### Laboratory

- Measurements in control systems
- Valves and other actuators.
- ON/OFF control for a selected process.
- Programming of controllers (part 1)
- Programming of controllers (part 2)
- PID controller implementation
- PID controller – tuning and application in a control loop.
- Supervisory and Data Acquisition (SCADA)systems
- Integration of measurement devices, controllers and actuators.
- A case study: Control system of a biotechnological plant

### Bibliography:

1. Z. Bubnicki "Teoria i algorytmy sterowania", PWN, Warszawa, 2005.
2. J. Kuźnik, Regulatory i układy regulacji. Wydawnictwo Politechniki Śląskiej, Gliwice, 2006.
3. Kasprzyk J.: Programowanie sterowników przemysłowych. WNT, Warszawa, 2006, 2007 (II wyd.).
4. R.Jakuszewski, "Podstawy Programowania Systemów SCADA–Proficy HMI/SCADA iFIX 5.0 PL", Wydawnictwo Pracowni Komputerowej Jacka Skalmierskiego, Gliwice 2010
5. Stanisław Flaga. Programowanie sterowników PLC w języku drabinkowym. Helion, Gliwice, 2010.
6. Legierski T., Kasprzyk J., Wyrwał J., Hajda J.: Programowanie Sterowników PLC . Wyd. Prac. Komp. J. Skalmierskiego, Gliwice, 2008 (II wyd.).

### Learning outcomes:

Knowledge: knows and understands:

1. The control system: measurement, control algorithm, actuators(examples), Measurements in biotechnology (description of the commonly used measurements in biotechnology, for example level, flow, temperature, ion selective measurements etc.), Actuators (pumps, valves, mixers etc..), Industrial controllers (processor units, I-O modules, A-D converters etc.), Controllers programming foundations (in a selected language), PID controller (algorithm, implementation), Selected control systems (level, flow, temperature dissolved oxygen, pH etc.,), Supervisory Control and Data Acquisition Systems (SCADA, Selected advanced control systems topics (redundancy, identification, advanced control algorithms etc..)) (K2A W01)

### Assessment methods and assessment criteria:

Written test and grading of written reports.

### Information on course edition:

### Default type of course examination report:

ZAL

### Bibliography:

missing bibliography in English

### Details of classes and study groups

lecture (30 hours)

### Study groups details

Group number 1

#### Class instructors:

Dr hab. inż. Witold Nocoń

Dr hab. inż. Piotr Skupin

Dr hab. inż. Piotr Łaszczyk

laboratory classes (30 hours)

### Study groups details

Group number 1

#### Class instructors:

Dr hab. inż. Witold Nocoń

Dr hab. inż. Piotr Skupin

Dr hab. inż. Piotr Łaszczyk

### Element of course groups in various terms:

| Course group description                                     | First term  | Last term |
|--------------------------------------------------------------|-------------|-----------|
| <i>missing group description in English</i> (BioAIS-BF>2(1)) | 2020/2021-Z |           |

### Course credits in various terms:

#### Biotechnology, full-time master degree studies 3 sem. (BioAIS-SM3)

| Type of credits                        | Number | First term  | Last term |
|----------------------------------------|--------|-------------|-----------|
| European Credit Transfer System (ECTS) | 4      | 2020/2021-Z |           |