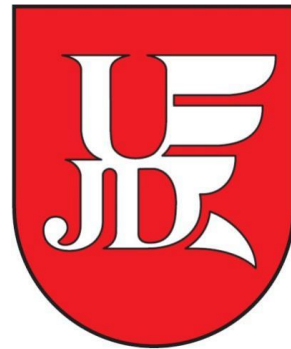


**Jan Dlugosz University
in Czestochowa**



**Courses taught in English
for exchange students
at the Faculty of Science & Technology,
Summer semester, academic year 2023/24**



Erasmus+

Biotechnology

Course title	ECTS	Hours	Form	Semester (Summer)	Course description
<p style="text-align: center;">Cell biology dr Marcin Sysa</p>	2	20	laboratory	Summer	<p>Cell biology is the study of the structure and function of eukaryotic cells in comparison to prokaryotic ones. The laboratory covers the following topics: observation of particular eukaryotic cell organelles using a light microscope (wet mount, stained slides); cell membrane – structure and function, water movement in plant cells; isolation and chromatography of plant pigments; mitochondria – structure and function, staining in yeast cells; enzymes – amylase detection in germinating seeds; cell division – mitosis and meiosis, preparing a root tip cell squash, orcein staining and identification of the stages of mitosis.</p>
<p style="text-align: center;">Genetics dr Magdalena Marczak</p>	1 2	15 30	lecture laboratory	Summer	<p>The Genetics course is designed to provide knowledge of the basics of genetics in relation to pro- and eukaryotic organisms. The main goals of the course are: Students' familiarization with the history of genetic discoveries, including Mendel's laws and the chromosomal theory of heredity; familiarization with the cellular and molecular mechanisms responsible for the processes of inheritance, indication of the importance of environmental factors in shaping the variability of complex characteristics and causing mutations; learning the basics of human genetics, methods of sex determination in humans as well as gender-linked characteristics; presentation of selected mutations</p>

					responsible for the emergence of hereditary diseases and responsible for the variability of selected quantitative characteristics; developing the ability to plan, conduct and analyze the results of genetic experiments.
English in biotechnology dr hab. Iwona Zawierucha, prof. UJD	1	15	exercises	Summer	The aim of the course is to improve general language competence to the extent that enables skillful use of various English-language materials and media, popular science and specialist literature in the field of biotechnology. Working with texts containing vocabulary from fields related to biotechnology such as cell biology, genetics, microbiology, molecular biology, genetic engineering, immunology.
Agricultural microbiology mgr Agnieszka Godela	3	30	laboratory	Summer	Agricultural microbiology covers issues related to auto- and allochthonic microflora of soil and water environment. During the laboratory classes, the student will get acquainted with selected microbiological techniques including indirect methods (surface sowing, deep sowing, reduction) and direct methods (technique of preparation of viable and solidified preparations) of microorganism culture. Student will study the morphology of bacterial, fungal and radial cells. During laboratory classes, the student will isolate and identify microorganisms from agricultural and agricultural soils and from the aquatic environment. By observing microbial culture on specialized culture media, he will determine the contribution of microbes in the circulation of carbon, nitrogen, phosphorus and sulfur in nature. The student will get acquainted with the mutual relations between microorganisms and microorganisms and higher plants – the

					drawing method for determining antagonistic properties of fungal cultures, mycorrhizal fungi, MHB bacteria.
Cultivated plants and their economic importance dr Barbara Majchrzak	1	10	lecture	Summer	Domestication history and origin of cultivated plants. Habitat factors affecting plant production. Characteristics of the cultivated plants main groups including crop use, e.g.: cereals, root crops, legumes, vegetable plants, oil plants, fiber plants, spice plants, herbs and their economic importance. Selection of crops varieties and their genetic diversity.

Chemistry

Course title	ECTS	Hours	Form	Semester (Summer)	Course description
Modern drugs synthesis and their patenting Nowoczesna synteza leków i ich patentowanie prof. dr hab. P. Bałczewski	3	30	lecture	Summer	About the subject and its historical background. General information about drugs and their synthesis. Performing modern reactions that are not lectured in basic courses. Syntheses of drugs currently on the pharmaceutical market. Information on drugs patenting in Poland, Europe and the world. How to patent a drug. Example of a patent application to the patent office.
Biochemistry Biochemia dr hab. P. Rychter, prof. UJD	4 (2+2)	30+45	lecture + laboratory	Summer	The course of biochemistry, the position of biochemistry among the natural sciences. The structure and biological functions of bioorganic compounds (proteins, nucleic acids, lipids and carbohydrates). The structure and functions of biochemical cells, the problem of molecular biology. Enzymes and kinetics of enzymatic reactions. Basic metabolic pathways.
Basics of quantum chemistry Podstawy chemii kwantowej dr P. Brągiel	5 (2+3)	45 (15+30)	lecture + exercises	Summer	Acquainting students with the basic concepts of the language of quantum chemistry. Understanding of the relationship between the structure of the atom and its chemical properties and the ability to form chemical bonds. Understanding of the theoretical foundations of spectroscopy. Preparation for using simple models as a starting point for describing real chemical problems.

<p>Organic chemistry I Chemia organiczna I Prof. dr hab. J. Drabowicz</p>	3	30	lecture	Summer	<p>Organic chemistry: introduction and development outline. The main objective of the course is to gain an understanding of the basic methods of synthesis of basic groups of organic compounds in connection with the determination of their reactivity and physico-chemical properties based on the analysis of electronic and molecular structures.</p>
<p>Engineering of biomaterials Inżynieria biomateriałów dr K. Lewicka</p>	5	25	workshops	Summer	<p>Workshop classes carried out in the form of:</p> <ol style="list-style-type: none"> 1. Multimedia lecture concerning biomaterials science and biomaterials engineering, combined with discussion conducted by the class moderator 2. Taking a short test on the lecture topics and student projects discussed 3. Presentation of a previously assigned project by a group of students 4. Performing a series of practical tasks in the laboratory, thematically related to the previously discussed issues

Dietetics, Human nutrition & dietetics

Course title	ECTS	Hours	Form	Semester (Summer)	Course description
<p style="text-align: center;">Food chemistry dr hab. Janusz Kapuśniak, prof. UJD</p>	2	25	lecture	Summer	<p>Scope of food chemistry. Food structure and chemical composition Water as a food ingredient. Drinking water Saccharides in food and their functional properties Fats, their characteristics and properties of edible fats Proteins and protein raw materials Non-protein nitrogenous compounds. Minerals Food colours. Food aroma compounds Health and anti-nutritional compounds Polyphenols. Food additives Vitamins. Milk fat Food allergens Food contamination Mutagenic and carcinogenic food ingredients Interactions of food ingredients Changes occurring during storage and processing of food.</p>
<p style="text-align: center;">Food toxicology dr hab. Hanna Mojska, prof. UJD</p>	1	10	lecture	Summer	<p>The aim of the lecture is to introduce students to basic issues in the field of food toxicology and to familiarize students with, among others, the following issues: Historical outline of toxicology and fields of toxicology; Doses of poisons and measures of toxicity; Absorption and distribution of toxic compounds; Toxics penetration through intra-body barriers; Interactions of foreign substances in the body; Biotransformation (metabolism) and excretion of toxic compounds: Phase I, II and III of reactions of</p>

					biotransformation; Ways of excretion toxics from the body; Chemical food contaminants: natural toxics, pesticides, metals harmful to health, dioxins and PCBs, PAH, nitrosamines, processing toxicants etc. Estimation of exposure to toxic compounds present in food and risk assessment for human health.
Food toxicology dr hab. Hanna Mojska, prof. UJD	1	10	conv.	Summer	The aim of the seminar is to acquire the ability to use knowledge from lectures for the practical application of toxicology in ensuring food safety. Preparation of a written paper and presentation ppt. on a given topic.
Food biotechnology dr Arkadiusz Żarski	1	10	lecture	Summer	Issues related to the development of biotechnology, the goals of biotechnological processes and the economics of production using microorganisms. Raw materials and materials used in food biotechnology as well as selected biotechnological operations and processes. Innovative methods of obtaining and producing food, including biotechnologies. Biotechnological utilisation methods of byproducts and food industry wastes.
Food biotechnology dr Arkadiusz Żarski	2	25	laboratory	Summer	The main aim of the course is developing the ability to use of biotechnological methods in obtaining and analyzing of food products. The course scope includes the following issues: fermentation processes as advantages and disadvantages in food production; immobilization of microorganism; enzymatic hydrolysis of milk lipids; methods of cell disintegration and their importance for food industry biotechnology; biosynthesis of citric acid by <i>Aspergillus niger</i> strains; systems of interdependence between microorganisms in food.

<p>Diploma seminar prof. dr hab. Danuta Kołożyn-Krajewska</p>	6	40	seminar	Summer	<p>The aim of the course is to provide students with the ability to analyze data and use information from various sources (using information technology) as well as to prepare a written paper on a selected topic in the field of food science and nutrition and related fields. The scope of the course includes the following tasks: Analysis of selected internet reports/blogs related to human nutrition; Analysis of popular science articles related to human nutrition; Analysis of scientific publications related to human nutrition; Analysis of books/guides related to human nutrition; Preparation of a summary of a scientific publication; Preparation of a written paper on a given topic.</p>
<p>Diploma seminar dr hab. Hanna Mojska, prof. UJD</p>	6	40	seminar	Summer	<p>The aim of the diploma seminar is to familiarize students with the ability to analyze data and use information from various sources (using information technology) as well as to prepare short presentations (ppt.) and discuss in class on a selected topic in the field of food safety and nutritional risk factors for chronic non-communicable diseases. The scope of the course includes the following tasks: Analysis of selected internet reports/blogs related to food safety and nutritional risk factors for chronic non-communicable diseases; Analysis of popular science articles related to food safety and nutritional risk factors for chronic non-communicable diseases; Analysis of scientific publications related to food safety and nutritional risk factors for chronic non-communicable diseases; Analysis of books/guides related to food safety and nutritional risk factors for chronic non-communicable diseases nutrition; Preparation of a</p>

					summary of a scientific publication; Preparation of a written paper on a given topic.
Fermentation technologies dr Arkadiusz Żarski	3	30	workshop	Summer	As part of the workshop program, field activities and other practical classes are planned to familiarize with the obtaining and processing products using fermentation technologies. In addition, laboratory and seminar classes are planned in accordance with the following list: <ul style="list-style-type: none"> - Practical classes in laboratory: 1) preparation of raw materials and initiation of basic types of fermentation, 2) evaluation of fermentation products; macro and microscopic analysis; physical and chemical analysis. - Seminar classes: presentations on traditional and innovative methods used in fermentation technologies. - Field activities: factory of fermented food or beverages.
Food quality and safety management prof. dr hab. Danuta Kołożyn-Krajewska	1	15	lecture	Summer	The aim of the course is to familiarize students with quality management systems (ISO 9000, BRC, IFS, TQM etc) and the food safety management system (ISO 22000). The specific objectives are: providing knowledge related to the concept of quality, quality management systems and food safety, the traceability system, methods and tools for managing quality and food safety, acquiring the ability to work with standards, acquiring the ability to develop documentation according to the EN ISO 22 000 standard in the field of management and implementation of a safe product.

<p>Modern trends in food analytics prof. dr hab. Lesław Juszcak</p>	1	15	lecture	Summer	<p>The aim of the course is to provide students with knowledge of the theoretical foundations of modern instrumental methods used in food analysis and safety and quality control. Lecture topics include instrumental methods in the analysis of physical properties of food, including rheometry, texture analysis and differential scanning calorimetry. Theoretical attitudes and the use of UV-Vis spectrophotometry and spectrofluorimetry in food analysis and instrumental color analysis. Chromatographic techniques: gas, liquid, ion and gel chromatography. In addition, the use of other separation techniques including capillary electrophoresis. Fundamentals and application of atomic absorption and emission spectrometry.</p>
<p>Modern trends in food analytics prof. dr hab. Lesław Juszcak</p>	1	15	conv.	Summer	<p>The aim of the course is to provide students with knowledge of the practical use of instrumental methods used in food analysis and safety and quality control. The basis of the course are presentations prepared by students on the instrumental determination of food ingredients, additional substances and chemical impurities that may occur in food.</p>
<p>Molecular gastronomy dr Kamila Kapuśniak</p>	1+3	15+30	lecture+lab.	Summer	<p>The aim of the course is to acquaint students with issues related to the production of dishes using molecular gastronomy methods – gelification, simple and inverted spherification, applications of liquid nitrogen, etc. Additionally basic knowledge about different types of hydrocolloids – use, origin and properties will be provided. Finally, few words about bubble tea – types, sample recipes and historical view.</p>

<p>Human nutrition mgr Cyprian Lisowski</p>	2	25	workshop	Summer	<p>During classes, students learn about issues such as: proper nutrition, defective nutrition: quantitative and qualitative malnutrition, essential nutrients, basal metabolic rate, factors influencing BMR. total metabolic rate, energy expenditure during various forms of physical activity, energy balance, energy sources, division of food products, the role of water in the body, water balance in the body, effects of water shortages and excess, water and electrolyte management of the body groups of food products and their nutritional value, acid-base balance, the role of nutrition in maintaining proper body pH, nutrition standards, planning and evaluating menus, calculation of nutritional values of food and comparison with standards.</p>

Physics

Course title	ECTS	Hours	Form	Semester (Summer)	Course description
Diploma seminar Prof. Dr hab. Janusz Berdowski	4	30	Seminar	Summer	Discussion of the principles of preparing some thesis (using and citing the literature, methods of developing results or source data, learning to present them, use of scientific language). Interviews with each student, at the beginning and end of the semester on the progress of the thesis.
Elements of Theoretical Mechanics Dr hab. Zygmunt Bąk Dr Piotr Brągiel	4	45	Lecture/ Exercise	Summer	The subject covers fundamentals of classical mechanics, Lagrange's equations, Hamiltonian function, principle of least action, canonical transformations, invariants of canonical transformations, Hamilton-Jacobi equation, matter waves, Schrödinger equation, motion in the central force field, Kepler's laws, scattering of particles by coulombic forces, differential scattering cross section.
Kwantowa teoria transportu elektronowego Quantum theory of electron transport Dr Dominik Szczyńskiak	3	30	Lecture/ Exercise	Summer	The aim of the course is to acquire theoretical knowledge necessary to understand the phenomenon of electron transport at the quantum level. In particular, the description of the above phenomenon based on the electron scattering theory and the Green's function formalism is discussed.

<p>Podstawy fizyki półprzewodników Basics of semiconductor physics Dr Katarzyna Szufa</p>	4	45	Lecture/Laboratory	Summer	The aim of the course is to familiarize students with the division of materials in terms of electrical properties of charge carrier transport in various semiconductor structures.
<p>Materiały amorficzne i fizyka materii miękkiej Amorphous materials and soft matter physics Dr Dominik Szczeniak</p>	3	35	Lecture/ Exercise	Summer	The subject concerns the Physics and Chemistry of Soft Materials, namely disordered glassy (including covalent and metallic) substances, polymers, colloidal, ceramic and glass-ceramic systems.
<p>Optoelektronika Prof. dr hab. Arkadiusz Mandowski Dr hab. Mandowska Ewa</p>	5	45	Lecture/Exercise/ Laboratory	Summer	Fiber optic technology;. Fiber optics gradient optics: fiber optic lenses, multiwave multiplexers.;. Fiber optic image guides: beam image guides, fiber optic plates, night vision devices, image correctors, high quality TV 50 lines/mm. Fiber optic sensors: detectors of physical fields and chemical quantities.. High optical power transmission: for NdYAG, CO2 lasers, surgical knives, industrial welding. Integrated optoelectronics. Planar circuits and systems for optical waves, which are an analogue of VLSI electronic systems
<p>Specialization laboratory Pracownia specjalizacyjna Dr hab. Migalska-Zalas Anna</p>	7	60	Laboratory	Summer	The aim of the course is to make it easier for students to do their work bachelor's degrees based on scientific research that will be carried out in the University's scientific laboratories.

Computer Science

Course title	ECTS	Hours	Form	Semester (Summer)	Course description
Algorytmy i struktury danych Algorithms and Data Structures Dr hab. Bożena Woźna-Szcześniak prof. UJD(lecture) mgr Mykola Zhyhallo (lab)	6	60	Lecture/Lab	Summer	The aim of the lecture is to familiarize students with the basic set of algorithms that perform tasks such as searching, sorting, and the most commonly used data structures: stacks, queues, dictionaries, priority queues, and tree structures. The basic problems of algorithms related to the analysis of the correctness and cost of algorithms will also be presented.
Elementy matematyki wyższej Elements of higher mathematics Dr Dronyuk Ivanna	6	60	Lecture/Exercise	Summer	The course will cover selected issues related to algebra (complex numbers, matrices and determinants, systems of linear equations) and the most important concepts related to the differential and integral calculus of functions of one variable (sequence, limit and continuity of functions, derivative of a function and its selected applications, indefinite integral and definite integral and its selected applications).
Sieci komputerowe Computer Networks Mgr Jacek Małek	6	60	Lecture/Lab	Summer	The aim of the lecture is to familiarize students with the basic types of computer networks, topologies and network protocols: ATM, Ethernet, TCP/IP, UDP.

<p>Zaawansowane programowanie w Javie Advanced programming in Java Dr hab. Andrzej Zbrzezny prof. UJD</p>	4	45	Lecture/Lab	Summer	<p>The aim of the lecture is to familiarize students with advanced concepts and programming methods introduced in Java 8.</p>
<p>Bazy danych Database Dr Stępień Lidia</p>	6	60	Lecture/Lab	Summer	<p>The aim of the course is to familiarize students with the basic concepts and concepts of database systems technology, necessary for the correct design, use and implementation of database systems and their applications. As part of this subject, students become familiar with the basic principles of database modeling and design, the relational data model, normalization of logical database schemas, and the logical organization and basic physical structures of data used in database systems.</p>
<p>Języki, automaty i gramatyki Languages, automata and grammars Dr hab. Andrzej Zbrzezny prof. UJD Mgr Hubert Drózdź</p>	5	45	Lecture/Lab	Summer	<p>The aim of the course is to introduce students to the basic concepts of the theory of formal languages, the basics of the theory of finite automata, and the basics of the theory of context-free grammars.</p>

Innovative technologies and advanced materials

Course title	ECTS	Hours	Form	Semester (Summer)	Course description
Intellectual property protection (Ochrona własności intelektualnej)	1	15	conv.	Summer	The main aim of the course is to know students the fundamentals of intellectual property protection based on international law. During the course, students analyze the procedures of patent obtaining in Polish and European patent offices.
Materials science (Nauka o materiałach)	5	60	lecture + lab.	Summer	To familiarize the student with the types of engineering materials, their structures and properties. To familiarize the student with the applications of materials in engineering. To present the principles of practical selection of materials for engineering applications. To impart knowledge of the latest developments and directions in materials engineering.
General mechanics (Mechanika ogólna)	4	60	lecture+ exercises	Summer	The aim of teaching the subject is to achieve knowledge from general mechanics. Acquiring necessary knowledge to solve theoretical exercises from statics, dynamics, kinematics.
Engineering project II (Projekt inżynierski II)	4	60	lab.	Summer	The course aims to prepare the student for the independent realization of engineering tasks using computer-aided design software and numerical simulations. The individually

					prepared project will be related to the subject of the new product design and optimization. The student's task will be preparing a complex report containing the stages of project accomplishment along with Numerical methods in mechanics a detailed results analysis.
Numerical methods in mechanics (Metody numeryczne w mechanice)	5	50	lecture + lab.	Summer	The aim of a course is the introduction to using numerical methods in engineering. The students will learn how to apply numerical methods to solve different engineering issues, for which there is no analytical solution.
An Optional Course I (Przedmiot fakultatywny I)	3	60	lecture + workshop	Summer	The aim of the subject is to raise student awareness and competences and to track current technical achievements used in safety engineering in a selected field. Curriculum contents individually selected to students' choices.
Computational Fluid Dynamics (Obliczeniowa mechanika płynów)	4	55	lecture + lab.	Summer	The course includes learning of theoretical and practical issues of computational fluid dynamics required to conduct engineering simulations of fluids flow using Ansys Fluent software. Fluent software contains the broad, physical modeling capabilities needed to model flow, turbulence, heat transfer and reactions for industrial applications.

Physics	5	60	lecture + exercises + lab	Summer	Classical mechanics of a material and complete point; Mechanical and thermodynamic properties of the body; Fundamentals of electrodynamics; Elements of action and wave optics; Sound waves - the basics of acoustics; Elements of the condensed phase theory; Selected issues in nuclear physics. Selected research methods.
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Safety Engineering

Course title	ECTS	Hours	Form	Semester (Summer)	Course description
Fire safety of building structures (Bezpieczeństwo pożarowe obiektów budowlanych)	3	30	workshop	Summer	Discussion of issues related to the principles and procedures for ensuring fire and explosion safety in the process of investment implementation contained in the Construction Law, the Law on Fire Protection and executive acts. Principles of ensuring fire and explosion safety in construction and technological facilities resulting from technical conditions. Principles and technical conditions for ensuring evacuation from buildings and structures. Principles and criteria for equipping buildings and technological equipment with technical fire protection systems. Principles of safe operation of buildings and technological equipment.
Intellectual property protection (Ochrona własności intelektualnej)	1	15	conv.	Summer	The main aim of the course is to know students the fundamentals of intellectual property protection based on international law. During the course, students analyze the procedures of patent obtaining in Polish and European patent offices.
Materials science (Nauka o materiałach)	6	75	lecture + lab.	Summer	The main aim of the course is to familiarize the student with the types of engineering materials, their structures and properties. To familiarize the student with the applications

					of materials in engineering. To present the principles of practical selection of materials for engineering applications.
General mechanics (Mechanika ogólna)	6	60	lecture+ exercises	Summer	The aim of teaching the subject is to achieve knowledge from general mechanics. Acquiring necessary knowledge to solve theoretical exercises from statics, dynamics, kinematics.
Engineering project I (Projekt inżynierski I)	6	60	lab.	Summer	The course aims to prepare the student for the independent realization of engineering tasks using computer-aided design software and numerical simulations. The individually prepared project will be related to the subject of the new product design and optimization. The student's task will be preparing a complex report containing the stages of project accomplishment along with Numerical methods in mechanics a detailed results analysis.
An Optional Course I (Przedmiot fakultatywny I)	4	60	lecture + workshop	Summer	The aim of the subject is to raise student awareness and competences and to track current technical achievements used in safety engineering in a selected field. Curriculum contents individually selected to students' choices.
Physics (Fizyka)	6	60	lecture + exercises + lab	Summer	Classical mechanics of a material and complete point; Mechanical and thermodynamic properties of the body; Fundamentals of electrodynamics; Elements of action and wave optics; Sound waves - the basics of acoustics; Elements of the condensed phase theory; Selected issues in nuclear physics. Selected research methods.

Management of the innovative projects (Zarządzanie projektami innowacyjnymi)	1	15	workshops	Summer	<p>In the present world of vast information flow and the need for fast adjustment of innovative products and services, project work has gained popularity. There arises the necessity of professional project management (PM). The course aims to equip the participants in the know-how – from planning through implementation to the evaluation of project outcomes. Students develop practical PM skills through the hybrid of traditional and modern methodologies. They learn to lead collaboration processes – teamwork – by cloud computing tools. At the end of the course, students submit a project proposal. It can be processed further, e.g., when trying to find the project funding.</p>
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Medical engineering

Course title	ECTS	Hours	Form	Semester (Summer)	Course description
<p style="text-align: center;">Rehabilitation engineering (Inżynieria rehabilitacyjna)</p>	4	45	lab. + workshop	Summer	<p>The aim of the course is to acquire knowledge and skills in the field of construction and functions of devices and techniques supporting the process of the human musculoskeletal system rehabilitation and modern solutions in this area. Additionally, the participant acquires the ability to analyze patent applications for medical devices.</p>
<p style="text-align: center;">Methodology of scientific research and their commercialization (Metodologia badań naukowych i ich komercjalizacja)</p>	2	15	workshop	Summer	<p>The aim of teaching the subject is to familiarize students with the basic concepts and assumptions of scientific research to provide knowledge enabling planning, realization and acquisition of research projects. During the course, the student is acquainted with the research process, starting from defining the research problem and hypotheses, through the creation of a research plan, the appropriate selection of research tools and the correct conclusions. The student learns the principles of commercialization of scientific research products and the process of transferring the research results to industry with particular emphasis on respecting copyright.</p>

Multimedia engineering

Course title	ECTS	Hours	Form	Semester (Summer)	Course description
Systemy zarządzania treścią Content management systems Mgr Damian Ślimak	4	50	Lecture/Exercise	Summer	The aim of the course is to familiarize students with the most popular content management systems. During the course students will learn the basics of configuration, management and use of selected CMS systems.
Projekt studyjny Studio project Dr Rafał Miedziński	6	20	Exercise	Summer	A full studio recording session will be performed during the class.
Wprowadzenie do akustyki Introduction to acoustics Prof. Dr hab. Janusz Berdowski/ dr Izabela Fuks-Janczarek	5	60	Lecture/Exercise/Laboratory	Summer	The purpose of this lecture is to introduce students to the role of acoustics in the modern world.
Podstawy elektroniki analogowej i cyfrowej Basics of analog and digital electronic Dr hab. Edmund Golis/dr Kordian Chamerski	5	60	Lecture/ Exercise	Summer	The course introduces the basics of analog and digital electronics

Cyfrowe układy audio Digital audio and video devices dr Kordian Chamerski	5	45	Lecture/Exercise	Summer	This lecture introduces students to the construction, principle of operation, and methods of control and programming of digital integrated circuits used in audio and video technology.
Mikrokontrolery Microcontrollers Dr Rafał Miedziński	5	45	Lecture/Laboratory	Summer	This subject introduces students to the Arduino platform and UNO and ESP32 microcontrollers.

Forensics and Security Systems

Course title	ECTS	Hours	Form	Semester (Summer)	Course description
Selected Aspects of Physics (Wybrane elementy fizyki)	6	45	lecture + lab.+ exercises	Summer	Physical phenomena and processes in forensics and security systems
Forensic Science Technique (Technika kryminalistyczna)	7	75	lecture + lab.	Summer	Forensic techniques, visual inspection and trace protection, functioning of forensic databases
Intellectual property protection (Ochrona własności intelektualnej)	1	10	conv.	Summer	The main aim of the course is to know students the fundamentals of intellectual property protection based on international law. During the course, students analyze the procedures of patent obtaining in Polish and European patent offices.
Toxicology (Toksykologia)	2	25	lecture + lab.	Summer	Acquiring knowledge related to the problems of poisons present in the environment. Getting to know the dangers of ingesting toxic substances (fate in the body).

<p>Legal aspects of e-discovery processes (Prawne aspekty procesów e-discovery)</p>	2	30	conv.	Summer	<p>An introduction to the Electronic Discovery Reference Model (EDRM) and its practical possibilities for use in the tasks posed by modern computer forensics. E-discovery as a tool for searching narrow ranges of data, or individual files from large databases. Basics of identification, securing the data and their processing, the possibilities of their analysis, as well as the possibilities of preparing the collected material in the conducted evidentiary proceedings.</p>
<p>Biometric identification of identity (Biometryczna identyfikacja tożsamości)</p>	3	40	lecture + conv.	Summer	<p>To familiarize students with the basic concepts of biometrics. To teach basic methods of biometrics and automatic recognition of physical and behavioral characteristics. Acquiring knowledge of systems for automatic identification and verification of the identity of individuals based on the study of measurable biological characteristics.</p>

Mathematics

Course title	ECTS	Hours	Form	Semester (Summer)	Course description
Diploma seminar / Seminarium dyplomowe	9	5	seminar	Summer	Objective of the course: 1) Developing the ability to draw conclusions based on conducted research 2) Developing the skill of using a clear and precise language 3) Improving computer techniques for scientific text editing 4) Ability to present prepared work - self-presentation
Mathematical support of decision making / Matematyczne wspomaganie decyzji	4	45	Lecture/Lab	Summer	Getting students acquainted with decision-making problems, optimization problems, examples of linear optimization, methods of solving linear optimization problems, elements of the game theory.
Linear algebra 2 / Algebra liniowa 2	7	60	Lecture/Exercise	Summer	Present basic concepts and theorems related to linear spaces and linear transformations.
Typesetting of mathematical text in Latex / Skład tekstu matematycznego w Latex-u	2	15	Lab	Summer	The aim of the laboratory is to familiarize students with the practical principles of computer typesetting mathematical text in the LaTeX system.
Differential equations / Równania różniczkowe	3	30	Lecture/ Workshops	Summer	First order differential equations (general solution, initial conditions, existence and uniqueness of the solution). Higher order differential equations (general solution, initial conditions and boundary conditions).
Introduction to topology Wstęp do topologii	5	45	Lecture/Exercise	Summer	Basic properties of subsets of metric space and their transformations.

