



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Regulation and control [S2EJ1>RiS]

### Course

Field of study

Nuclear Power Engineering

Year/Semester

1/2

Area of study (specialization)

–

Profile of study

general academic

Level of study

second-cycle

Course offered in

Polish

Form of study

full-time

Requirements

elective

### Number of hours

Lecture

15

Laboratory classes

0

Other (e.g. online)

0

Tutorials

15

Projects/seminars

0

### Number of credit points

2,00

### Coordinators

dr inż. Andrzej Kwapisz

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### Lecturers

### Prerequisites

Has knowledge of mathematics and selected branches of physics (mechanics, thermodynamics, electrodynamics) with particular emphasis on nuclear physics. Has knowledge of the operation of basic regulation and control systems. Is able to describe selected physical phenomena using mathematical tools. Is able to build models of control systems. Can show initiative in acquiring new knowledge.

### Course objective

Acquiring knowledge about basic control and automatic regulation systems, learning the basics of operation of process control systems in nuclear energy. Getting to know the methods of synthesis of control and automatic regulation systems.

### Course-related learning outcomes

Knowledge:

1. The student has knowledge of the application of control and regulation systems in energy systems, including nuclear energy.

Skills:

1. The student is able to build control and regulation systems used in nuclear energy and examine their properties.
2. The student is able to obtain information from various sources, also in a foreign language, regarding nuclear energy, draw conclusions and present his or her own opinions.

Social competences:

1. Understands the impact of control and regulation systems on the operational reliability and safety of equipment used in nuclear energy.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture

Final colloquium in written form at the end of the semester, the colloquium includes test questions or problem tasks related to the topics of classes conducted within the subject, graded on a point scale from 0 to 100%, additionally rewarded for active participation in classes.

Tutorials

Verification of individual preparation for classes, covering material from a single lesson exercise or block of exercises, assessment of individual reports on exercises prepared by the student, colloquium at the end of the semester, colloquium includes test questions or problem tasks, all grades on a point scale from 0 to 100%, final grade based on the weighted average of all component grades. Additionally, bonuses for activity in classes and completed homework assignments.

### Programme content

Control and regulation systems in nuclear energy, application of control algorithms.

### Course topics

Lecture

Principles of operation of control and regulation systems used in nuclear energy. Regulation and control systems for elements of nuclear installations - structure, types, selection methods. Sources of measurement signals for control systems. Algorithms for generating control signals for elements of nuclear installations.

Tutorials

Methods of building control and regulation systems for nuclear installations. Creating algorithms for digital and analog control and regulation systems for applications related to nuclear energy. Processing of measurement and control signals. Analysis of phenomena occurring in control and regulation systems using specialized software.

### Teaching methods

Lecture

Multimedia and interactive presentation presenting important issues related to the subject, didactic discussion based on the subject literature, informative lecture, problem-oriented lecture, case analysis, work on source materials.

Tutorials

Carrying out exercises, using publicly available information to support the teaching process, encouraging students to independently search for optimal solutions and solve problems.

### Bibliography

Basic:

1. Józef Korbicz, Borys I. Mokin, Metody matematyczne w zagadnieniach kontroli i sterowania w energetyce, Zielona Góra : Wydawnictwo Wyższej Szkoły Inżynierskiej, Kijów Technika, 1990
2. Międzynarodowy słownik terminologiczny elektryki - Elektroenergetyczna automatyka zabezpieczeniowa PN-IEC 60050-448, Warszawa : Polski Komitet Normalizacyjny, 2001.
3. Jacek Nowicki, Część elektryczna elektrowni jądrowej, Warszawa : Stowarzyszenie Elektryków Polskich, 2017
4. Eugeniusz Rosołowski, Automatyczne sterowanie i regulacja : procesy ciągłe i dyskretne, Warszawa : Akademicka Oficyna Wydawnicza EXIT, 2020

5. Sterowanie procesami ciągłymi : wykorzystanie LabVIEW, Warszawa : Wydawnictwo Naukowe PWN, 2022
6. Andrzej Strupczewski, Awarie reaktorowe a bezpieczeństwo energetyki jądrowej, Warszawa : Wydawnictwa Naukowo-Techniczne, 1990
7. Bohdan Synal, Wilhelm Rojewski, Witold Dzierżanowski, Elektroenergetyczna automatyka zabezpieczeniowa : podstawy, Wrocław : Oficyna Wydawnicza Politechniki Wrocławskiej, 2003
8. Praca zbiorowa pod red. Wilibalda Winklera, oprac. Adrian Halinka [et al.], Elektroenergetyczna automatyka zabezpieczeniowa w przykładach i zadaniach, Gliwice : Wydawnictwo Politechniki Śląskiej, 2006

Additional:

1. Colin Tucker, Jak zostać operatorem reaktora jądrowego : przewodnik dla początkujących, Bielsko-Biała : Wydawnictwo Dragon, 2022
2. Witold Krieser, Sterowanie programowalne : od mikrokontrolera do sterownika PLC, Gliwice : Helion, 2022

### Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00