

Course catalogue for incoming Erasmus+ students

Control engineering and robotics

2025/2026

| Course title | Semester | ECTS | Lecture | Lab | Project |
|--------------------------------------|----------|------|---------|-----|---------|
| System Analysis and Modeling | winter | 6 | 15 | 30 | 30 |
| Artificial intelligence | winter | 6 | 15 | 30 | 30 |
| Database systems + Computer networks | winter | 6 | 15 | 30 | 30 |
| 3D programs | winter | 6 | 15 | 30 | 30 |
| Fundamentals of automatic control | winter | 6 | 15 | 30 | 30 |
| Fundamentals of robotics | winter | 6 | 15 | 30 | 30 |
| Industrial controllers | summer | 6 | 15 | 30 | 30 |
| SCADA systems | summer | 6 | 15 | 30 | 30 |
| HMI panel design | summer | 6 | 15 | 30 | 30 |
| Sensors | summer | 6 | 15 | 30 | 30 |
| Control Theory | summer | 6 | 15 | 30 | 30 |
| Transitional Project I | summer | 6 | 0 | 0 | 75 |
| Transitional Project II | summer | 6 | 0 | 0 | 75 |

Winter semester

STATE ACADEMY OF APPLIED SCIENCES IN GŁOGÓW

INSTITUTE OF ENGINEERING AND TECHNICAL SCIENCES

SYLLABUS / COURSE DESCRIPTION



BASIC INFORMATION ABOUT THE SUBJECT

| | | | | |
|---------------------------------------|---|---|------------------|-----------|
| Name of the subject (module) | System Analysis and Modeling | | Course code | 20 |
| Name of the unit teaching the subject | | Institute of Engineering and Technology Sciences | | |
| Level of education | First-cycle studies | Profile | Practical | |
| Field of study | Control engineering and robotics | Specialization | | |
| Education module | Basic | Language of instruction | English | |
| Semester | II | Form of assessment | Exam | |

HOURLY DIMENSION OF DIDACTIC CLASSES

FULL-TIME STUDIES

| | | |
|---------|---------|------------|
| Lecture | Project | Laboratory |
| 15 | 30 | 30 |

TOTAL HOURLY DIMENSION OF CLASSES

| | |
|----------------------------|------------|
| Student's independent work | 75 |
| Total | 150 |
| ECTS | 6 |

PREREQUISITES

Knowledge of the basics of differential and integral calculus of functions of one real variable.

COURSE OBJECTIVE

To learn the basic concepts of differential and integral calculus of functions of several variables. Introduction to the theory of ordinary differential equations. Application of acquired knowledge to the creation and analysis of mathematical models used to solve problems in engineering practice.

LEARNING OUTCOMES FOR THE COURSE

| CODE | DESCRIPTION | LEARNING OUTCOME |
|------------------|--|------------------|
| Knowledge | | |
| W1 | Has advanced knowledge of mathematics, including: mathematical analysis, linear algebra, probabilistic methods, mathematical statistics, and operations on complex variables aimed at solving problems such as: (1) analysis and synthesis of dynamic systems, (2) analysis of experimental results, (3) analysis and synthesis of electrical and electronic circuits, (4) solving general mechanics problems, including kinematics and dynamics. Is able to apply this knowledge in the field of study. | K_W01 |
| | W1.1 The student recognizes issues that can be naturally solved using definite integrals, multiple integrals, or partial derivative methods. Knows the geometric and physical meaning of the concepts learned. | |

Skills

| | | | |
|--|---|--|-------------------------|
| U1 | The student is able to obtain information from sources such as literature, databases, and other commonly available media, as well as integrate it for interpretation, draw conclusions, and formulate opinions. | | K_U01 |
| | U1.1 | Has the ability to search available sources for information related to solving problems in the field of mathematical analysis. | |
| Competencies | | | |
| K1 | Is aware of the need to cooperate and work in a group, taking on various roles within it, setting priorities for the completion of tasks defined by themselves or others | | K_K06 |
| | K1.1 | Has the ability to independently solve mathematical problems using both analytical and algorithmic methods; the ability to work in a team and present their achievements (orally and in writing). Participates in the individual stages of group mathematical problem solving and actively participates in discussing the mathematical apparatus selected to solve these problems. | |
| EDUCATIONAL CONTENT | | | |
| TOPIC | | | |
| Lecture | | | |
| 1 | Partial derivative. Directional derivative. | | |
| 2 | Gradient. Higher-order derivatives. | | |
| 3 | Extrema of functions of two variables. Extrema of functions of several variables. | | |
| 4 | Double integral. Calculation methods. Applications. | | |
| 5 | Ordinary differential equations of the first order. Physical and technical problems leading to differential equations. | | |
| 6 | Numerical series. Comparison criterion, Cauchy's criterion, d'Alembert's criterion. Power series. | | |
| Laboratory | | | |
| 1 | Partial derivative. Directional derivative. | | |
| 2 | Gradient. Higher-order derivatives. | | |
| 3 | Extrema of functions of two variables. Extrema of functions of several variables. | | |
| 4 | Double integral. Calculation methods. Applications. | | |
| 5 | Ordinary differential equations of the first order. Physical and technical problems leading to differential equations. | | |
| 6 | Numerical series. Comparison criterion, Cauchy's criterion, d'Alembert's criterion. Power series. | | |
| Project | | | |
| 1 | 1. Defining the project task. Specification of the goal, assumptions, functional and non-functional requirements. | | |
| 2 | 2. Defining the application structure. Defining (writing down) use cases. | | |
| 3 | 3. Implementation of the designed solution | | |
| 4 | 4. Testing and corrections, and preparation of the final version of the project | | |
| 5 | 5. Preparation of project documentation. Project completion. | | |
| VERIFICATION OF LEARNING OUTCOMES | | | |
| CODE | DESCRIPTION | | LEARNING OUTCOME |
| Knowledge | | Lecture | |
| W1 | W1.1 | 1 written exam open-ended questions | K_W01 |
| Skills | | Lecture | |
| U1 | U1.1 | 1 written exam open-ended questions | K_U01 |
| Competencies | | Lecture | |
| K1 | K1.1 | 1 written exam open-ended questions | K_K06 |
| Knowledge | | Laboratory | |
| W1 | W1.1 | 1 report | K_W01 |
| Skills | | Laboratory | |
| U1 | U1.1 | 1 report | K_U01 |
| Competencies | | Laboratory | |
| K1 | K1.1 | 1 report | K_K06 |

| | | Knowledge | Project |
|-----------|---|-------------------------|---------|
| W1 | 1 | Project | |
| W2 | 1 | Multimedia presentation | |
| | | Skills | Project |
| U1 | 1 | oral response | |
| U2 | 1 | report(s) | |

FORMS OF ASSESSMENT

For each of the learning outcomes specified for the subject in terms of knowledge, skills, and competences, the assessment is as follows:

| | | | |
|------------|---|------------|---|
| 2,0 | the student obtains less than 51% of the maximum number of points | 4,0 | the student obtains between 71% and 80% of the maximum number of points |
| 3,0 | the student obtains between 51% and 60% of the maximum number of points | 4,5 | the student obtains between 81% and 90% of the maximum number of points |
| 3,5 | the student obtains between 61% and 70% of the maximum number of points | 5,0 | student scores above 90% of the maximum number of points |

Assessment criteria according to the scale:

| | | |
|-----------------|-------------|--|
| very good | 5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a very good degree |
| good plus | 4,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a more than good degree |
| good | 4 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a good degree |
| sufficient plus | 3,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a fairly good degree |
| satisfactory | 3 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a satisfactory degree |
| unsatisfactory | 3 | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice |
| pass | pass | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice |
| failed | nzal | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice |

LITERATURE

Basic

| | |
|---|--|
| 1 | G.M. Fichtenholz, Differential and Integral Calculus, volumes 1-3, PWN Scientific Publishers, Warsaw 2012. |
| 2 | W. Kryszicki, L. Włodarski, Mathematical Analysis in Tasks, parts I-II, PWN, Warsaw 2021. |

Supplementary

| | |
|---|--|
| 1 | F. Leja, Differential and Integral Calculus with an Introduction to Differential Equations, PWN, Warsaw 2012. |
| 2 | M. Gewert, Z. Skoczylas, Mathematical Analysis 2, Definitions, Theorems, Formulas. GiS Publishing House, Wrocław 2022. |
| 3 | M. Gewert, Z. Skoczylas, Mathematical Analysis 2, Examples and Exercises. GiS Publishing House, Wrocław 2022. |
| 4 | M. Giaquinta, G. Modica, Mathematical Analysis, Birkhäuser Boston Incorporated 2012. |

STATE ACADEMY OF APPLIED SCIENCES IN GŁOGÓW

INSTITUTE OF ENGINEERING AND TECHNICAL SCIENCES

SYLLABUS / COURSE DESCRIPTION



BASIC INFORMATION ABOUT THE SUBJECT

| | | | | |
|---------------------------------------|---|---|--------------------------|----|
| Name of the subject (module) | Artificial intelligence | | Course code | 22 |
| Name of the unit teaching the subject | | Institute of Engineering and Technology Sciences | | |
| Level of education | First-cycle studies | Profile | Practical | |
| Field of study | Control engineering and robotics | Specialization | | |
| Education module | Basic | Language of instruction | English | |
| Semester | VI | Form of assessment | Pass with a grade | |

HOURLY DIMENSION OF DIDACTIC CLASSES

FULL-TIME STUDIES

| | | |
|---------|---------|------------|
| Lecture | Project | Laboratory |
| 15 | 30 | 30 |

TOTAL HOURLY DIMENSION OF CLASSES

| | |
|----------------------------|------------|
| Student's independent work | 75 |
| Total | 150 |
| ECTS | 6 |

COURSE OBJECTIVE

To familiarize students with the architectures of artificial neural networks and their learning algorithms. To familiarize students with fuzzy set theory and fuzzy inference. To familiarize students with various graph search strategies. To develop skills in the use of artificial intelligence methods in solving practical engineering problems.

LEARNING OUTCOMES FOR THE COURSE

| CODE | DESCRIPTION | LEARNING OUTCOME |
|------------------|--|------------------|
| Knowledge | | |
| W1 | Has advanced knowledge of applied mathematics, including mathematical modeling, numerical methods, and simulation methods used to solve engineering problems and tasks. Has basic knowledge of a selected specialty and is able to apply it in the field of study. | K_W02 |
| | W1.1 Is aware of the computational complexity of the artificial intelligence methods learned. | |
| | W1.2 Is able to list the types of artificial neurons and characterize their properties. | |
| W2 | Has advanced knowledge in the following areas: (1) formulation of decision-making problems, (2) simple, heuristic, and metaheuristic search techniques, (3) expert systems and intelligent computing, and the impact of these factors on the life cycle of objects and quality management. | K_W15 |
| | W2.1 Is able to list and characterize the structures of fuzzy and neuro-fuzzy systems. | |
| | W2.2 Is able to list and define simple and heuristic search algorithms. | |
| Skills | | |
| U1 | Is able to use and appropriately select applications for engineering calculations, synthesis, and analysis of system models, both digital and analog. | K_U05 |
| | U1.1 Is able to implement fuzzy system models. | |

| | | | |
|--|--|--|--|
| | U1.2 | Is able to creatively use the learned methods of artificial intelligence to solve new problems. | |
| | U1.3 | Is able to design and implement a simple and heuristic search program. | |
| | U1.4 | Is able to implement artificial neural network models. | |
| U2 | Is able to define a decision-making problem and assess the usefulness of artificial intelligence methods and techniques for solving it, as well as design and implement a simple decision support system. | | K_U17 |
| | U2.1 | is able to apply artificial intelligence techniques to the decision support process. | |
| Competencies | | | |
| K1 | Is aware of the need to clearly formulate information related to technological achievements for the chosen field of study. | | K_K04 |
| | K1.1 | is able to present information related to ongoing projects in a clear manner so that it is understandable to the recipient | |
| | K1.2 | is able to define the tasks of team members implementing a project in order to achieve the set goal in a timely and optimal manner | |
| EDUCATIONAL CONTENT | | | |
| TOPIC | | | |
| Lecture | | | |
| 1 | Breadth-first and depth-first search algorithms. A* algorithm. Heuristic functions. Memory and time complexity of search strategies. Minimax algorithm. Alpha-beta pruning algorithm. Search with constraints. | | |
| 2 | Artificial neural networks. Structure of a biological neuron. Mathematical model of a neuron. Simple perceptron. Perceptron learning rule. Limitations of a simple perceptron. Neuron models and their properties. Adaline and Madaline structures. Multilayer networks. Single-layer network learning. Multi-layer network learning. Backpropagation algorithm. Dynamic neuron models. Dynamic neural networks. Examples of artificial neural network applications. | | |
| Laboratory | | | |
| 1 | Breadth-first and depth-first search algorithms. A* algorithm. Heuristic functions. Memory and time complexity of search strategies. Minimax algorithm. Alpha-beta pruning algorithm. Search with constraints. | | |
| 2 | Artificial neural networks. Structure of a biological neuron. Mathematical model of a neuron. Simple perceptron. Perceptron learning rule. Limitations of a simple perceptron. Neuron models and their properties. Adaline and Madaline structures. Multilayer networks. Single-layer network learning. Multi-layer network learning. Backpropagation algorithm. Dynamic neuron models. Dynamic neural networks. Examples of artificial neural network applications. | | |
| 3 | Fuzzy and neuro-fuzzy systems. Fuzzy sets and fuzzy logic. Operations on fuzzy sets. Fuzzy inference. Fuzzy rules. Examples of fuzzy systems. Neuro-fuzzy structures and their learning algorithms. | | |
| Project | | | |
| 1 | Defining the project task. Specification of the goal, assumptions, functional and non-functional requirements. | | |
| 2 | Defining the application structure. Defining (writing down) use cases. | | |
| 3 | Implementation of the designed solution | | |
| 4 | Testing and corrections, and preparation of the final version of the project | | |
| 5 | Preparation of project documentation. Project completion. | | |
| VERIFICATION OF LEARNING OUTCOMES | | | |
| CODE | DESCRIPTION | | LEARNING OUTCOME |
| Knowledge | | Lecture | |
| W1 | W1.1 | 1 | Written test with open-ended questions |
| | W1.2 | 1 | Written test with open-ended questions |
| W2 | W2.1 | 1 | Written test with open-ended questions |
| | W2.2 | 1 | Written test with open-ended questions |
| Skills | | Lecture | |
| U1 | U1.1 | 1 | Written test with open-ended questions |
| | U1.2 | 1 | Written test with open-ended questions |
| | U1.3 | 1 | Written test with open-ended questions |

| | | | | |
|---|---|--|--|---|
| | U1.4 | 1 | Written test with open-ended questions | |
| U2 | U2.1 | 1 | Written test with open-ended questions | K_U17 |
| Competencies | | Lecture | | |
| K1 | K1.1 | 1 | Written test with open-ended questions | K_K04 |
| | K1.2 | 1 | Written test with open-ended questions | |
| Knowledge | | Laboratory | | |
| W1 | W1.1 | 1 | report | K_W02 |
| | W1.2 | 1 | report | |
| W2 | W2.1 | 1 | report | K_W15 |
| | W2.2 | 1 | report | |
| Skills | | Laboratory | | |
| U1 | U1.1 | 1 | report | K_U05 |
| | U1.2 | 1 | report | |
| | U1.3 | 1 | report | |
| | U1.4 | 1 | report | |
| U2 | U2.1 | 1 | report | K_U17 |
| Competencies | | Laboratory | | |
| K1 | K1.1 | 1 | report | K_K04 |
| | K1.2 | 1 | report | |
| Knowledge | | Project | | |
| W1 | | 1 | Project | K_W16 |
| W2 | | 1 | Multimedia presentation | K_W22 |
| Skills | | Project | | |
| U1 | | 1 | oral response | K_U02 |
| U2 | | 1 | report(s) | K_U23 |
| FORMS OF ASSESSMENT | | | | |
| For each of the learning outcomes specified for the subject in terms of knowledge, skills, and competences, the assessment is as follows: | | | | |
| 2,0 | the student obtains less than 51% of the maximum number of points | | 4,0 | the student obtains between 71% and 80% of the maximum number of points |
| 3,0 | the student obtains between 51% and 60% of the maximum number of points | | 4,5 | the student obtains between 81% and 90% of the maximum number of points |
| 3,5 | the student obtains between 61% and 70% of the maximum number of points | | 5,0 | student scores above 90% of the maximum number of points |
| Assessment criteria according to the scale: | | | | |
| very good | 5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a very good degree | | |
| good plus | 4,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a more than good degree | | |
| good | 4 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a good degree | | |
| sufficient plus | 3,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a fairly good degree | | |
| satisfactory | 3 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a satisfactory degree | | |
| unsatisfactory | 3 | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice | | |
| pass | pass | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice | | |
| failed | nzal | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice | | |
| LITERATURE | | | | |
| Basic | | | | |
| 1 | Jakubiak M., Stacewicz P., Trust in artificial intelligence systems, 2023. | | | |
| 2 | Król-Nowak A., Kotarba K., Fundamentals of machine learning, 2022. | | | |
| 3 | Wołk K., Playing with artificial intelligence, 2018 | | | |
| 4 | Iljaszewicz P., Artificial neural networks ANN: Kohonen networks, 2018. | | | |
| Supplementary | | | | |
| 1 | Rutkowski L., Journal of Artificial Intelligence and Soft Computing Research, 2021. | | | |

STATE ACADEMY OF APPLIED SCIENCES IN GŁOGÓW

INSTITUTE OF ENGINEERING AND TECHNICAL SCIENCES

SYLLABUS / COURSE DESCRIPTION



| BASIC INFORMATION ABOUT THE SUBJECT | | | |
|---|--|---|-------------------|
| Name of the subject (module) | Database systems + Computer networks | | Course code 24 |
| Name of the unit teaching the subject | | Institute of Engineering and Technology Sciences | |
| Level of education | First-cycle studies | Profile | Practical |
| Field of study | Control engineering and robotics | Specialization | |
| Education module | Basic | Language of instruction | English |
| Semester | II | Form of assessment | Pass with a grade |
| HOURLY DIMENSION OF DIDACTIC CLASSES | | | |
| FULL-TIME STUDIES | | | |
| Lecture | Project | | Laboratory |
| 15 | 30 | | 30 |
| TOTAL HOURLY DIMENSION OF CLASSES | | | |
| Student's independent work | 75 | | |
| Total | 150 | | |
| ECTS | 6 | | |
| PREREQUISITES | | | |
| Fundamentals of Information Technology | | | |
| COURSE OBJECTIVE | | | |
| <p>Familiarization with the basic elements of a computer workstation and central processing unit components. Ability to identify, indicate, and describe the most important parameters of a given component. Familiarization with the capabilities of Office Web Apps. Acquisition of knowledge about basic network devices, network cabling, and network topologies. Advantages and disadvantages of individual solutions. Familiarization with the basic techniques of data transfer in a network (routing, protocols, nat). Identification of IT threats and countermeasures.</p> <p>Thorough familiarization with the capabilities of the Office suite (Word, Excel, PowerPoint, Access). Basic tools in Windows. Programs for data processing and visualization. Basic information about relational databases. Familiarization with number systems and their practical use in IP addressing.</p> | | | |
| LEARNING OUTCOMES FOR THE COURSE | | | |
| CODE | DESCRIPTION | | LEARNING OUTCOME |
| Knowledge | | | |
| W1 | Has advanced knowledge of the structure and functioning of processors, computers, and computer networks. Can apply this knowledge to solve engineering problems and in non-technical applications. | | K_W06 |
| | W1.1 | Knows the basic components of computers and computer networks | |
| W2 | Has advanced general knowledge of industrial automation devices and industrial networks, knowing their systematics, applicable standards, and symbols used to represent them. | | K_W14 |
| | W2.1 | Knows the principles of operation of computer hardware, network devices, and transmission media. Knows the types of databases and the principles of their design. | |

| Skills | | | |
|----------------------------|---|---|--------------|
| U1 | Is able to design simple digital circuits and configure computer hardware and computer network devices | | K_U07 |
| | U1.1 | Is able to design a simple computer network. Is able to select the right computer hardware and network devices for the right purpose and task based on the description and technical documentation. | |
| U2 | Can write simple programs in low- and high-level languages and analyze and configure selected operating systems. | | K_U08 |
| | U2.1 | Is able to configure a computer for software needs. Is able to design and create a simple database. | |
| Competencies | | | |
| K1 | Is aware of the rapid obsolescence of acquired knowledge for the chosen field of study and the resulting need to improve professional competences based on emerging technologies, knowing the possibilities of further education both at higher levels of study and in training courses conducted by recognized institutions. | | K_K03 |
| | K1.1 | Is able to use technical documentation, understanding rapidly changing trends and devices available on the market | |
| K2 | Is aware of entrepreneurial thinking and acting. In their work as an engineer, acts in accordance with the principles of engineering ethics. | | K_K05 |
| | K2.1 | Understands the responsibility of their work, acting in accordance with applicable technical and ethical principles. | |
| K3 | Is aware of the need to cooperate and work in a group, taking on various roles within it, setting priorities for the completion of tasks defined by themselves or others | | K_K06 |
| | K3.1 | Is able to work in a team on a complex task of designing a database or computer network. | |
| EDUCATIONAL CONTENT | | | |
| TOPIC | | | |
| Lecture | | | |
| 1 | Computer architecture. | | |
| 2 | Basic network devices. | | |
| 3 | Network definitions and types | | |
| 4 | Cabling used in computer networks. | | |
| 5 | Routing and NAT. | | |
| 6 | TCP and UDP protocols. | | |
| 7 | IT security. | | |
| 8 | Antivirus prevention. | | |
| 9 | Relational databases | | |
| 10 | Database design | | |
| Laboratory | | | |
| 1 | Using MS Word. | | |
| 2 | Use of MS Excel. | | |
| 3 | Use of MS PowerPoint. | | |
| 4 | Introduction to operating systems. | | |
| 5 | Windows operating system – graphical user interface and basic applications. | | |
| 6 | Programs for statistical processing and data visualization. | | |
| 7 | Relational databases | | |
| 8 | Databases. MS Access. | | |
| 9 | Number systems | | |
| 10 | IP addressing principles. | | |
| Project | | | |
| 1 | Defining the project task. Specification of the goal, assumptions, functional and non-functional requirements. | | |
| 2 | Defining the application structure. Defining (writing down) use cases. | | |
| 3 | Implementation of the designed solution | | |

| 4 | Testing and corrections, and preparation of the final version of the project | | |
|---|--|--|---|
| 5 | Preparation of project documentation. Project completion. | | |
| VERIFICATION OF LEARNING OUTCOMES | | | |
| CODE | DESCRIPTION | | LEARNING OUTCOME |
| Knowledge | | Lecture | |
| W1 | W1.1 | 1 | Written test with open-ended questions |
| | | 2 | Class participation |
| W2 | W2.1 | 1 | Written test with open-ended questions |
| | | 2 | Class participation |
| U1 | U1.1 | 1 | Written test with open-ended questions |
| | | 2 | Class participation |
| Skills | | Lecture | |
| K1 | K1.1 | 1 | Class participation |
| | | 1 | Class participation |
| K2 | K2.1 | 1 | Class participation |
| | | 1 | Class participation |
| K3 | K3.1 | 1 | Class participation |
| | | 1 | Class participation |
| Knowledge | | Laboratory | |
| W1 | W1.1 | 1 | Written test with open-ended questions |
| | | 2 | Practical test |
| | | 3 | Class participation |
| W2 | W2.1 | 1 | Written test with open-ended questions |
| | | 2 | Practical test |
| | | 3 | Class participation |
| Skills | | Laboratory | |
| U1 | U1.1 | 1 | Written test with open-ended questions |
| | | 2 | Practical test |
| | | 3 | Class participation |
| Competencies | | Laboratory | |
| K1 | K1.1 | 1 | Class participation |
| | | 1 | Class participation |
| K2 | K2.1 | 1 | Class participation |
| | | 1 | Class participation |
| K3 | K3.1 | 1 | Class participation |
| | | 1 | Class participation |
| Knowledge | | Project | |
| W1 | 1 | Project | |
| W2 | 1 | Multimedia presentation | |
| Skills | | Project | |
| U1 | 1 | oral response | |
| U2 | 1 | report(s) | |
| FORMS OF ASSESSMENT | | | |
| For each of the learning outcomes specified for the subject in terms of knowledge, skills, and competences, the assessment is as follows: | | | |
| 2,0 | the student obtains less than 51% of the maximum number of points | 4,0 | the student obtains between 71% and 80% of the maximum number of points |
| 3,0 | the student obtains between 51% and 60% of the maximum number of points | 4,5 | the student obtains between 81% and 90% of the maximum number of points |
| 3,5 | the student obtains between 61% and 70% of the maximum number of points | 5,0 | student scores above 90% of the maximum number of points |
| Assessment criteria according to the scale: | | | |
| very good | 5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a very good degree | |
| good plus | 4,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a more than good degree | |
| good | 4 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a good degree | |
| sufficient plus | 3,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a fairly good degree | |

| | | |
|----------------|-------------|--|
| satisfactory | 3 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a satisfactory degree |
| unsatisfactory | 3 | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice |
| pass | pass | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice |
| failed | nzal | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice |

LITERATURE

Basic

| | |
|---|--|
| 1 | Jakub Kubica, "Fundamentals of Computer Networks for Technicians and Students," Part 1, ITStart 2021 |
| 2 | J. Gleen Brookshear, Dennis Brylow "Computer Science: A General Overview," 13th edition, PWN 2022 |

Supplementary

| | |
|---|--|
| 1 | Damian Strojek, Jerzy Kluczewski, Robert Wszelaki, Marek Smyczek "Packet Tracer for young beginner administrators," ITStart 2023 |
| 2 | C. J. Date, "Database Design and Relational Theory. Normal Forms and All That Jazz," Apress Media 2019 |

STATE ACADEMY OF APPLIED SCIENCES IN GŁOGÓW

INSTITUTE OF ENGINEERING AND TECHNICAL SCIENCES

SYLLABUS / COURSE DESCRIPTION



| BASIC INFORMATION ABOUT THE SUBJECT | | | |
|---|--|---|--------------------------|
| Name of the subject (module) | 3D programs | | Course code 27 |
| Name of the unit teaching the subject | | Institute of Engineering and Technology Sciences | |
| Level of education | First-cycle studies | Profile | Practical |
| Field of study | Control engineering and robotics | Specialization | |
| Education module | Major | Language of instruction | English |
| Semester | III | Form of assessment | Pass with a grade |
| HOURLY DIMENSION OF DIDACTIC CLASSES | | | |
| FULL-TIME STUDIES | | | |
| Lecture | Project | | Laboratory |
| 15 | 30 | | 30 |
| TOTAL HOURLY DIMENSION OF CLASSES | | | |
| Student's independent work | | 75 | |
| Total | | 150 | |
| ECTS | | 6 | |
| COURSE OBJECTIVE | | | |
| The aim of the course is to master product design, including simulation, FEM calculations, and documentation management. The course is based on the INVENTOR program. | | | |
| LEARNING OUTCOMES FOR THE COURSE | | | |
| CODE | DESCRIPTION | | LEARNING OUTCOME |
| Knowledge | | | |
| W1 | Has advanced knowledge in the selected specialization | | K_W16 |
| | W1.1 | Is able to build 3D objects and perform their strength analysis | |
| W2 | Has advanced knowledge of CAD techniques and engineering graphics. | | K_W22 |
| | W2.1 | Is able to use libraries of ready-made components | |
| Skills | | | |
| U1 | Is able to prepare documentation and an oral presentation on the implementation of an engineering task, using appropriate information and communication techniques and tools | | K_U02 |
| | U1.1 | Is able to develop an animation of the assembly of individual structural elements | |
| U2 | Is able to use CAD systems and create engineering graphics | | K_U23 |
| | U2.1 | is able to create two-dimensional documentation based on a spatial object | |
| Competencies | | | |
| K1 | Is consciously responsible for their own work and follows the rules for teamwork | | K_K01 |
| | K1.1 | Is able to organize teamwork in the design of a given structure | |
| K2 | Is aware of entrepreneurial thinking and acting. In their work as an engineer, acts in accordance with the principles of engineering ethics. | | K_K05 |
| | K2.1 | Is aware of the designer's responsibility for the safe use of the object | |

| EDUCATIONAL CONTENT | | | | |
|-----------------------------------|---|-------------------|---------------------|-------|
| TOPIC | | | | |
| Lecture | | | | |
| 1 | Definition of a project file, its settings, organization of work with Inventor application files | | | |
| 2 | Relative, absolute, and polar coordinates. Characteristic points and object handles | | | |
| 3 | Creating solid elements by rotating profiles relative to the axis and discussing modification operations by breaking down operations into arrays and applying assembly elements, i.e., threaded holes | | | |
| 4 | Removing degrees of freedom between assembly components - forcing movement in the assembly, detecting collisions between components. | | | |
| Practical classes | | | | |
| 1 | Creating simple models of objects constructed from rotational and flat solids | | | |
| 2 | exercise in applying constraints between components of an object composed of several subassemblies | | | |
| 3 | Practicing strength calculations for an object loaded with a concentrated force with a continuous load - using the FEM module | | | |
| 4 | Drawing 2D documentation based on a spatial drawing - projections, cross-sections, cutaways | | | |
| Project | | | | |
| 1 | design of a gear transmission with specified parameters using the INVENTOR program | | | |
| 2 | Load simulations and strength calculations - gear | | | |
| VERIFICATION OF LEARNING OUTCOMES | | | | |
| CODE | DESCRIPTION | | LEARNING OUTCOME | |
| Knowledge | | Lecture | | |
| W1 | W1.1 | 1 | oral exam | K_W16 |
| | | 2 | Class participation | |
| W2 | W2.1 | 1 | oral exam | K_W22 |
| | | 2 | Class participation | |
| Skills | | Lecture | | |
| U1 | U1.1 | 1 | oral exam | K_U02 |
| | | 2 | Class participation | |
| U2 | U2.1 | 1 | oral exam | K_U23 |
| | | 2 | Class participation | |
| Competencies | | Lecture | | |
| K1 | K1.1 | 1 | oral exam | K_K01 |
| | | 2 | Class participation | |
| K2 | K2.1 | 1 | oral exam | K_K05 |
| | | 2 | Class participation | |
| Knowledge | | Practical classes | | |
| W1 | W1.1 | 1 | oral exam | K_W16 |
| | | 2 | Class participation | |
| W2 | W2.1 | 1 | oral exam | K_W22 |
| | | 2 | Class participation | |
| Skills | | Practical classes | | |
| U1 | U1.1 | 1 | oral exam | K_U02 |
| | | 2 | Class participation | |
| U2 | U2.1 | 1 | oral exam | K_U23 |
| | | 2 | Class participation | |
| Competencies | | Practical classes | | |
| K1 | K1.1 | 1 | Practical test | K_K01 |
| | | 2 | Class participation | |
| K2 | K2.1 | 1 | Practical test | K_K05 |
| | | 2 | Class participation | |
| Knowledge | | Project | | |
| W1 | W1.1 | 1 | design | K_W16 |

| | | | | |
|----|------|---------------------|---------------------|----------------|
| | | 2 | Class participation | |
| W2 | W2.1 | 1 | design | K_W22 |
| | | 2 | Class participation | |
| | | Skills | | Project |
| U1 | U1.1 | 1 | design | K_U02 |
| | | 2 | Class participation | |
| U2 | U2.1 | 1 | design | K_U23 |
| | | 2 | Class participation | |
| | | Competencies | | Project |
| K1 | K1.1 | 1 | design | K_K01 |
| | | 2 | Class participation | |
| K2 | K2.1 | 1 | design | K_K05 |
| | | 2 | Class participation | |

FORMS OF ASSESSMENT

For each of the learning outcomes specified for the subject in terms of knowledge, skills, and competences, the assessment is as follows:

| | | | |
|------------|---|------------|---|
| 2,0 | the student obtains less than 51% of the maximum number of points | 4,0 | the student obtains between 71% and 80% of the maximum number of points |
| 3,0 | the student obtains between 51% and 60% of the maximum number of points | 4,5 | the student obtains between 81% and 90% of the maximum number of points |
| 3,5 | the student obtains between 61% and 70% of the maximum number of points | 5,0 | student scores above 90% of the maximum number of points |

Assessment criteria according to the scale:

| | | |
|-----------------|-------------|--|
| very good | 5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a very good degree |
| good plus | 4,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a more than good degree |
| good | 4 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a good degree |
| sufficient plus | 3,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a fairly good degree |
| satisfactory | 3 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a satisfactory degree |
| unsatisfactory | 3 | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice |
| pass | pass | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice |
| failed | nzal | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice |

LITERATURE

Basic

| | |
|---|--|
| 1 | P. Płuciennik, Designing machine components using Autodesk Inventor, Warsaw: Wydawnictwo Naukowe PWN. 2013 |
| 2 | Andrzej Jaskulski, Autodesk Inventor Professional 2018PL/2018+/Fusion 360: design methodology |
| 3 | B. Wysogład. Selected issues in computer-aided design. Racibórz: State Higher Vocational School Publishing House. 2018 |

Supplementary

| | |
|---|--|
| 1 | K. Kapias. Inventor. Practical solutions Helion 2016 |
|---|--|

STATE ACADEMY OF APPLIED SCIENCES IN GŁOGÓW

INSTITUTE OF ENGINEERING AND TECHNICAL SCIENCES

SYLLABUS / COURSE DESCRIPTION



| BASIC INFORMATION ABOUT THE SUBJECT | | | |
|---|--|--|-------------------|
| Name of the subject (module) | Fundamentals of automatic control | | Course code 32 |
| Name of the unit teaching the subject | | Institute of Engineering and Technology Sciences | |
| Level of education | First-cycle studies | Profile | Practical |
| Field of study | Control engineering and robotics | Specialization | |
| Education module | Major | Language of instruction | English |
| Semester | III | Form of assessment | Exam |
| HOURLY DIMENSION OF DIDACTIC CLASSES | | | |
| FULL-TIME STUDIES | | | |
| Lecture | Project | | Laboratory |
| 15 | 30 | | 30 |
| TOTAL HOURLY DIMENSION OF CLASSES | | | |
| Student's independent work | | 75 | |
| Total | | 150 | |
| ECTS | | 6 | |
| PREREQUISITES | | | |
| System analysis and modeling | | | |
| COURSE OBJECTIVE | | | |
| To familiarize students with the basic techniques of designing automatic control systems. To develop students' understanding of control quality indicators. To acquire the skills to select controllers and methods for their tuning. | | | |
| LEARNING OUTCOMES FOR THE COURSE | | | |
| CODE | DESCRIPTION | | LEARNING OUTCOME |
| Knowledge | | | |
| W1 | Has advanced knowledge of physics in the fields of mechanics, thermodynamics, optics, electricity and magnetism, and solid state physics, including the knowledge necessary to understand the basic physical phenomena occurring in automatic control systems. Has basic knowledge of a selected specialization and is able to apply it in the field of study. | | K_W03 |
| | W1.1 | Knows the concepts of stability, observability, and controllability of physical systems. | |
| W2 | Has advanced knowledge of the basic types and structures of automatic control systems: (1) understands the need to construct a mathematical description of the system for the purposes of control system design, (2) has basic knowledge of control system design methods, (3) has elementary knowledge related to the control of discrete and continuous systems. | | K_W10 |
| | W2.1 | Understands the need for mathematical description of automation systems and control system design based on established quality criteria. | |
| | W2.2 | Has general knowledge of linear controllers, including PID controllers and methods of their tuning. | |

| | | | | |
|--|--|---|------------------------------------|-------------------------|
| | W2.3 | Has basic knowledge of designing automatic control systems in the field of time and frequency | | |
| Skills | | | | |
| U1 | Is able to apply controller design techniques and assess the quality of their operation. | | | K_U12 |
| | U1.1 | Has the ability to model dynamic systems | | |
| | U1.2 | Is able to use modern tools for designing automatic control systems | | |
| | U1.3 | Has the ability to design and evaluate the quality of automatic control systems | | |
| U2 | Is able to use modern engineering software tools, e.g., Matlab Control System Toolbox and Simulink, in the design of automatic control systems | | | K_U16 |
| | U2.1 | Is able to build and tune a PID controller using the "Autotune" method in Simulink. | | |
| U3 | Is able to design digital automatic control systems, select controllers and their parameters, measuring sensors, and actuators. | | | K_U15 |
| | U3.1 | Can select a controller and its parameters for digital systems. | | |
| Competencies | | | | |
| K1 | Is consciously responsible for their own work and follows the rules for teamwork | | | K_K01 |
| | K1.1 | Is able to work in a team on a complex task of designing an automatic control system | | |
| EDUCATIONAL CONTENT | | | | |
| TOPIC | | | | |
| Lecture | | | | |
| 1 | Basic concepts and definitions. Overview of the lecture structure | | | |
| 2 | Mathematical modeling of dynamic systems, structural diagrams | | | |
| 3 | Operator transmittance of automation systems. Linearization | | | |
| 4 | Deviation transmittance. Deviation in steady state | | | |
| 5 | Basic control quality indicators. Delay and lead compensators | | | |
| 6 | PID controller. Tuning methods: step response method, Ziegler-Nichols method, analytical method | | | |
| 7 | Design of frequency domain control systems, root locus method | | | |
| 8 | Stability of automatic control systems | | | |
| Laboratory | | | | |
| 1 | MATLAB-Simulink environment | | | |
| 2 | Block diagrams | | | |
| 3 | Modeling of dynamic systems in the MATLABSimulink environment | | | |
| 4 | Analysis of basic dynamic elements | | | |
| 5 | Designing control systems using analytical methods | | | |
| 6 | Analysis of steady-state control error. Selection of controller structure | | | |
| 7 | Designing control systems using the root locus method | | | |
| 8 | PID controller tuning | | | |
| 9 | Application of the SISO TOOL for control system design | | | |
| Project | | | | |
| 1 | Defining the project task. Specification of the goal, assumptions, functional and non-functional requirements. | | | |
| 2 | Defining the application structure. Defining (writing down) use cases. | | | |
| 3 | Implementation of the designed solution | | | |
| 4 | Testing and corrections, and preparation of the final version of the project | | | |
| 5 | Preparation of project documentation. Project completion. | | | |
| VERIFICATION OF LEARNING OUTCOMES | | | | |
| CODE | DESCRIPTION | | | LEARNING OUTCOME |
| | Knowledge | | Lecture | |
| W1 | W1.1 | 1 | Written exam with closed questions | K_W03 |
| W2 | W2.1 | 1 | Written exam with closed questions | K_W10 |
| | W2.2 | 1 | Written exam with closed questions | |

| | | | | |
|---|---|--|------------------------------------|---|
| | W2.3 | 1 | Written exam with closed questions | |
| | | | Skills | Lecture |
| U1 | U1.1 | 1 | Class participation | K_U12 |
| | U1.2 | 1 | Class participation | |
| | U1.3 | 1 | Class participation | |
| U2 | U2.1 | 1 | Class participation | K_U16 |
| | | | Competencies | Lecture |
| K1 | K1.1 | 1 | Class participation | K_K01 |
| | | | Knowledge | Laboratory |
| W1 | W1.1 | 1 | Class participation | K_W03 |
| W2 | W2.1 | 1 | Class participation | K_W10 |
| | W2.2 | 1 | Class participation | |
| | W2.3 | 1 | Class participation | |
| | | | Skills | Laboratory |
| U1 | U1.1 | 1 | Class participation | K_U12 |
| | U1.2 | 1 | Class participation | |
| | U1.3 | 1 | Class participation | |
| U2 | U2.1 | 1 | Class participation | K_U16 |
| | | | Competencies | Laboratory |
| K1 | K1.1 | 1 | Class participation | K_K01 |
| | | Knowledge | Project | |
| W1 | 1 | Project | | K_W16 |
| W2 | 1 | Multimedia presentation | | K_W22 |
| | | Skills | Project | |
| U1 | 1 | oral response | | K_U02 |
| U2 | 1 | report(s) | | K_U23 |
| FORMS OF ASSESSMENT | | | | |
| For each of the learning outcomes specified for the subject in terms of knowledge, skills, and competences, the assessment is as follows: | | | | |
| 2,0 | the student obtains less than 51% of the maximum number of points | | 4,0 | the student obtains between 71% and 80% of the maximum number of points |
| 3,0 | the student obtains between 51% and 60% of the maximum number of points | | 4,5 | the student obtains between 81% and 90% of the maximum number of points |
| 3,5 | the student obtains between 61% and 70% of the maximum number of points | | 5,0 | student scores above 90% of the maximum number of points |
| Assessment criteria according to the scale: | | | | |
| very good | 5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a very good degree | | |
| good plus | 4,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a more than good degree | | |
| good | 4 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a good degree | | |
| sufficient plus | 3,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a fairly good degree | | |
| satisfactory | 3 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a satisfactory degree | | |
| unsatisfactory | 3 | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice | | |
| pass | pass | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice | | |
| failed | nzal | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice | | |
| LITERATURE | | | | |
| Basic | | | | |
| 1 | Kabziński, J., Control theory: control system design, 2021. | | | |
| 2 | Słota, A., Continuous Process Control: Practical Use of LabVIEW™, 2022. | | | |
| 3 | Mitkowski, W., An outline of control theory, 2019. | | | |

Supplementary

| | |
|---|--|
| 1 | Świder, J., Baier, A., Control and automation of technological processes and mechatronic systems: pneumatic and electropneumatic systems with logical control (PLC), 2012. |
| 2 | Jarzębowska, E., Dynamics and control of mechanical systems: wheeled vehicles and underwater unmanned aerial vehicles, satellites, and space manipulators, 2021. |

STATE ACADEMY OF APPLIED SCIENCES IN GŁOGÓW

INSTITUTE OF ENGINEERING AND TECHNICAL SCIENCES

SYLLABUS / COURSE DESCRIPTION



| BASIC INFORMATION ABOUT THE SUBJECT | | | |
|---|--|---|--------------------------|
| Name of the subject (module) | Fundamentals of robotics | | Course code 33 |
| Name of the unit teaching the subject | | Institute of Engineering and Technology Sciences | |
| Level of education | First-cycle studies | Profile | Practical |
| Field of study | Control engineering and robotics | Specialization | |
| Education module | Major | Language of instruction | English |
| Semester | II | Form of assessment | Exam |
| HOURLY DIMENSION OF DIDACTIC CLASSES | | | |
| FULL-TIME STUDIES | | | |
| Lecture | Project | | Laboratory |
| 15 | 30 | | 30 |
| TOTAL HOURLY DIMENSION OF CLASSES | | | |
| Student's independent work | | 75 | |
| Total | | 150 | |
| ECTS | | 6 | |
| COURSE OBJECTIVE | | | |
| <p>The aim is to familiarize students with the basic methods of describing the position and orientation of rigid bodies, the kinematics and dynamics of manipulators that are the object of control, planning, and motion control. The lectures also cover issues related to control in terms of industrial applications.</p> | | | |
| LEARNING OUTCOMES FOR THE COURSE | | | |
| CODE | DESCRIPTION | | LEARNING OUTCOME |
| Knowledge | | | |
| W1 | Has advanced knowledge of modern industrial robots, including: (1) basic drive and sensor systems of industrial robots, (2) limitations related to the functioning of industrial robots, (3) typical applications of robots in industry | | K_W11 |
| | W1.1 | Knows the basic components of an industrial manipulator (including servo mechanisms) and types of drives (electric, hydraulic, pneumatic). Is able to write a simple automatic program for an industrial robot. | |
| W2 | Has advanced knowledge of the current state and latest trends in the development of Control engineering and robotics. | | K_W17 |
| | W2.1 | Knows the most popular manufacturers of manipulators and is able to determine the possibilities of using robots for process automation. | |
| Skills | | | |
| U1 | Is able to solve problems related to the operation of industrial robots, such as: (1) simple and inverse kinematics tasks for typical industrial manipulators, (2) the use of typical robot programming languages and methods, (3) the application of safety rules related to the use of robots. | | K_U13 |

| | | | |
|--|---|--|-------------------------|
| | U1.1 | Is able to solve forward and inverse kinematics tasks to determine the position of a robot's end effector. Is able to identify and solve problems related to robot safety, such as risks associated with robot movement, equipment failures, damage caused by robots, etc. | |
| Competencies | | | |
| K1 | Is aware of the continuous development and impact of modern engineering methods and techniques in the field of Control engineering and robotics on the advancement of civilization. | | K_K02 |
| | K1.1 | Understands the need to introduce elements of Control engineering and robotics, such as industrial manipulators or cobots, in order to automate processes and thus increase production efficiency. | |
| K2 | Is aware of the need to clearly formulate information related to technological achievements for the chosen field of study. | | K_K04 |
| | K2.1 | Understands the significance of breakthrough events in the field and their effect on the current development of technology, e.g., landing a probe on Mars, sending rockets into space and their return to platforms on Earth. | |
| EDUCATIONAL CONTENT | | | |
| TOPIC | | | |
| Lecture | | | |
| 1 | Basic concepts related to robotics | | |
| 2 | Manipulator spaces | | |
| 3 | Grippers used in robotics | | |
| 4 | Homogeneous forms of basic transformations | | |
| 5 | Simple manipulator tasks | | |
| 6 | Inverse task of manipulators | | |
| 7 | Equations of manipulator dynamics | | |
| 8 | Robot modeling | | |
| 9 | External systems used in robotics | | |
| Laboratory | | | |
| 1 | Basic concepts related to robotics | | |
| 2 | Manipulator spaces | | |
| 3 | Grippers used in robotics | | |
| 4 | Homogeneous forms of basic transformations | | |
| 5 | Simple manipulator tasks | | |
| 6 | Inverse task of manipulators | | |
| 7 | Equations of manipulator dynamics | | |
| 8 | Robot modeling | | |
| 9 | External systems used in robotics | | |
| Project | | | |
| 1 | Basic concepts related to robotics | | |
| 2 | Manipulator spaces | | |
| 3 | Grippers used in robotics | | |
| 4 | Homogeneous forms of basic transformations | | |
| 5 | Simple manipulator tasks | | |
| 6 | Inverse task of manipulators | | |
| 7 | Equations of manipulator dynamics | | |
| 8 | Robot modeling | | |
| 9 | External systems used in robotics | | |
| VERIFICATION OF LEARNING OUTCOMES | | | |
| CODE | DESCRIPTION | | LEARNING OUTCOME |
| | Knowledge | Lecture | |
| W1 | W1.1 | 1 Written exam with closed questions | K_W11 |

| | | | | |
|---|---|--|--|---|
| W2 | W2.1 | 1 | Written exam with closed questions | K_W17 |
| | | | Skills | Lecture |
| U1 | U1.1 | 1 | Written exam with closed questions | K_U13 |
| | | | Competencies | Lecture |
| K1 | K1.1 | 1 | Written exam with closed questions | K_K02 |
| K2 | K2.1 | 1 | Written exam with closed questions | K_K04 |
| | | | Knowledge | Laboratory |
| W1 | W1.1 | 1 | Written test with open-ended questions | K_W11 |
| | | 2 | Class participation | |
| W2 | W2.1 | 1 | Written test with open-ended questions | K_W17 |
| | | 2 | Class participation | |
| | | | Skills | Laboratory |
| U1 | U1.1 | 1 | Written test with open-ended questions | K_U13 |
| | | 2 | Class participation | |
| | | | Competencies | Laboratory |
| K1 | K1.1 | 1 | Class participation | K_K02 |
| K2 | K2.1 | 1 | Class participation | K_K04 |
| | | | Knowledge | Project |
| W1 | W1.1 | 1 | design | K_W11 |
| W2 | W2.1 | 1 | design | K_W17 |
| | | | Skills | Project |
| U1 | U1.1 | 1 | design | K_U13 |
| | | | Competencies | Project |
| K1 | K1.1 | 1 | design | K_K02 |
| K2 | K2.1 | 1 | design | K_K04 |
| FORMS OF ASSESSMENT | | | | |
| For each of the learning outcomes specified for the subject in terms of knowledge, skills, and competences, the assessment is as follows: | | | | |
| 2,0 | the student obtains less than 51% of the maximum number of points | | 4,0 | the student obtains between 71% and 80% of the maximum number of points |
| 3,0 | the student obtains between 51% and 60% of the maximum number of points | | 4,5 | the student obtains between 81% and 90% of the maximum number of points |
| 3,5 | the student obtains between 61% and 70% of the maximum number of points | | 5,0 | student scores above 90% of the maximum number of points |
| Assessment criteria according to the scale: | | | | |
| very good | 5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a very good degree | | |
| good plus | 4,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a more than good degree | | |
| good | 4 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a good degree | | |
| sufficient plus | 3,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a fairly good degree | | |
| satisfactory | 3 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a satisfactory degree | | |
| unsatisfactory | 3 | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice | | |
| pass | pass | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice | | |
| failed | nzal | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice | | |
| LITERATURE | | | | |
| Basic | | | | |
| 1 | Kulczycki, P., Korbicz, J., Kacprzyk, J., Automation, robotics, and information processing, 2020 | | | |
| 2 | Szelerski, M., Industrial robotics: theory, construction, operation, 2019 | | | |
| 3 | Buratowski T.: Fundamentals of Robotics, AGH University of Science and Technology Publishing House, Krakow, 2006. | | | |
| Supplementary | | | | |
| 1 | Kaczmarek, W., Panasiuk, J., Programming Industrial Robots, 2017 | | | |

Summer semester

STATE ACADEMY OF APPLIED SCIENCES IN GŁOGÓW

INSTITUTE OF ENGINEERING AND TECHNICAL SCIENCES

SYLLABUS / COURSE DESCRIPTION



| BASIC INFORMATION ABOUT THE SUBJECT | | | |
|--|--|---|-------------------|
| Name of the subject (module) | Industrial controllers | | Course code 36 |
| Name of the unit teaching the subject | | Institute of Engineering and Technology Sciences | |
| Level of education | First-cycle studies | Profile | Practical |
| Field of study | Control engineering and robotics | Specialization | |
| Education module | Major | Language of instruction | English |
| Semester | III | Form of assessment | Exam |
| HOURLY DIMENSION OF DIDACTIC CLASSES | | | |
| FULL-TIME STUDIES | | | |
| Lecture | Project | | Laboratory |
| 15 | 30 | | 30 |
| TOTAL HOURLY DIMENSION OF CLASSES | | | |
| Student's independent work | | 75 | |
| Total | | 150 | |
| ECTS | | 6 | |
| COURSE OBJECTIVE | | | |
| Knowledge of the construction and operation of PLC controllers. Knowledge of basic programming languages. Knowledge of peripheral devices for PLC systems. | | | |
| LEARNING OUTCOMES FOR THE COURSE | | | |
| CODE | DESCRIPTION | | LEARNING OUTCOME |
| Knowledge | | | |
| W1 | Has advanced knowledge of industrial property protection and copyright law; is able to use patent information resources | | K_W19 |
| | W1.1 | Knowledge allows for acting in accordance with the ethics of the engineering profession. Applies intellectual property protection regulations | |
| W2 | Has advanced knowledge of: (1) signal quantization and sampling, (2) digital control algorithms, including digital PID controllers, (3) implementation of state-feedback and output-feedback control systems using state observers. | | K_W13 |
| | W2.1 | knows digital control algorithms | |
| Skills | | | |
| U1 | Is able to design a control system using programmable logic controllers (PLCs) by: (1) applying basic structures and languages enabling the description of PLC operation, (b) verifying the correctness of the description of the operation of a simple control system | | K_U14 |

| | | | |
|--|---|--|-----------------------------------|
| | U1.1 | Is able to update their knowledge, use technical and company knowledge resources and software. Is able to verify the correctness of the description of control systems | |
| Competencies | | | |
| K1 | Is aware of the rapid obsolescence of acquired knowledge for the chosen field of study and the resulting need to improve professional competences based on emerging technologies, knowing the possibilities of further education both at higher levels of study and in training courses conducted by recognized institutions. | | K_K03 |
| | K1.1 | Continuously improves by participating in courses and training, uses the latest types of software tools | |
| K2 | Is aware of the need to cooperate and work in a group, taking on various roles within it, setting priorities for the completion of tasks defined by themselves or others | | K_K06 |
| | K2.1 | Applies the principles of teamwork in practice, understands the goals of the team, accepts procedures and their role in the team. Is able to take on a specific role in the team, knows, accepts, and applies the rules of the team. | |
| EDUCATIONAL CONTENT | | | |
| TOPIC | | | |
| Lecture | | | |
| 1 | Basic concepts related to PLC controllers | | |
| 2 | PLC programming languages | | |
| 3 | PLC controller design | | |
| 4 | Analog and digital inputs and outputs of a PLC controller | | |
| 5 | Installation of controllers in mechatronic systems | | |
| 6 | Sensors for PLC systems | | |
| 7 | Industrial networks in PLC controllers | | |
| 8 | Mathematical operations in PLC controllers | | |
| 9 | SCADA systems | | |
| Laboratory | | | |
| 1 | Basic concepts related to PLC controllers - search | | |
| 2 | PLC programming languages - sample startup | | |
| 3 | PLC controller design - dismantling damaged controllers | | |
| 4 | Analog and digital inputs and outputs of a PLC controller - setting inputs and reading outputs | | |
| 5 | Installation of controllers in mechatronic systems - connecting the controller to the system | | |
| 6 | Sensors for PLC systems - connecting, input configuration | | |
| 7 | Industrial networks in PLC controllers - depending on the controller, programming network operations, e.g., in Profinet | | |
| 8 | Mathematical operations in a PLC controller - use of mathematical blocks in the program | | |
| 9 | SCADA systems - system programming, | | |
| Project | | | |
| 1 | Defining the project task. Specification of the goal, assumptions, functional and non-functional requirements. | | |
| 2 | Defining the application structure. Defining (writing down) use cases. | | |
| 3 | Implementation of the designed solution | | |
| 4 | Testing and corrections, and preparation of the final version of the project | | |
| 5 | Preparation of project documentation. Project completion. | | |
| VERIFICATION OF LEARNING OUTCOMES | | | |
| CODE | DESCRIPTION | | LEARNING OUTCOME |
| Knowledge | | Lecture | |
| W1 | W1.1 | 1 | written exam open-ended questions |
| Competencies | | Lecture | |
| K1 | K1.1 | 1 | Practical test |
| K2 | K2.1 | 1 | Class participation |
| Knowledge | | Laboratory | |
| W1 | W1.1 | 1 | Practical test |
| Competencies | | Laboratory | |

| | | | | |
|-----------|-------------|-------------------------|---------------------|----------------|
| K1 | K1.1 | 1 | Practical test | K_K03 |
| K2 | K2.1 | 1 | Class participation | K_K06 |
| | | Knowledge | | Project |
| W1 | 1 | Project | | K_W16 |
| W2 | 1 | Multimedia presentation | | K_W22 |
| | | Skills | | Project |
| U1 | 1 | oral response | | K_U02 |
| U2 | 1 | report(s) | | K_U23 |

FORMS OF ASSESSMENT

For each of the learning outcomes specified for the subject in terms of knowledge, skills, and competences, the assessment is as follows:

| | | | |
|------------|---|------------|---|
| 2,0 | the student obtains less than 51% of the maximum number of points | 4,0 | the student obtains between 71% and 80% of the maximum number of points |
| 3,0 | the student obtains between 51% and 60% of the maximum number of points | 4,5 | the student obtains between 81% and 90% of the maximum number of points |
| 3,5 | the student obtains between 61% and 70% of the maximum number of points | 5,0 | student scores above 90% of the maximum number of points |

Assessment criteria according to the scale:

| | | |
|-----------------|-------------|--|
| very good | 5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a very good degree |
| good plus | 4,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a more than good degree |
| good | 4 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a good degree |
| sufficient plus | 3,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a fairly good degree |
| satisfactory | 3 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a satisfactory degree |
| unsatisfactory | 3 | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice |
| pass | pass | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice |
| failed | fail | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice |

LITERATURE

Basic

| | |
|---|---|
| 1 | Kwaśniewski J., PLC controllers in engineering practice, Legionowo 2008 |
| 2 | Gilewski T, PLC programmer school: industrial controllers Helion Gliwice 2017 |

Supplementary

| | |
|---|---|
| 1 | Flaga S, Programming PLC controllers in ladder language, Legionowo: BTC Publishing House 2010 |
| 2 | Kasprzyk J, Programming industrial controllers, Scientific and Technical Publishing House, 2006 |
| 3 | Sałat R, Introduction to PLC programming, Wydawnictwa Komunikacji i Łączności, 2010 |
| 4 | Katariya Sanjay, Industrial Automation Solutions for PLC, SCADA, Drive, and Field Instruments: Easy to Learn Industrial Automation, HarperCollins 360, 2016 |

STATE ACADEMY OF APPLIED SCIENCES IN GŁOGÓW

INSTITUTE OF ENGINEERING AND TECHNICAL SCIENCES

SYLLABUS / COURSE DESCRIPTION



BASIC INFORMATION ABOUT THE SUBJECT

| | | | | |
|---------------------------------------|---|---|--------------------------|-----------|
| Name of the subject (module) | SCADA systems | | Course code | 38 |
| Name of the unit teaching the subject | | Institute of Engineering and Technology Sciences | | |
| Level of education | First-cycle studies | Profile | Practical | |
| Field of study | Control engineering and robotics | Specialization | | |
| Education module | Major | Language of instruction | English | |
| Semester | I | Form of assessment | Pass with a grade | |

HOURLY DIMENSION OF DIDACTIC CLASSES

FULL-TIME STUDIES

| | | |
|---------|---------|------------|
| Lecture | Project | Laboratory |
| 15 | 30 | 30 |

TOTAL HOURLY DIMENSION OF CLASSES

| | |
|----------------------------|------------|
| Student's independent work | 75 |
| Total | 150 |
| ECTS | 6 |

COURSE OBJECTIVE

To familiarize students with the basics of SCADA systems using the Wonderware Intouch program as an example familiarizing students with methods of visualizing industrial processes, familiarizing students with methods of coupling communication between controllers and the SCADA system.

LEARNING OUTCOMES FOR THE COURSE

| CODE | DESCRIPTION | LEARNING OUTCOME |
|---------------------|---|------------------|
| Knowledge | | |
| W1 | Has advanced knowledge in the selected specialization | K_W16 |
| | W1.1 Knows the basic properties of the Wonderware Intouch environment | |
| | W1.2 Has knowledge of basic tools for coupling communication between the SCADA system and PLC controllers and HMI panels | |
| Skills | | |
| U1 | Is able to use specialist knowledge to solve simple tasks related to the chosen specialization | K_U18 |
| | U1.1 Is able to design and implement simple SCADA visualization | |
| | U1.2 Is able to dynamically use the SCADA system for remote monitoring and control of remote devices and automation systems | |
| Competencies | | |
| K1 | Is consciously responsible for their own work and follows the rules for teamwork | K_K01 |
| | K1.1 Is able to build a single SCADA system functionality (e.g., logging) and integrate it into the overall visualization prepared by other group members. | |
| K2 | Is aware of the continuous development and impact of modern engineering methods and techniques in the field of Control engineering and robotics on the advancement of civilization. | K_K02 |

| | | | |
|--|-------------|---|--|
| | K2.1 | Understands the impact of engineering activities on the civilizational development of society | |
| | K2.2 | understands the non-technical aspects of engineering and their impact on the economy | |
| | K2.3 | determines the impact of remote surveillance systems on the organization of work in dispatch and maintenance departments. | |

EDUCATIONAL CONTENT

TOPIC

Lecture

| | |
|---|--|
| 1 | Overview of the lecture structure Introduction |
| 2 | Introduction to the TIA Portal environment |
| 3 | Principles of visualization design in the Wonderware Intouch system |
| 4 | Building simple HMI applications |
| 5 | Integration of SCADA applications with HMI and PLC |
| 6 | Creating scripts in the SCADA system |
| 7 | Generating current and historical trend charts in the SCADA system |
| 8 | Handling alarms in the SCADA system |
| 9 | Implementation of advanced visualization in the Wonderware Intouch environment |

Laboratory

| | |
|---|--|
| 1 | Overview of the lecture structure Introduction |
| 2 | Introduction to the TIA Portal environment |
| 3 | Principles of visualization design in the Wonderware Intouch system |
| 4 | Building simple HMI applications |
| 5 | Integration of SCADA applications with HMI and PLC |
| 6 | Creating scripts in the SCADA system |
| 7 | Generating current and historical trend charts in the SCADA system |
| 8 | Handling alarms in the SCADA system |
| 9 | Implementation of advanced visualization in the Wonderware Intouch environment |

Project

| | |
|---|--|
| 1 | Defining the project task. Specification of the goal, assumptions, functional and non-functional requirements. |
| 2 | Defining the application structure. Defining (writing down) use cases. |
| 3 | Implementation of the designed solution |
| 4 | Testing and corrections, and preparation of the final version of the project |
| 5 | Preparation of project documentation. Project completion. |

VERIFICATION OF LEARNING OUTCOMES

| CODE | DESCRIPTION | | | LEARNING OUTCOME |
|-------------------------------|-------------|---|--|------------------|
| Knowledge Lecture | | | | |
| W1 | W1.1 | 1 | Written test with open-ended questions | K_W16 |
| | W1.2 | 1 | Written test with open-ended questions | |
| Skills Lecture | | | | |
| U1 | U1.1 | 1 | Written test with open-ended questions | K_U18 |
| | U1.2 | 1 | Written test with open-ended questions | |
| Competencies Lecture | | | | |
| K1 | K1.1 | 1 | Written test with open-ended questions | K_K01 |
| K2 | K2.1 | 1 | Written test with open-ended questions | K_K02 |
| | K2.2 | 1 | Written test with open-ended questions | |
| | K2.3 | 1 | Written test with open-ended questions | |
| Knowledge Laboratory | | | | |
| W1 | W1.1 | 1 | design | K_W16 |
| | W1.2 | 1 | design | |
| Skills Laboratory | | | | |
| U1 | U1.1 | 1 | design | K_U18 |

| | | | | |
|---|--|--|---------------------|---|
| | U1.2 | 1 | design | |
| | | | Competencies | Laboratory |
| K1 | K1.1 | 1 | design | K_K01 |
| K2 | K2.1 | 1 | design | K_K02 |
| | K2.2 | 1 | design | |
| | K2.3 | 1 | design | |
| | | Knowledge | Project | |
| W1 | 1 | Project | | K_W16 |
| W2 | 1 | Multimedia presentation | | K_W22 |
| | | Skills | Project | |
| U1 | 1 | oral response | | K_U02 |
| U2 | 1 | report(s) | | K_U23 |
| FORMS OF ASSESSMENT | | | | |
| For each of the learning outcomes specified for the subject in terms of knowledge, skills, and competences, the assessment is as follows: | | | | |
| 2,0 | the student obtains less than 51% of the maximum number of points | | 4,0 | the student obtains between 71% and 80% of the maximum number of points |
| 3,0 | the student obtains between 51% and 60% of the maximum number of points | | 4,5 | the student obtains between 81% and 90% of the maximum number of points |
| 3,5 | the student obtains between 61% and 70% of the maximum number of points | | 5,0 | student scores above 90% of the maximum number of points |
| Assessment criteria according to the scale: | | | | |
| very good | 5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a very good degree | | |
| good plus | 4,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a more than good degree | | |
| good | 4 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a good degree | | |
| sufficient plus | 3,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a fairly good degree | | |
| satisfactory | 3 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a satisfactory degree | | |
| unsatisfactory | 3 | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice | | |
| pass | pass | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice | | |
| failed | nzal | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice | | |
| LITERATURE | | | | |
| Basic | | | | |
| 1 | Witczak M., System control and visualization, PWSZ in Głogów, Głogów, 2011. | | | |
| 2 | Dzierżek K., Programming GE Fanuc controllers, Wyd. Pol. Biały., 2007. | | | |
| 3 | Kwaśniewski J., PLC controllers in engineering practice, BTC, Legionowo, 2008. | | | |
| Supplementary | | | | |
| 1 | Oprędkiewicz K., SCADA systems in the Android environment, Measurements, Automation, Robotics No. 12, pp. 95-99, 2014. | | | |

STATE ACADEMY OF APPLIED SCIENCES IN GŁOGÓW

INSTITUTE OF ENGINEERING AND TECHNICAL SCIENCES

SYLLABUS / COURSE DESCRIPTION



| BASIC INFORMATION ABOUT THE SUBJECT | | | |
|---|--|--|--------------------------|
| Name of the subject (module) | HMI panel design | | Course code 39 |
| Name of the unit teaching the subject | | Institute of Engineering and Technology Sciences | |
| Level of education | First-cycle studies | Profile | Practical |
| Field of study | Control engineering and robotics | Specialization | |
| Education module | Major | Language of instruction | English |
| Semester | V | Form of assessment | Pass with a grade |
| HOURLY DIMENSION OF DIDACTIC CLASSES | | | |
| FULL-TIME STUDIES | | | |
| Lecture | Project | | Laboratory |
| 15 | 30 | | 30 |
| TOTAL HOURLY DIMENSION OF CLASSES | | | |
| Student's independent work | | 75 | |
| Total | | 150 | |
| ECTS | | 6 | |
| PREREQUISITES | | | |
| High school level knowledge of mathematics in the basic range | | | |
| COURSE OBJECTIVE | | | |
| To familiarize students with the basics of HMI systems using the EasyBuilder8000 program as an example familiarizing students with methods of implementing HMI systems, familiarizing students with methods of programming operator panels. | | | |
| LEARNING OUTCOMES FOR THE COURSE | | | |
| CODE | DESCRIPTION | | LEARNING OUTCOME |
| Knowledge | | | |
| W1 | Has advanced knowledge in the selected specialization | | K_W16 |
| | W1.1 | Knows the basic properties of the Win CC flexible programming environment. | |
| | W1.2 | Has knowledge of basic tools for constructing HMIs using Win CC flexible. | |
| Skills | | | |
| U1 | Is able to use specialist knowledge to solve simple tasks related to the chosen specialization | | K_U18 |
| | U1.1 | Can design and implement a simple HMI application | |
| | U1.2 | is able to design an HMI panel for specific tasks, taking into account the operator's level of perception and application security | |
| Competencies | | | |
| K1 | Is consciously responsible for their own work and follows the rules for teamwork | | K_K01 |
| | K1.1 | Understands the possibility of dividing the work of designing HMI panel visualizations into different stages performed by other programmers. | |

| | | | | |
|--|---|---|-------------------------|--------------|
| K2 | Is aware of the continuous development and impact of modern engineering methods and techniques in the field of Control engineering and robotics on the advancement of civilization. | | K_K02 | |
| | K2.1 | Understands the impact of engineering activities on the civilizational development of society | | |
| | K2.2 | understands the non-technical aspects of engineering and their impact on the economy | | |
| | K2.3 | Understands the need to take into account the user level context when designing human-machine communication | | |
| EDUCATIONAL CONTENT | | | | |
| TOPIC | | | | |
| Lecture | | | | |
| 1 | Overview of the lecture structure Introduction | | | |
| 2 | Introduction to the TIA Portal and Win CC flexible environments. | | | |
| 3 | Principles of HMI application design in Win CC flexible. | | | |
| 4 | Building simple HMI applications | | | |
| 5 | Integration of HMI applications with PLC | | | |
| 6 | Programming AstradA operator panels | | | |
| 7 | Programming Weintek operator panels | | | |
| 8 | Integration of HMI systems with external devices | | | |
| 9 | Implementation of an advanced HMI project | | | |
| Laboratory | | | | |
| 1 | Overview of the lecture structure Introduction | | | |
| 2 | Introduction to the TIA Portal and Win CC flexible environments. | | | |
| 3 | Principles of HMI application design in Win CC flexible. | | | |
| 4 | Building simple HMI applications | | | |
| 5 | Integration of HMI applications with PLC | | | |
| 6 | Programming AstradA operator panels | | | |
| 7 | Programming Weintek operator panels | | | |
| 8 | Integration of HMI systems with external devices | | | |
| 9 | Implementation of an advanced HMI project | | | |
| Project | | | | |
| 1 | Defining the project task. Specification of the goal, assumptions, functional and non-functional requirements. | | | |
| 2 | Defining the application structure. Defining (writing down) use cases. | | | |
| 3 | Implementation of the designed solution | | | |
| 4 | Testing and corrections, and preparation of the final version of the project | | | |
| 5 | Preparation of project documentation. Project completion. | | | |
| VERIFICATION OF LEARNING OUTCOMES | | | | |
| CODE | DESCRIPTION | | LEARNING OUTCOME | |
| Knowledge | | Lecture | | |
| W1 | W1.1 | 1 | design | K_W16 |
| | | 2 | Class participation | |
| | W1.2 | 1 | design | |
| | | 2 | Class participation | |
| Skills | | Lecture | | |
| U1 | U1.1 | 1 | design | K_U18 |
| | | 2 | Class participation | |
| | U1.2 | 1 | design | |
| | | 2 | Class participation | |
| Competencies | | Lecture | | |
| K1 | K1.1 | 1 | Class participation | K_K01 |
| K2 | K2.1 | 1 | Class participation | K_K02 |

| | | | | |
|---|---|--|---------------------|---|
| | K2.2 | 1 | Class participation | |
| | K2.3 | 1 | Class participation | |
| | | Knowledge | | Laboratory |
| W1 | W1.1 | 1 | design | K_W16 |
| | | 2 | Class participation | |
| | W1.2 | 1 | design | |
| | | 2 | Class participation | |
| | | Skills | | Laboratory |
| U1 | U1.1 | 1 | design | K_U18 |
| | | 2 | Class participation | |
| | U1.2 | 1 | design | |
| | | 2 | Class participation | |
| | | Competencies | | Laboratory |
| K1 | K1.1 | 1 | Class participation | K_K01 |
| K2 | K2.1 | 1 | Class participation | K_K02 |
| | K2.2 | 1 | Class participation | |
| | K2.3 | 1 | Class participation | |
| | | Knowledge | | Project |
| W1 | 1 | Project | | K_W16 |
| W2 | 1 | Multimedia presentation | | K_W22 |
| | | Skills | | Project |
| U1 | 1 | oral response | | K_U02 |
| U2 | 1 | report(s) | | K_U23 |
| FORMS OF ASSESSMENT | | | | |
| For each of the learning outcomes specified for the subject in terms of knowledge, skills, and competences, the assessment is as follows: | | | | |
| 2,0 | the student obtains less than 51% of the maximum number of points | | 4,0 | the student obtains between 71% and 80% of the maximum number of points |
| 3,0 | the student obtains between 51% and 60% of the maximum number of points | | 4,5 | the student obtains between 81% and 90% of the maximum number of points |
| 3,5 | the student obtains between 61% and 70% of the maximum number of points | | 5,0 | student scores above 90% of the maximum number of points |
| Assessment criteria according to the scale: | | | | |
| very good | 5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a very good degree | | |
| good plus | 4,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a more than good degree | | |
| good | 4 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a good degree | | |
| sufficient plus | 3,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a fairly good degree | | |
| satisfactory | 3 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a satisfactory degree | | |
| unsatisfactory | 3 | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice | | |
| pass | pass | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice | | |
| failed | nzal | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice | | |
| LITERATURE | | | | |
| Basic | | | | |
| 1 | Witczak M., System control and visualization, PWSZ in Głogów, Głogów, 2011. | | | |
| 2 | Dzierżek K., Programming GE Fanuc controllers, Wyd. Pol. Biał., 2007. | | | |
| 3 | Jakuszewski, R., Advanced issues in SCADA system programming - Supervisory Control and Data Acquisition: Proficy HMI/SCADA iFIX 5.0 PL, 2010. | | | |
| Supplementary | | | | |
| 1 | Kwaśniewski J., PLC controllers in engineering practice, BTC, Legionowo, 2008. | | | |

STATE ACADEMY OF APPLIED SCIENCES IN GŁOGÓW

INSTITUTE OF ENGINEERING AND TECHNICAL SCIENCES

SYLLABUS / COURSE DESCRIPTION



| BASIC INFORMATION ABOUT THE SUBJECT | | | |
|---|---|--|--------------------------|
| Name of the subject (module) | Sensors | | Course code 40 |
| Name of the unit teaching the subject | | Institute of Engineering and Technology Sciences | |
| Level of education | First-cycle studies | Profile | Practical |
| Field of study | Control engineering and robotics | Specialization | |
| Education module | Major | Language of instruction | English |
| Semester | VI | Form of assessment | Pass with a grade |
| HOURLY DIMENSION OF DIDACTIC CLASSES | | | |
| FULL-TIME STUDIES | | | |
| Lecture | Project | | Laboratory |
| 15 | 30 | | 30 |
| TOTAL HOURLY DIMENSION OF CLASSES | | | |
| Student's independent work | | 75 | |
| Total | | 150 | |
| ECTS | | 6 | |
| PREREQUISITES | | | |
| Mathematics and physics course | | | |
| COURSE OBJECTIVE | | | |
| Familiarizing students with the design and operation of sensors used in robotics and automation. Knowledge of measurement circuits for the above-mentioned sensors and devices that collect data from sensors. | | | |
| LEARNING OUTCOMES FOR THE COURSE | | | |
| CODE | DESCRIPTION | | LEARNING OUTCOME |
| Knowledge | | | |
| W1 | Has advanced knowledge of the basics of electrical engineering and electronics, including knowledge of basic phenomena, laws, quantities, and units necessary for the analysis of simple electrical and electronic circuits of direct and sinusoidal alternating current. Understands and is able to apply this knowledge in the context of Control engineering and robotics. | | K_W07 |
| | W1.1 | Is able to analyze the operation of a simple electrical/electronic circuit. Is able to analyze non-technical aspects of engineering activities and draw conclusions. | |
| W2 | Has advanced knowledge of industrial property protection and copyright law; is able to use patent information resources | | K_W19 |
| | W2.1 | Analyzes technical documentation, applies copyright protection rules. | |
| Skills | | | |
| U1 | Is able to use and appropriately select applications for engineering calculations, synthesis, and analysis of system models, both digital and analog. | | K_U05 |
| | U1.1 | Continuously obtains information from many sources in order to improve and apply it in professional work. Is able to select and use engineering applications, model systems with their help. Is able to create presentations using multimedia techniques and present them. | |

| | | | | |
|--|---|--|--|-------------------------|
| U2 | Is able to: (1) perform measurements of basic electrical quantities, (2) process the obtained measurement results, (3) determine measurement errors and uncertainties | | | K_U10 |
| | U2.1 | Builds measurement systems, analyzes measurement results, and processes them mathematically to calculate errors and trends | | |
| Competencies | | | | |
| K1 | Is aware of the need to clearly formulate information related to technological achievements for the chosen field of study. | | | K_K04 |
| | K1.1 | Uses appropriate techniques for communicating information. Accepts the need for continuous civilizational development. Is able to work in a group, understands its goals, and takes a specific position in the group | | |
| EDUCATIONAL CONTENT | | | | |
| TOPIC | | | | |
| Lecture | | | | |
| 1 | Performing measurements, measurement methods, elements of the measurement track | | | |
| 2 | Measurement inaccuracy, types of errors, processing of measurement results | | | |
| 3 | Calibration of measuring instruments | | | |
| 4 | Temperature sensors | | | |
| 5 | Position sensors | | | |
| 6 | Vibration sensors | | | |
| 7 | Torque and pressure sensors | | | |
| 8 | Optoelectronic sensors | | | |
| 9 | Sensor support via network systems, HART protocol, Zigbee networks | | | |
| Laboratory | | | | |
| 1 | Measurement implementation, measurement methods, measurement path components - selection and configuration | | | |
| 2 | Measurement inaccuracy, types of errors, measurement uncertainty, processing of measurement results - calculations | | | |
| 3 | Calibration of measuring instruments - applicable regulations and their interpretation | | | |
| 4 | Temperature sensors - types, connection and configuration | | | |
| 5 | Position sensors - types, kinds, connection and configuration | | | |
| 6 | Vibration sensors - types, kinds, connection and configuration | | | |
| 7 | Torque and pressure sensors - types, connection and configuration | | | |
| 8 | Optoelectronic sensors – types, varieties, connection and configuration | | | |
| 9 | Sensor support by network systems, HART protocol, Zigbee networks - module configuration | | | |
| Project | | | | |
| 1 | Defining the project task. Specification of the goal, assumptions, functional and non-functional requirements. | | | |
| 2 | Defining the application structure. Defining (writing down) use cases. | | | |
| 3 | Implementation of the designed solution | | | |
| 4 | Testing and corrections, and preparation of the final version of the project | | | |
| 5 | Preparation of project documentation. Project completion. | | | |
| VERIFICATION OF LEARNING OUTCOMES | | | | |
| CODE | | DESCRIPTION | | LEARNING OUTCOME |
| | | Knowledge | | Lecture |
| W1 | W1.1 | 1 | Written test with open-ended questions | K_W07 |
| W2 | W2.1 | 1 | Written test with open-ended questions | K_W19 |
| | | Skills | | Lecture |
| U1 | U1.1 | 1 | Practical test | K_U05 |
| U2 | U2.1 | 1 | Practical test | K_U10 |
| | | Competencies | | Lecture |
| K1 | K1.1 | 1 | semester project | K_K04 |
| | | 2 | Class participation | |
| | | Knowledge | | Laboratory |
| W1 | W1.1 | 1 | semester project | K_W07 |
| | | 2 | Class participation | |

| | | | | |
|---|--|--|---------------------|---|
| W2 | W2.1 | 1 | Practical test | K_W19 |
| | | | Skills | Laboratory |
| U1 | U1.1 | 1 | Practical test | K_U05 |
| U2 | U2.1 | 1 | semester project | K_U10 |
| | | | Competencies | Laboratory |
| K1 | K1.1 | 1 | semester project | K_K04 |
| | | 2 | Class participation | |
| | | Knowledge | Project | |
| W1 | 1 | Project | | K_W16 |
| W2 | 1 | Multimedia presentation | | K_W22 |
| | | | Skills | Project |
| U1 | 1 | oral response | | K_U02 |
| U2 | 1 | report(s) | | K_U23 |
| FORMS OF ASSESSMENT | | | | |
| For each of the learning outcomes specified for the subject in terms of knowledge, skills, and competences, the assessment is as follows: | | | | |
| 2,0 | the student obtains less than 51% of the maximum number of points | | 4,0 | the student obtains between 71% and 80% of the maximum number of points |
| 3,0 | the student obtains between 51% and 60% of the maximum number of points | | 4,5 | the student obtains between 81% and 90% of the maximum number of points |
| 3,5 | the student obtains between 61% and 70% of the maximum number of points | | 5,0 | student scores above 90% of the maximum number of points |
| Assessment criteria according to the scale: | | | | |
| very good | 5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a very good degree | | |
| good plus | 4,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a more than good degree | | |
| good | 4 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a good degree | | |
| sufficient plus | 3,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a fairly good degree | | |
| satisfactory | 3 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a satisfactory degree | | |
| unsatisfactory | 3 | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice | | |
| pass | pass | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice | | |
| failed | nzal | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice | | |
| LITERATURE | | | | |
| Basic | | | | |
| 1 | Miłek M.: Electrical metrology of non-electrical quantities, Zielona Góra: Publishing House of the University of Zielona Góra, 2006. | | | |
| 2 | M. Rząsa, Electrical and electronic temperature sensors, Wydawnictwa Komunikacji i Łączności 2005 | | | |
| 3 | W. Nawrocki, Sensors and measurement systems, Poznań University of Technology Publishing House 2005 | | | |
| Supplementary | | | | |
| 1 | Tumański S.: Measurement Technology, WNT, Warsaw 2007. | | | |
| 2 | Sensors Evaluation Techniques, Cville Gail Vance, Publisher: Crc Pr Inc | | | |

STATE ACADEMY OF APPLIED SCIENCES IN GŁOGÓW

INSTITUTE OF ENGINEERING AND TECHNICAL SCIENCES

SYLLABUS / COURSE DESCRIPTION



| BASIC INFORMATION ABOUT THE SUBJECT | | | |
|--|--|--|--------------------------|
| Name of the subject (module) | Control Theory | | Course code 41 |
| Name of the unit teaching the subject | | Institute of Engineering and Technology Sciences | |
| Level of education | First-cycle studies | Profile | Practical |
| Field of study | Control engineering and robotics | Specialization | |
| Education module | Major | Language of instruction | English |
| Semester | III | Form of assessment | Pass with a grade |
| HOURLY DIMENSION OF DIDACTIC CLASSES | | | |
| FULL-TIME STUDIES | | | |
| Lecture | Project | | Laboratory |
| 15 | 30 | | 30 |
| TOTAL HOURLY DIMENSION OF CLASSES | | | |
| Student's independent work | | 75 | |
| Total | | 150 | |
| ECTS | | 6 | |
| PREREQUISITES | | | |
| Course in mathematics, linear algebra, and system analysis and modeling | | | |
| COURSE OBJECTIVE | | | |
| Familiarizing students with basic techniques for designing continuous process control systems Developing students' understanding of state feedback control techniques Developing students' understanding of output-feedback control techniques | | | |
| LEARNING OUTCOMES FOR THE COURSE | | | |
| CODE | DESCRIPTION | | LEARNING OUTCOME |
| Knowledge | | | |
| W1 | Has advanced knowledge of the basic types and structures of automatic control systems: (1) understands the need to construct a mathematical description of the system for the purposes of control system design, (2) has basic knowledge of control system design methods, (3) has elementary knowledge related to the control of discrete and continuous systems. | | K_W10 |
| | W1.1 | Able to draw a block diagram of a control system and create a mathematical description for it. | |
| W2 | Has advanced knowledge of: (1) signal quantization and sampling, (2) digital control algorithms, including digital PID controllers, (3) implementation of state-feedback and output-feedback control systems using state observers. | | K_W13 |
| | W2.1 | Able to describe the PID algorithm | |
| Skills | | | |
| U1 | Is able to apply controller design techniques and assess the quality of their operation. | | K_U12 |
| | U1.1 | Be able to design a controller and determine its performance | |
| U2 | Is able to use modern engineering software tools, e.g., Matlab Control System Toolbox and Simulink, in the design of automatic control systems | | K_U16 |

| | | | | |
|--|---|--|--|-------------------------|
| | U2.1 | Able to simulate a given automation system | | |
| Competencies | | | | |
| K1 | Is aware of the rapid obsolescence of acquired knowledge for the chosen field of study and the resulting need to improve professional competences based on emerging technologies, knowing the possibilities of further education both at higher levels of study and in training courses conducted by recognized institutions. | | | K_K03 |
| | K1.1 | Actively participates in activities that improve professional qualifications | | |
| EDUCATIONAL CONTENT | | | | |
| TOPIC | | | | |
| Lecture | | | | |
| 1 | Basic concepts and definitions. Overview of the lecture structure | | | |
| 2 | Simulating the operation of systems. Phase plane method. | | | |
| 3 | Connecting systems. | | | |
| 4 | Stability and methods of its analysis: Lapunov method, pole testing | | | |
| 5 | Controllability, attainability, and observability | | | |
| 6 | State feedback control | | | |
| 7 | State feedback control with specified quality parameters | | | |
| 8 | State feedback control: state observers, separability principle | | | |
| 9 | Predictive control: consideration of constraints and minimization of the quality criterion | | | |
| Laboratory | | | | |
| 1 | Basic concepts and definitions. Overview of the course structure | | | |
| 2 | Simulating system operation. Phase plane method - exercise | | | |
| 3 | System coupling - exercise | | | |
| 4 | Stability and methods of its analysis: Lapunov method, pole examination - determining stability | | | |
| 5 | Controllability, attainability, and observability – exercise | | | |
| 6 | State feedback control – exercise | | | |
| 7 | State feedback control with given quality parameters - exercise | | | |
| 8 | State feedback control: state observers, separability principle - exercise | | | |
| 9 | Predictive control: taking constraints into account and minimizing the quality criterion - exercise | | | |
| Project | | | | |
| 1 | Basic concepts and definitions. Project overview, topic assignment | | | |
| 2 | Simulating system operation. Phase plane method. Reference to the project | | | |
| 3 | Combining systems in the project area | | | |
| 4 | Project - stability testing - Lapunov method, pole testing | | | |
| 5 | Controllability, attainability, and observability. State feedback control | | | |
| 6 | Project - discussion of the first stage of the project | | | |
| 7 | State feedback control with specified quality parameters | | | |
| 8 | State feedback control: state observers, separability principle. Predictive control: taking constraints into account and minimizing the quality criterion | | | |
| 9 | Presentation and discussion of the project. Checking whether the project contains the required content from the lecture and laboratory | | | |
| VERIFICATION OF LEARNING OUTCOMES | | | | |
| CODE | DESCRIPTION | | | LEARNING OUTCOME |
| | | Knowledge | Lecture | |
| W1 | W1.1 | 1 | Written test with open-ended questions | K_W10 |
| | | 2 | design | |
| W2 | W2.1 | 1 | Written test with open-ended questions | K_W13 |
| | | Skills | Lecture | |
| U1 | U1.1 | 1 | Written test with open-ended questions | K_U12 |
| U2 | U2.1 | 1 | Practical test | K_U16 |
| | | 2 | Class participation | |
| | | Competencies | Lecture | |
| K1 | K1.1 | 1 | design | K_K03 |
| | | 2 | report | |
| | | Knowledge | Laboratory | |

| | | | | |
|---|---|--|--|---|
| W1 | W1.1 | 1 | design | K_W10 |
| | | 2 | report | |
| W2 | W2.1 | 1 | Written test with open-ended questions | K_W13 |
| | | | Skills | Laboratory |
| U1 | U1.1 | 1 | design | K_U12 |
| U2 | U2.1 | 1 | design | K_U16 |
| | | | Competencies | Laboratory |
| K1 | K1.1 | 1 | design | K_K03 |
| | | | Knowledge | Project |
| W1 | W1.1 | 1 | design | K_W10 |
| W2 | W2.1 | 1 | design | K_W13 |
| | | | Skills | Project |
| U1 | U1.1 | 1 | design | K_U12 |
| U2 | U2.1 | 1 | design | K_U16 |
| | | | Competencies | Project |
| K1 | K1.1 | 1 | design | K_K03 |
| | | 2 | report | |
| FORMS OF ASSESSMENT | | | | |
| For each of the learning outcomes specified for the subject in terms of knowledge, skills, and competences, the assessment is as follows: | | | | |
| 2,0 | the student obtains less than 51% of the maximum number of points | | 4,0 | the student obtains between 71% and 80% of the maximum number of points |
| 3,0 | the student obtains between 51% and 60% of the maximum number of points | | 4,5 | the student obtains between 81% and 90% of the maximum number of points |
| 3,5 | the student obtains between 61% and 70% of the maximum number of points | | 5,0 | student scores above 90% of the maximum number of points |
| Assessment criteria according to the scale: | | | | |
| very good | 5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a very good degree | | |
| good plus | 4,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a more than good degree | | |
| good | 4 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a good degree | | |
| sufficient plus | 3,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a fairly good degree | | |
| satisfactory | 3 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a satisfactory degree | | |
| unsatisfactory | 3 | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice | | |
| pass | pass | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice | | |
| failed | nzal | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice | | |
| LITERATURE | | | | |
| Basic | | | | |
| 1 | W. Mitkowski. Control theory: supplementary materials for laboratory exercises. AGH University of Science and Technology. University Scientific and Didactic Publishing House, 2007 | | | |
| 2 | J. Kabziński, Control theory: design of control systems, PWN Warsaw 2021 | | | |
| 3 | Witczak M., Control and visualization of systems, State Higher Vocational School in Głogów, Głogów, 2011 | | | |
| Supplementary | | | | |
| 1 | Brzózka J., Regulators and automation systems, MIKOM, Warsaw, 2004 | | | |
| 2 | Kaczorek T., Dzieliński A., Dąbrowski W., Łopatka R., Fundamentals of Control Theory, WNT, Warsaw, 2006 | | | |
| 3 | Leigh J. R. Essentials of Non-Linear Control Theory, | | | |

STATE ACADEMY OF APPLIED SCIENCES IN GŁOGÓW

INSTITUTE OF ENGINEERING AND TECHNICAL SCIENCES

SYLLABUS / COURSE DESCRIPTION



| BASIC INFORMATION ABOUT THE SUBJECT | | | |
|---|--|--|--------------------------|
| Name of the subject (module) | Transitional Project I | | Course code 53 |
| Name of the unit teaching the subject | | Institute of Engineering and Technology Sciences | |
| Level of education | First-cycle studies | Profile | Practical |
| Field of study | Control engineering and robotics | Specialization | AiUR |
| Education module | Specialization | Language of instruction | English |
| Semester | VI | Form of assessment | Pass with a grade |
| HOURLY DIMENSION OF DIDACTIC CLASSES | | | |
| FULL-TIME STUDIES | | | |
| Lecture | Project | | Laboratory |
| 0 | 75 | | 0 |
| TOTAL HOURLY DIMENSION OF CLASSES | | | |
| Student's independent work | | 75 | |
| Total | | 150 | |
| ECTS | | 6 | |
| PREREQUISITES | | | |
| Ability to create technical documentation, ability to search for and process information | | | |
| COURSE OBJECTIVE | | | |
| Developing the ability to solve technical problems using knowledge from various fields of technology. | | | |
| LEARNING OUTCOMES FOR THE COURSE | | | |
| CODE | DESCRIPTION | | LEARNING OUTCOME |
| Knowledge | | | |
| W1 | Has advanced knowledge of mathematics, including: mathematical analysis, linear algebra, probabilistic methods, mathematical statistics, and operations on complex variables aimed at solving problems such as: (1) analysis and synthesis of dynamic systems, (2) analysis of experimental results, (3) analysis and synthesis of electrical and electronic circuits, (4) solving general mechanics problems, including kinematics and dynamics. Is able to apply this knowledge in the field of study. | | K_W01 |
| | W1.1 | Analyzes the project topic | |
| W2 | Has advanced knowledge of the basics of electrical engineering and electronics, including knowledge of basic phenomena, laws, quantities, and units necessary for the analysis of simple electrical and electronic circuits of direct and sinusoidal alternating current. Understands and is able to apply this knowledge in the context of Control engineering and robotics. | | K_W07 |
| | W2.1 | Calculates the parameters and values necessary for the project | |
| W3 | Has advanced general knowledge of industrial automation devices and industrial networks, knowing their systematics, applicable standards, and symbols used to represent them. | | K_W14 |
| | W3.1 | Able to place the project in the field of automation | |
| W4 | Has advanced knowledge in the selected specialization | | K_W16 |

| | | | | |
|---|---|---|----------------|---|
| | W4.1 | Synthesizes project elements | | |
| W5 | Has advanced knowledge of the current state and latest trends in the development of Control engineering and robotics. | | | K_W17 |
| | W5.1 | The project corresponds to the current state of knowledge | | |
| Skills | | | | |
| U1 | Is able to design simple digital circuits and configure computer hardware and computer network devices | | | K_U07 |
| | U1.1 | Uses a computer efficiently | | |
| U2 | Is able to examine the basic properties of linear dynamic systems, such as: (1) stability, (2) controllability, (3) observability | | | K_U11 |
| | U2.1 | Performs analysis of the operation of a dynamic system | | |
| U3 | Is able to assess the usefulness of methods and tools used to solve engineering problems typical for the chosen field of study. Is able to select and apply appropriate methods and tools | | | K_U21 |
| | U3.1 | Selects appropriate methods and tools. Efficiently obtains and analyzes information. Synthesizes information in the project area | | |
| Competencies | | | | |
| K1 | Is aware of the need to clearly formulate information related to technological achievements for the chosen field of study. | | | K_K04 |
| | K1.1 | Effectively presents the results of work. Accepts and applies group priorities. Applies modern methods in the project area. Takes a specific position in the team, accepts and applies the rules in force in it | | |
| EDUCATIONAL CONTENT | | | | |
| TOPIC | | | | |
| Project | | | | |
| 1 | Discussion of the structure and scope of classes. Introduction | | | |
| 2 | Case study of a device malfunction or operation | | | |
| 3 | Determination of methods and tools for repair/renovation/modernization | | | |
| 4 | Verification of the functional correctness of the designed system | | | |
| 5 | Preparation of technical documentation | | | |
| 6 | Presentation of the project | | | |
| VERIFICATION OF LEARNING OUTCOMES | | | | |
| CODE | DESCRIPTION | | | LEARNING OUTCOME |
| | Knowledge | | Project | |
| W1 | W1.1 | 1 | design | K_W01 |
| W2 | W2.1 | 1 | design | K_W07 |
| W3 | W3.1 | 1 | design | K_W14 |
| W4 | W4.1 | 1 | design | K_W16 |
| W5 | W5.1 | 1 | design | K_W17 |
| | Skills | | Project | |
| U1 | U1.1 | 1 | design | K_U07 |
| U2 | U2.1 | 1 | design | K_U11 |
| U3 | U3.1 | 1 | design | K_U21 |
| | Competencies | | Project | |
| K1 | K1.1 | 1 | design | K_K04 |
| FORMS OF ASSESSMENT | | | | |
| For each of the learning outcomes specified for the subject in terms of knowledge, skills, and competences, the assessment is as follows: | | | | |
| 2,0 | the student obtains less than 51% of the maximum number of points | | 4,0 | the student obtains between 71% and 80% of the maximum number of points |
| 3,0 | the student obtains between 51% and 60% of the maximum number of points | | 4,5 | the student obtains between 81% and 90% of the maximum number of points |

| | | | |
|--|---|--|--|
| 3,5 | the student obtains between 61% and 70% of the maximum number of points | 5,0 | student scores above 90% of the maximum number of points |
| Assessment criteria according to the scale: | | | |
| very good | 5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a very good degree | |
| good plus | 4,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a more than good degree | |
| good | 4 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a good degree | |
| sufficient plus | 3,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a fairly good degree | |
| satisfactory | 3 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a satisfactory degree | |
| unsatisfactory | 3 | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice | |
| pass | pass | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice | |
| failed | nzal | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice | |
| LITERATURE | | | |
| Basic | | | |
| 1 | L. Kurmaz, Fundamentals of designing machine components and assemblies, Kielce: Kielce University of Technology, 2011 | | |
| 2 | T. Dobrzański, Technical drawing of machines, Warsaw, Scientific and Technical Publishing House, 2009 | | |
| Supplementary | | | |
| 1 | Cz. Grzbiela, Machines, Electrical Equipment, and Automation in Industry, Wydawnictwo Śląsk 2010 | | |
| 2 | Engineering Design by John Karsnitz, | | |
| 3 | Engineering Project Management for the Global High-Technology Industry, Sammy G Shina, McGraw-Hill Companies; Illustrated Edition (January 7, 2014) | | |

STATE ACADEMY OF APPLIED SCIENCES IN GŁOGÓW

INSTITUTE OF ENGINEERING AND TECHNICAL SCIENCES

SYLLABUS / COURSE DESCRIPTION



| BASIC INFORMATION ABOUT THE SUBJECT | | | |
|---|--|--|--------------------------|
| Name of the subject (module) | Transitional Project II | | Course code 54 |
| Name of the unit teaching the subject | | Institute of Engineering and Technology Sciences | |
| Level of education | First-cycle studies | Profile | Practical |
| Field of study | Control engineering and robotics | Specialization | AiUR |
| Education module | Specialization | Language of instruction | English |
| Semester | VI | Form of assessment | Pass with a grade |
| HOURLY DIMENSION OF DIDACTIC CLASSES | | | |
| FULL-TIME STUDIES | | | |
| Lecture | Project | | Laboratory |
| 0 | 75 | | 0 |
| TOTAL HOURLY DIMENSION OF CLASSES | | | |
| Student's independent work | | 75 | |
| Total | | 150 | |
| ECTS | | 6 | |
| PREREQUISITES | | | |
| Knowledge and skills from previously completed courses, in particular in the field of control and regulation system design | | | |
| COURSE OBJECTIVE | | | |
| Developing the ability to solve technical problems using knowledge from various fields of technology. Acquiring skills and experience in preparing studies in preparation for work in industrial plants | | | |
| LEARNING OUTCOMES FOR THE COURSE | | | |
| CODE | DESCRIPTION | | LEARNING OUTCOME |
| Knowledge | | | |
| W1 | Has advanced knowledge of mathematics, including: mathematical analysis, linear algebra, probabilistic methods, mathematical statistics, and operations on complex variables aimed at solving problems such as: (1) analysis and synthesis of dynamic systems, (2) analysis of experimental results, (3) analysis and synthesis of electrical and electronic circuits, (4) solving general mechanics problems, including kinematics and dynamics. Is able to apply this knowledge in the field of study. | | K_W01 |
| | W1.1 | Analyzes the project topic | |
| W2 | Has advanced knowledge of the basics of electrical engineering and electronics, including knowledge of basic phenomena, laws, quantities, and units necessary for the analysis of simple electrical and electronic circuits of direct and sinusoidal alternating current. Understands and is able to apply this knowledge in the context of Control engineering and robotics. | | K_W07 |
| | W2.1 | Calculates the parameters and values necessary for the project | |
| W3 | Has advanced general knowledge of industrial automation devices and industrial networks, knowing their systematics, applicable standards, and symbols used to represent them. | | K_W14 |

| | | | | |
|---|---|---|----------------|---|
| | W3.1 | Able to place the project in the field of automation. Synthesizes project elements | | |
| W4 | Has advanced knowledge of the current state and latest trends in the development of Control engineering and robotics. | | | K_W17 |
| | W4.1 | The project corresponds to the current state of knowledge | | |
| Skills | | | | |
| U1 | The student is able to obtain information from sources such as literature, databases, and other commonly available media, as well as integrate it for interpretation, draw conclusions, and formulate opinions. | | | K_U01 |
| | U1.1 | Efficiently obtains and analyzes information | | |
| U2 | Is able to design simple digital circuits and configure computer hardware and computer network devices | | | K_U07 |
| | U2.1 | Uses a computer efficiently | | |
| U3 | Is able to examine the basic properties of linear dynamic systems, such as: (1) stability, (2) controllability, (3) observability | | | K_U11 |
| | U3.1 | Efficiently obtains and analyzes information. Analyzes the operation of a dynamic system. Synthesizes information in the project area. Selects appropriate methods and tools | | |
| Competencies | | | | |
| K1 | Is aware of the need to clearly formulate information related to technological achievements for the chosen field of study. | | | K_K04 |
| | K1.1 | Effectively presents the results of work. Accepts and applies group priorities. Applies modern methods in the project area. Takes a specific position in the team, accepts and applies the rules in force in it | | |
| EDUCATIONAL CONTENT | | | | |
| TOPIC | | | | |
| Project | | | | |
| 1 | Overview of the course structure. Introduction | | | |
| 2 | Assignment of a project task based on automation systems; the task should include elements of PLC programming, elements of control techniques, | | | |
| 3 | discussion of work progress - consultation of problems, indication of necessary corrections and additions | | | |
| 4 | checking the functional correctness of the designed system | | | |
| 5 | preparation of technical documentation | | | |
| 6 | project presentation - analysis of results | | | |
| VERIFICATION OF LEARNING OUTCOMES | | | | |
| CODE | DESCRIPTION | | | LEARNING OUTCOME |
| | Knowledge | | Project | |
| W1 | W1.1 | 1 | design | K_W01 |
| W2 | W2.1 | 1 | design | K_W07 |
| W3 | W3.1 | 1 | design | K_W14 |
| W4 | W4.1 | 1 | design | K_W17 |
| | Skills | | Project | |
| U1 | U1.1 | 1 | design | K_U01 |
| U2 | U2.1 | 1 | design | K_U07 |
| U3 | U3.1 | 1 | design | K_U11 |
| | Competencies | | Project | |
| K1 | K1.1 | 1 | design | K_K04 |
| FORMS OF ASSESSMENT | | | | |
| For each of the learning outcomes specified for the subject in terms of knowledge, skills, and competences, the assessment is as follows: | | | | |
| 2,0 | the student obtains less than 51% of the maximum number of points | | 4,0 | the student obtains between 71% and 80% of the maximum number of points |

| | | | |
|------------|---|------------|---|
| 3,0 | the student obtains between 51% and 60% of the maximum number of points | 4,5 | the student obtains between 81% and 90% of the maximum number of points |
| 3,5 | the student obtains between 61% and 70% of the maximum number of points | 5,0 | student scores above 90% of the maximum number of points |

Assessment criteria according to the scale:

| | | |
|-----------------|-------------|--|
| very good | 5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a very good degree |
| good plus | 4,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a more than good degree |
| good | 4 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a good degree |
| sufficient plus | 3,5 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a fairly good degree |
| satisfactory | 3 | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice to a satisfactory degree |
| unsatisfactory | 3 | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice |
| pass | pass | the student knows, understands, and explains the intended learning outcomes and is able to apply them in practice |
| failed | nzal | the student does not know, understand, or explain the intended learning outcomes and is unable to apply them in practice |

LITERATURE

Basic

| | |
|---|--|
| 1 | Dzierżek K., Programming GE Fanuc Controllers, Wyd. Pol. Biał., 2007 |
| 2 | Witczak M., Control and visualization of systems, State Higher Vocational School in Głogów, Głogów, 2011 |

Supplementary

| | |
|---|--|
| 1 | Automation, Production Systems, and Computer-Integrated Manufacturing, Global Edition, Mikell Groover, PEARSON Education Limited, April 2015 |
| 2 | Kwaśniewski J., PLC controllers in engineering practice, BTC, Legionowo, 2008 |