Maritime University of Szczecin

Courses in English for Erasmus Students

Faculty of Computer Science and Telecommunications

academic year 2026/2027

winter and summer semester

Szczecin 2026

Maritime University of Szczecin
Faculty of Computer Science and Telecommunications
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Academic year 2026-2027

Teaching period: 03/03/2027-28/06/2027, examination period: 29/06/2027-12/07/2027

Available courses for exchange students (English)

#	Name	Form of classes and hours	ECTS cr
1	**Customer development**	Lectures – 20 h	2
2	**Discrete mathematics**	Lectures – 20 h, Workshops – 20 h	7
3	**Electrotechnics**	Lectures – 20 h, Workshops – 10 h, Labs – 10 h	5
4	**Object-oriented programming**	Lectures – 20 h, Labs – 20 h	4
5	**Artificial intelligence**	Lectures – 20 h, Labs – 20 h	6
6	**Internet of things**	Lectures – 20 h, Labs – 20 h	6

Grading scale

Polish Grad	ECTS Grade	English Equivalent
5.0	**A**	Excellent
4.5	**B**	Very Good
4.0	**C**	Good
3.5	**D**	Satisfactory
3.0	**E**	Sufficient
2.0	**F / FX**	Fail / Unsatisfactory

 # 1. Customer development

ECTS 2 cr
Lectures – 20 h
Lecturer:
Piotr Wołejsza (email: p.wolejsza@pm.szczecin.pl)

I. Learning objectives
The aim of the course is to enhance students' competencies in the development of soft skills and to provide substantive knowledge concerning business development in the IT industry. Another objective is to foster an entrepreneurial mindset. The means of achieving this goal include increasing self-confidence and encouraging creative problem-solving, developing business projects through teamwork, and improving skills in identifying appropriate business models for specific products or services.
Students will develop competencies in creating simple prototypes (MVP – Minimum Viable Product) and in identifying user needs in relation to IT projects and commissioned tasks.

II. Prerequisites
Secondary school level.

III. Learning outcomes
The student has knowledge of the fundamentals of communication and management. Identifies the basic elements of market mechanisms in the IT industry. The student has knowledge of knowledge transfer from academia to the economy. The student can develop assumptions for a business model of an innovative IT venture. The student is able to create prototypes. The student applies methodologies for identifying customer needs in developed IT projects, e.g., Customer Development.

IV. Detailed course content
1. Communication and leadership in a team
2. Operation of enterprises in a market economy: forms of enterprises, business efficiency, business development strategies
3. Intellectual property protection
4. Developing an entrepreneurial mindset of a constructor/designer who repeatedly verifies the designed product/service
5. Sources of business ideas – initial business concept
6. Customer needs analysis
7. Idea visualization – first prototype
8. Verification of customer needs based on the prototype
9. Drawing conclusions
10. Presentation of the validated concept to an investor

 # 2. Discrete mathematics

ECTS 7 cr
Lectures – 20 h, Workshops – 20 h
Lecturer:
Marek Landowski (email: m.landowski@pm.szczecin.pl)

I. Learning objectives
The aim of this course is to provide knowledge of the basic tools of discrete mathematics and to develop the skills necessary to apply them in a chosen engineering discipline.

II. Prerequisites
Secondary school level.

III. Learning outcomes
Has basic knowledge of the algebra of sets, relations and functions. Applies the laws of mathematical logic to construct a program and to improve, test, and verify its correctness. Performs simple deductive reasoning, applies the principle of mathematical induction, and sees its connection to programming. Can count objects to analyze the cost of the algorithm. Knows the basic problems of graph theory.

IV. Detailed course content
Lectures
1. Relations and sets. Counting.
2. Elements of mathematical logic: propositional calculus, predicate calculus. Resolution method.
3. Principle of mathematical induction. Theorem proving techniques.
4. Recursion.
5. Graphs and trees.
6. Asymptotics, asymptotic notation
7. Elements of number theory. Modular arithmetic.
Workshops
Calculation exercises cover topics presented in lectures

 # 3. Electrotechnics

ECTS 5 cr
Lectures – 20 h, Workshops – 10 h, Labs – 10 h
Lecturer:
Paweł Frankowski (email: p.frankowski@pm.szczecin.pl)

I. Learning objectives
The educational objectives are:
- to provide students with an understanding of the basic phenomena and relationships in DC and AC electrical circuits,
- to acquire the skills to perform basic linear and nonlinear calculations for DC and sinusoidal electrical circuits,
- to understand the operation and construction of basic electrical and power electronics components,
- to understand the construction, operating principles, and operation of electrical machines used in industry,
- to understand the construction of simple power systems and network systems used in industry.

II. Prerequisites
Secondary school level of mathematics and physics.

III. Learning outcomes
The student has the ability to apply the laws of electrical engineering in practice and to create basic, simple equations used in the theory of electrical circuits. Students can estimate and determine the parameters of electrical circuits, as well as electrical units and quantities. They understand and can calculate the parameters of DC and sinusoidal circuits. They know and can use the concepts and equations of apparent, active, and reactive power in electrical circuits. The student has the ability to identify magnetic phenomena accompanying the flow of electric current and apply them in practice. Understands the construction and operating principles of the most common types of DC and AC electric machines. Can identify the advantages and disadvantages of various types of electric machines in drive and generator applications. Students can measure electrical quantities in DC and AC circuits. They can select appropriate measuring instruments and ranges. They also have the ability to connect simple electrical circuits. Knowledge of issues related to electrical networks of various types and the shock protection used in them.

IV. Detailed course content
Lectures
1. Basic definitions used in electrical engineering. Electrical quantities and their units.
2. Basic laws and phenomena in electric circuits. Magnetic phenomena around electrical conductors.
3. Direct current circuits. Circuit components and their applications.
4. Equivalent resistance in DC circuits. Properties of rectified and filtered currents and voltages.
5. AC circuits. Characteristic quantities and basic relationships in sinusoidal voltage circuits.
6. Concepts of active, reactive, and apparent power. Phasor diagrams of voltages and power - generation and physical significance.
7. Properties and phenomena occurring in RLC circuits. Series and parallel resonance.
8. AC circuits - calculations of sample circuits.
9. Applications of AC in electrical engineering.
10. Single- and three-phase electrical network systems in industrial applications.
11. DC electric machines. Construction and applications.
12. Asynchronous and synchronous AC electric machines. Construction and applications. Synchronous machines as a primary and emergency source of energy.
13. Construction and operation of a low-voltage power system.
14. The role and operation of protective devices in electrical circuits.
15. Shock protection in electrical circuits and installations.
Workshops
1. Calculating DC circuit parameters
2. Solving DC circuits.
3. Calculating AC circuit parameters.
4. Solving AC circuits.
5. Calculations in circuits powered by sinusoidal AC and rectified current.
6. Calculating electrical circuit parameters during transient processes.
Labs
1. Current and voltage measurements in DC circuits.
2. Linear and nonlinear resistance measurements.
3. Basic measurements in AC circuits.
4. Power measurements in single-phase circuits.
5. Examining RLC circuits - connecting the circuit, measuring series and parallel resonance systems.
6. Examining DC motors.
7. Examining AC motors.
8. Examining symmetrical three-phase circuits.
9. Shock protection in low-voltage circuits.

 # 4. Object-oriented programming

ECTS 4 cr
Lectures – 20 h, Labs – 20 h
Lecturers:
Leszek Misztal (email: l.misztal@pm.szczecin.pl), Oskar Desecki (email: o.desecki@pm.szczecin.pl)

I. Learning objectives
The aim of the course is to provide knowledge of the basic concepts and issues occurring in object-oriented programming, in particular: class, object, encapsulation, inheritance and polymorphism.

II. Prerequisites
Secondary school level.

III. Learning outcomes
Can define classes and use the encapsulation mechanism. Can initialize class objects and destroy them correctly. Can use the mechanisms of inheritance and polymorphism. Can use generalized types and collections. Has basic knowledge and skills in the use of UML.

IV. Detailed course content
Lectures
1. Object-oriented domain modeling. Introduction to object-oriented programming.
2. Classes and objects, object constructing and destroying, static components, initialization lists.
3. Data protection, encapsulation, friend functions.
4. Inheritance, virtual methods, and polymorphism.
5. Introduction to UML, basic system modeling diagrams.
6. Templates and interfaces.
7. Handling exceptions.
8. Generic programming techniques.
9. Smart pointers, anonymous functions (lambdas).
10. Accessing operating system mechanisms: threads, streams.
11. Text processing (string library).
12. C++ STL, string, vector, queue, collections, and more. iterators. graphs.
13. Design patterns.
14. Graphical user interface. Introduction to QT.
15. Modular programming and interoperability with other programming languages.

Labs
1. Object-oriented paradigms, introduction, good programming practices, doxygen, camel notation, and pascal case.
2. Learning to use classes and objects.
3. Constructors, destructors, and copy constructors, initializer lists, nested classes, and classes with mutable structures.
4. Basics of inheritance, multiple inheritance, polymorphism, and operator overloading.
5. Class, use-case, state, and sequence diagrams, scrum and XP programming methodologies.
6. Function and class templates, template specializations.
7. Feature classes, guideline classes, metaprogramming, assertions, and requirements classes.
8. Creating and using interfaces, smart pointers, and lambda expressions.
9. Stream handling, stream filtering, iterators, error and message streams.
10. Using exceptions, throwing and catching exceptions. Text processing.
11. Threading.
12. The STL library: vectors, lists, sets, stacks, iterators. Graphs.
13. Applicability of design patterns: adapters, decorators, singletons, abstract factories, object factories, observers.
14. Graphical user interface programming in QT: windows, menus, dialog boxes, and media embedding.
15. Modular programming. Embedding Python in C++.

 # 5. Artificial intelligence

ECTS 6 cr
Lectures – 20 h, Labs – 20 h
Lecturers:
Zbigniew Pietrzykowski (email: z.pietrzykowski@pm.szczecin.pl), Oskar Desecki (email: o.desecki@pm.szczecin.pl)

I. Learning objectives
The aim of the education is to provide knowledge and develop practical skills in the use of artificial intelligence methods and tools in various fields of human activity, including the maritime economy, in particular knowledge representation and inference methods.

II. Prerequisites
Secondary school level.

III. Learning outcomes
Has knowledge of mathematics, computer science and automation necessary to formulate and solve typical simple tasks in the field of artificial intelligence applications. Has structured general knowledge covering the subject, methods and tools of artificial intelligence. Knows the basic methods, techniques and tools used to solve simple engineering tasks in the field of artificial intelligence applications. The ability to effectively use artificial intelligence methods, techniques and tools to acquire, represent and use knowledge. The ability to effectively use artificial intelligence methods, techniques and tools when solving engineering tasks in the field of artificial intelligence applications.

IV. Detailed course content
Lectures
1. Artificial intelligence – basic concepts, key issues.
2. Symbolic artificial intelligence: cognitive simulation, logic-based approach, rule-based and structured knowledge representation, mathematical linguistics-based approach.
3. Computational intelligence: connectionist models, models inspired by mathematics and biology.
4. Fuzzy sets – fuzzy logic, fuzzy inference and inference models, applications.
5. Neural networks – basic concepts, properties of neural models, task classes, learning methods, types of networks, applications.
6. Genetic algorithms – basic concepts, principles of operation, coding methods, genetic operators, applications.
7. Machine learning: inducing decision trees and decision rules.
8. Expert systems – basic concepts, expert system architecture, knowledge representation, applications.
9. State space search – basic concepts, search graphs and methods, heuristics, dynamic programming.
10. Multi-agent systems – basic concepts, types of agents, software agents, applications.
11. Data mining – selected topics.
Labs
1. Logic programming environment. Logic programming.
2. Fuzzy systems.
3. Neural networks.
4. Expert systems.
5. Genetic algorithms.

 # 6. Internet of things

ECTS 6 cr
Lectures – 20 h, Labs – 20 h
Lecturer:
Paweł Frankowski (email: p.frankowski@pm.szczecin.pl)

I. Learning objectives
The aim of the classes is to provide practical knowledge of the issues related to the construction of intelligent systems using the concept of the Internet of Things.

II. Prerequisites
Secondary school level.

III. Learning outcomes
Knowledge of Internet of Things systems. Knowledge of radio and telecommunications devices. Designing intelligent systems using the Internet of Things.

IV. Detailed course content
Lectures
1. Basic Elements of the IoT System Structure,
2. Technologies Used in IoT,
3. Sensors,
4. Marking Methods Used in IoT: RFID, SMS, Graphics, Virtual,
5. Human-to-Thing Communication, Thing-to-Human Communication, Thing-to-Thing Communication, Communication Between Objects and People in Motion,
6. Use of Wireless Networks in the Internet of Things: Personal, Radio, Sensor, Individual (WiFi, Bluetooth, ZigBee, Z-Wave),
7. QR Codes,
8. Electronic Product Codes (EPC) - RFID Technology,
9. NFC Technology, Beacons,
10. Smart Cards: Magnetic, Chip, Proximity,
11. Wearable Devices (Computers),
12. IoT Applications, Smart Things: Devices, Cars, Homes, Clothes.
Labs
1. Completion of a series of partial laboratory tasks using the IoT environment. Tasks will be assigned by the instructor at the beginning of the course, including:
a. Controlling an object/process using a microcontroller,
b. Using mobile devices for control,
c. Using NFC tags,
2. Completion of an individual and/or team project on a topic proposed by the instructor, utilizing the technologies and devices available in the laboratory. Students participating in the course are welcome to propose their own project topics.