**Załącznik**
do Uchwały Senatu nr T.0022.62.20222
z dnia 11 lipca 2022 roku

# PROGRAM STUDIÓW

## INFORMACJE PODSTAWOWE

| | |
|---|---|
| Nazwa kierunku studiów | Applied Informatics |
| Poziom kształcenia | Studia pierwszego stopnia |
| Profil kształcenia | Ogólnoakademicki |
| Język studiów | angielski |
| Forma studiów | stacjonarne |
| Liczba semestrów | 6 |
| Tytuł zawodowy nadawany absolwentom | licencjat |
| Specjalności *(jeżeli dotyczy)* | brak |

## PRZYPORZĄDKOWANIE KIERUNKU DO DZIEDZINY ORAZ DYSCYPLIN

| Dziedzina nauki | Nauki społeczne | | |
|---|---|---|---|
| Dyscyplina (dyscypliny) naukowe:<br>jeśli kierunek studiów związany jest z dwoma lub więcej dyscyplinami, wymagane jest także określenie procentowego udziału liczby punktów ECTS dla każdej z dyscyplin w łącznej liczbie punktów ECTS koniecznej do ukończenia studiów - ze wskazaniem dyscypliny wiodącej | Dyscyplina | Punkty ECTS | % ECTS |
| | Nauki o zarządzaniu i jakości (dyscyplina wiodąca) | 86 | 53% |
| | Informatyka | 75 | 47% |
| | | | |

## CHARAKTERYSTYKA KIERUNKU

koncepcje i cele kształcenia / związek z misją i strategią Uczelni / potrzeby społeczno-gospodarcze

Absolwenci kierunku Applied Informatics posiadać będą wiedzę na temat technik i narzędzi współczesnej informatyki, procesów biznesowych zachodzących w organizacjach, z uwzględnieniem istniejących uwarunkowań prawnych i ekonomicznych.
Absolwenci będą mogli ubiegać się o pracę w zawodzie informatyka w firmach sektora informatycznego oraz w organizacjach wykorzystujących informatykę w swojej działalności (zarówno w sektorze gospodarczym jak i sektorze publicznym).
Program studiów na kierunku Applied Informatics obejmuje wszystkie przedmioty wchodzące w skład kanonu informatyki. Studenci uczą się budowy i zasad działania systemów komputerowych, programowania, baz danych, systemów operacyjnych, sieci komputerowych oraz projektowania systemów informacyjnych. Uzyskują też gruntowną wiedzę z zakresu ekonomii, zarządzania, przedsiębiorczości, rachunkowości i prawa. Dzięki temu dobrze rozumieją rzeczywistość gospodarczą,

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| co ma istotne znaczenie przy projektowaniu, wdrażaniu, administrowaniu i analizowaniu systemów informatycznych wspierających działalność biznesową, jak też przy budowaniu oprogramowania tworzącego zaawansowane aplikacje komputerowe.<br>Student poznaje, oprócz języków programowania (m.in. Python, Java, JavaScript, PHP), zasady: projektowania programów dopasowanych do wymagań użytkowników, organizacji i zarządzania projektami informatycznymi oraz komunikacji, zarówno wewnątrz grupy, jak i w kontaktach z użytkownikami. Absolwent jest przygotowany do projektowania i utrzymywania systemów komputerowych, które gromadzą, przesyłają, przetwarzają i zabezpieczają informacje. |

## LICZBA GODZIN ZAJĘĆ

| | |
|---|---|
| Łączna liczba godzin zajęć | 1800 |

## LICZBA PUNKTÓW ECTS:

| | |
|---|---|
| konieczna do ukończenia studiów | 195 |
| którą student musi uzyskać w ramach zajęć z bezpośrednim udziałem nauczycieli akademickich lub innych osób prowadzących zajęcia | 98 |
| którą student musi uzyskać w ramach praktyk zawodowych *(jeżeli dotyczy)* | 6 |
| którą student musi uzyskać w ramach zajęć z zakresu nauki języków obcych | 18 |
| która może być uzyskana w ramach kształcenia z wykorzystaniem metod i technik kształcenia na odległość | 146 |

## PRAKTYKI ZAWODOWE *(jeżeli dotyczy)*:

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|---|---|
| Wymiar *(godziny lekcyjne)* | 4 tygodnie |
| Cel | Celem praktyk jest uzupełnienie wiedzy studenta nabywanej w trakcie studiów na uczelni o praktyczne aspekty funkcjonowania firm i instytucji |
| Zasady i forma odbywania | Zasady realizacji praktyk regulują dokumenty:<br>– Regulamin studenckich praktyk zawodowych – wprowadzony Zarządzeniem Rektora nr R-0201-262018 z dnia 13 czerwca 2018 r.<br>– Plany studiów zatwierdzone przez rady kolegiów – zgodne z Krajowymi Ramami Kwalifikacji oraz ze standardami kształcenia na kierunku Applied Informatics.<br>Praktykę student może realizować w okresie wakacyjnym lub w trakcie trwania roku akademickiego. Fakt odbywania praktyki nie może być powodem opuszczania zajęć dydaktycznych. Forma odbywania praktyki uzgadniana jest indywidualnie z każdym pracodawcą co do zakresu obowiązków i ilości godzin dziennie. Praktyka może być realizowana w siedzibie pracodawcy (stacjonarnie) lub zdalnie, w kraju lub za granicą. |

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| Zasady i forma zaliczania | Praktyki należy zaliczyć do końca trwania II roku studiów (tj. do końca trwania letniej sesji poprawkowej IV semestru). Niezbędnymi dokumentami do prawidłowego zaliczenia obowiązkowych praktyk studenckich są:<br>– Umowa o realizację praktyki,<br>– Raport z odbytej praktyki,<br>Dokumenty potwierdzające zawarcie ubezpieczenia OC i NNW na czas realizacji praktyk studenckich (zgodnie z pkt. 3 § 6 Umowy o organizację studenckiej praktyki zawodowej). |

## EFEKTY UCZENIA SIĘ

| Poziom Polskiej Ramy Kwalifikacji | 6 |
|---|---|

| **Symbol efektu uczenia się dla kierunku** | **Opis efektów uczenia się** | **Odniesienie do charakterystyk efektów uczenia się (uniwersalnych pierwszego stopnia oraz charakterystyk drugiego stopnia)** |
|---|---|---|
| **P_W (WIEDZA) Absolwent zna i rozumie:** | | |
| IS6_W01 | knows advanced concepts, theoretical issues and methods of problem description and solving typical for basic general knowledge in the disciplines of quality and management science and computer science | P6S_WG |
| IS6_W02 | knows advanced concepts and issues of digital data representation, storage, processing and exchange as well as management aspects of these processes in economic and social organizations | P6S_WG |
| IS6_W03 | has detailed knowledge of programming methods and technologies necessary to understand advanced principles of analysis, design, implementation and maintenance of information systems | P6S_WG |
| IS6_W04 | knows and understands to an advanced degree the architecture, technological background, principles of operation, installation and administration of operating systems, services, applications and computer networks | P6S_WG |
| IS6_W05 | understands advanced concepts of analysis and design of data flow and information processes in organizations and knows the basic models, approaches and methods of implementing complex information systems | P6S_WG |
| IS6_W06 | knows and understands the structure, organization and basic mechanisms and functions of the information society as well as mutual relations of developers and users of information technologies | P6S_WK |

| | | |
|---|---|---|
| IS6_W07 | knows the areas of application and forms of implementation of products and services in the field of information technologies as well as typical economic, legal and social phenomena and problems related to them | P6S_WK |
| IS6_W08 | has advanced knowledge about basic methods of managing information technology projects and about design, manufacture and quality management processes for information products and services | P6S_WK |
| **P_U (UMIEJĘTNOŚCI) Absolwent potrafi:** | | |
| IS6_U01 | is able to use technical documentation and professional information resources in Polish and English in order to acquire knowledge necessary to solve complex information technology problems | P6S_UW |
| IS6_U02 | is able to analyze complex information and business processes and formulate a description of problems regarding information technology applications in these processes, including organizational, legal and social aspects | P6S_UW |
| IS6_U03 | can design a complex information technology system addressing a given problem, choosing the right methods, taking into account functional and economic criteria and identifying the basic requirements | P6S_UW |
| IS6_U04 | given a complex design, is able to develop an information technology system, choosing the right tools, methods and technologies, assessing its quality and carrying out implementation and administrative tasks | P6S_UW |
| IS6_U05 | has the ability to communicate with the professional environment in Polish and English and to prepare documentation using precise informatics terminology, textual and graphic notation techniques | P6S_UK |
| IS6_U06 | can formulate opinions about information technology developments, their applications and specific solutions and is able to justify personal opinion and to integrate different views into learned knowledge | P6S_UK |
| IS6_U07 | on the basis of self-assessment of knowledge, skills and personal characteristics, is able to plan and organize the implementation of information technology projects both individually and in a multidisciplinary team | P6S_UO |
| IS6_U08 | understands the constant need to study new technological solutions and improve own skills, knows appropriate sources of knowledge and forms of self-education, and is able to plan individual learning activities | P6S_UU |
| **P_K (KOMPETENCJE SPOŁECZNE) Absolwent jest gotów:** | | |

| | | |
|---|---|---|
| IS6_K01 | is ready to critically evaluate either existing or self-designed and developed information technology systems in terms of generally accepted quality characteristics and best practices | P6S_KK |
| IS6_K02 | is ready to recognize the limitations of own knowledge and skills, taking into account the specificity of technological progress, and knows the importance of professional conduct in situations requiring consultation with other people | P6S_KK |
| IS6_K03 | understands the need to popularize the achievements of information technology and is ready to promote knowledge, skills and social attitudes in this area in an accessible and widely understandable way | P6S_KO |
| IS6_K04 | is ready to consider social, legal and economic impact of information technology systems, and to accept personal responsibility for decisions regarding development and deployment of such systems | P6S_KO |
| IS6_K05 | is able to propose and implement economically advantageous information technology solutions, and demonstrates an entrepreneurial attitude towards introducing changes reflecting technological progress | P6S_KO |
| IS6_K06 | is aware of the need to follow best practices, organizational culture, security principles and legal regulations related to the specificity of information technology professions, in relation to oneself and associates | P6S_KR |

# OPIS PROCESU PROWADZĄCEGO DO UZYSKANIA EFEKTÓW UCZENIA SIĘ

## PLAN STUDIÓW[1]

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **Rok studiów:** | **pierwszy** | | | | | |
| | | | **Semestr studiów:** | **pierwszy** | | | | | |
| | | | Łączna liczba godzin zajęć: | 340 | | | | | |
| | | | Łączna liczba punktów ECTS: | 32 | | | | | |
| Lp. | Przedmiot (nazwa) | Forma zajęć | Liczba godzin dydakt. | Forma zaliczenia przedmiotu | Liczba pkt. ECTS | ECTS/dyscyplina(-y) | | | Zajęcia obowiązkowe (O) / do wyboru (W) |
| | | | | | | NoZiJ | informatyka | inne | |
| 1 | Computer System Architecture | W + Ć | 30 + 15 | E | 5 | 0 | 5 | 0 | O |
| 2 | Electronic Data Interchange | W + Ć | 15 + 15 | E | 4 | 0 | 4 | 0 | O |
| 3 | English Language: 1.1 | L | 30 | Z | 2 | 1 | 1 | 0 | O |
| 4 | Foreign Language: 2.1 | L | 30 | Z | 2 | 2 | 0 | 0 | W |
| 5 | Organisation and Management | W + Ć | 15 + 30 | E | 5 | 5 | 0 | 0 | O |
| 6 | Computer Programming 1 | Ć | 30 | Z | 3 | 0 | 3 | 0 | O |
| 7 | Theoretical Foundations of Computer Science | W + Ć | 15 + 30 | E | 5 | 0 | 4 | matematyka: 1 | O |
| 8 | Physical Education | Ć | 30 | Z | 0 | 0 | 0 | 0 | O |
| 9 | Introduction to Mathematics | Ć | 55 | Z | 5 | 0 | 0 | matematyka: 5 | O |
| | **RAZEM SEMESTR** | **W4 / Ć7 / L2** | **340** | **E4 / Z5** | **31** | **8** | **17** | 6 | **O8 / W1** |

[1] W przypadku przyporządkowania kierunku do więcej niż jednej dyscypliny, przedmioty wskazane w planie studiów jako zajęcia obowiązkowe muszą zapewniać osiągnięcie w ramach dyscypliny wiodącej co najmniej połowy efektów uczenia się (co najmniej 51% punktów ECTS koniecznych do ukończenia kierunku).

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|---|---|---|---|---|---|---|---|---|---|
| | | | **Rok studiów:** | **pierwszy** | | | | | |
| | | | **Semestr studiów:** | **drugi** | | | | | |
| | | | Łączna liczba godzin zajęć: | 350 | | | | | |
| | | | Łączna liczba punktów ECTS: | 32 | | | | | |
| Lp. | Przedmiot (nazwa) | Forma zajęć | Liczba godzin dydakt. | Forma zaliczenia przedmiotu | Liczba pkt. ECTS | ECTS/dyscyplina(-y) | | | Zajęcia obowiązkowe (O) / do wyboru (W) |
| | | | | | | NoZiJ | informatyka | inne | |
| 1 | Mathematical Analysis and Linear Algebra | W + Ć | 25 + 40 | E | 5 | 0 | 0 | matematyka: 5 | O |
| 2 | Best Practices in Software Development | Ć | 30 | E | 5 | 1 | 4 | 0 | O |
| 3 | Economics | W + Ć | 25 + 15 | E | 4 | 0 | 0 | ekonomia i finanse: 4 | O |
| 4 | English Language: 1.2 | L | 30 | Z | 2 | 1 | 1 | 0 | O |
| 5 | Foreign Language 2.2 | L | 30 | Z | 2 | 2 | 0 | 0 | W |
| 6 | Computer Programming II | Ć | 30 | Z | 3 | 0 | 3 | 0 | O |
| 7 | Probability and Statistics | W + Ć | 20 + 30 | E | 5 | 0 | 0 | matematyka: 5 | O |
| 8 | Physical Education | Ć | 30 | Z | 0 | 0 | 0 | 0 | O |
| 9 | Introduction to Information Systems | W + Ć | 30 + 15 | E | 5 | 5 | 0 | 0 | O |
| | **RAZEM SEMESTR** | **W4 / Ć7 / L2** | **350** | **E5 / Z4** | **31** | **9** | **8** | **14** | **O8 / W1** |

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|---|---|---|---|---|---|---|---|---|---|
| | | | **Rok studiów:** | **drugi** | | | | | |
| | | | **Semestr studiów:** | **trzeci** | | | | | |
| | | | Łączna liczba godzin zajęć: | 320 | | | | | |
| | | | Łączna liczba punktów ECTS: | 32 | | | | | |
| Lp. | Przedmiot (nazwa) | Forma zajęć | Liczba godzin dydakt. | Forma zaliczenia przedmiotu | Liczba pkt. ECTS | ECTS/dyscyplina(-y) | | | Zajęcia obowiązkowe (O) / do wyboru (W) |
| | | | | | | NoZiJ | informatyka | inne | |
| 1 | Information Systems Analysis and Design | W + Ć | 15 + 30 | E | 4 | 3 | 1 | 0 | O |
| 2 | E-business | W + Ć | 15 + 15 | E | 3 | 3 | 0 | 0 | O |
| 3 | Economics and Corporate Finance | W + Ć | 15 + 15 | E | 4 | 2 | 0 | ekonomia i finanse: 2 | O |
| 4 | English Language 1.3 | L | 30 | Z | 2 | 1 | 1 | 0 | O |
| 5 | Foreign Language 2.3 | L | 30 | Z | 2 | 2 | 0 | 0 | W |
| 6 | Numerical Methods | W + Ć | 15 + 30 | E | 5 | 0 | 2 | matematyka: 3 | O |
| 7 | Computer Programming III | Ć | 30 | Z | 3 | 0 | 3 | 0 | O |
| 8 | Operating Systems | W + Ć | 15 + 20 | E | 4 | 0 | 4 | 0 | O |
| 9 | Introduction to Database Systems | W + Ć | 15 + 30 | E | 5 | 2 | 3 | 0 | O |
| | **RAZEM SEMESTR** | **W6 / Ć7 / L2** | **320** | **E6 / Z3** | **32** | **13** | **14** | **5** | **O8 / W1** |

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|---|---|---|---|---|---|---|---|---|---|
| | | | **Rok studiów:** | **drugi** | | | | | |
| | | | **Semestr studiów:** | **czwarty** | | | | | |
| | | | Łączna liczba godzin zajęć: | 235 | | | | | |
| | | | Łączna liczba punktów ECTS: | 30 | | | | | |
| Lp. | Przedmiot (nazwa) | Forma zajęć | Liczba godzin dydakt. | Forma zaliczenia przedmiotu | Liczba pkt. ECTS | ECTS/dyscyplina(-y) | | | Zajęcia obowiązkowe (O) / do wyboru (W) |
| | | | | | | NoZiJ | informatyka | inne | |
| 1 | English Language 1.4 | L | 30 | E | 3 | 2 | 1 | 0 | O |
| 2 | Foreign Languagey 2.4 | L | 30 | E | 3 | 3 | 0 | 0 | W |
| 3 | Computer Programming IV | Ć | 30 | Z | 3 | 0 | 3 | 0 | O |
| 4 | Business Law | W | 30 | E | 4 | 1 | 0 | nauki prawne: 3 | O |
| 5 | Accounting | W + Ć | 25 + 15 | E | 4 | 3 | 0 | ekonomia i finanse: 1 | O |
| 6 | Computer Networks | W + Ć | 15 + 30 | E | 4 | 0 | 4 | 0 | O |
| 7 | Contemporary Trends in Computer Science | Ć | 30 | E | 3 | 1 | 2 | 0 | O |
| 8 | Intership | P | 0 | Z | 6 | 4 | 2 | 0 | O |
| 9 | **RAZEM SEMESTR** | **W3 / Ć4 / L2** | **235** | **E6 / Z2** | **30** | **14** | **12** | **4** | **O7 / W1** |

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|---|---|---|---|---|---|---|---|---|---|
| | | | **Rok studiów:** | **trzeci** | | | | | |
| | | | **Semestr studiów:** | **piąty** | | | | | |
| | | | Łączna liczba godzin zajęć: | 295 | | | | | |
| | | | Łączna liczba punktów ECTS: | 36 | | | | | |
| Lp. | Przedmiot (nazwa) | Forma zajęć | Liczba godzin dydakt. | Forma zaliczenia przedmiotu | Liczba pkt. ECTS | ECTS/dyscyplina(-y) | | | Zajęcia obowiązkowe (O) / do wyboru (W) |
| | | | | | | NoZiJ | informatyka | inne | |
| 1 | Computer Programming V | Ć | 30 | Z | 3 | 0 | 3 | 0 | O |
| 2 | IT Project Management | W + Ć | 15 + 20 | E | 3 | 2 | 1 | 0 | O |
| 3 | Concurrent and Parallel Programming | W + Ć | 15 + 20 | E | 4 | 1 | 3 | 0 | O |
| 4 | Object-Oriented Analysis and Design | W + Ć | 15 + 15 | E | 3 | 0 | 3 | 0 | O |
| 5 | Computer System Administration | W + Ć | 15 + 25 | E | 4 | 2 | 2 | 0 | O |
| 6 | Knowledge Management | W + Ć | 15 + 30 | E | 6 | 6 | 0 | 0 | O |
| 7 | Elective Course | Ć | 50 | Z | 8 | 6 | 2 | 0 | W |
| 8 | Seminar | S | 30 | Z | 5 | 3 | 2 | 0 | W |
| | **RAZEM SEMESTR** | **W5 / Ć7 / S1** | **295** | **E5 / Z3** | **36** | **20** | **16** | **0** | **O6 / W2** |

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|---|---|---|---|---|---|---|---|---|---|
| | | | **Rok studiów:** | **trzeci** | | | | | |
| | | | **Semestr studiów:** | **szósty** | | | | | |
| | | | Łączna liczba godzin zajęć: | 260 | | | | | |
| | | | Łączna liczba punktów ECTS: | 35 | | | | | |
| Lp. | Przedmiot (nazwa) | Forma zajęć | Liczba godzin dydakt. | Forma zaliczenia przedmiotu | Liczba pkt. ECTS | ECTS/dyscyplina(-y) | | | Zajęcia obowiązkowe (O) / do wyboru (W) |
| | | | | | | NoZiJ | informatyka | inne | |
| 1 | Occupational Safety and Health and Ergonomics | W | 15 | Z | 2 | 0 | 0 | nauki o zdrowiu: 2 | O |
| 2 | Information System Security | W + Ć | 15 + 15 | E | 2 | 1 | 1 | 0 | O |
| 3 | Enterprise Systems / Integrated Systems | W + Ć | 15 + 25 | E | 6 | 6 | 0 | 0 | O |
| 4 | Data Mining | W + Ć | 15 + 30 | E | 3 | 1 | 2 | 0 | O |
| 5 | Elective Course | Ć | 75 | Z | 12 | 9 | 3 | 0 | W |
| 6 | Elective Course B | W | 25 | Z | 3 | 0 | 0 | psychologia: 3 | W |
| 7 | Seminar | S | 30 | Z | 7 | 4 | 3 | 0 | W |
| | **RAZEM SEMESTR** | **W5 / Ć4 / S1** | **260** | **E3 / Z4** | **35** | **21** | **9** | **5** | **O4 / W3** |

**SPOSÓB WERYFIKACJI I OCENY EFEKTÓW UCZENIA SIĘ**

Szczegółowe zasady weryfikacji osiągania przez studentów efektów kształcenia określają karty przedmiotu poszczególnych przedmiotów. Efekty uczenia się obejmują między innymi:

- Egzaminy/kolokwia/sprawdziany zarówno ustne, jak i w formie pisemnej
- Podlegające ocenie wykonywane przez studentów samodzielnie lub grupowo zadania – eseje, prezentacje, przeprowadzenie debaty, itp.

Ważną rolę w udokumentowaniu nabycia określonych kompetencji przez studenta odgrywa napisanie i obrona pracy dyplomowej (licencjackiej).

**EFEKTY UCZENIA SIĘ I TREŚCI PROGRAMOWE PRZYPISANE DO ZAJĘĆ**
**(sporządzane dla przedmiotów pokazanych w planie studiów)**

| | |
|---|---|
| **1** | Nazwa przedmiotu |
| | **Accounting** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student has knowledge in the field of external business reporting (preparation and use of financial statements) in reliance on systems that provide historical and projected data to guide present and future operations.<br>**E2:** Student is able to record accounting transactions and calculate figure of income for merchandising company, classify and calculate historical costs and prepare financial statements of merchandising company.<br>**E3:** Student is ready to evaluate using a critical approach, fulfilling social obligations and acting for the benefit of the public. |
| **4** | Treści programowe przedmiotu |
| | **W1:** The concept of accounting and its functions: connection between accounting and economic activity and the role of the former in generating information. The users of such information; legal foundation of Polish accounting against the background of international bylaws and standards.<br>**W2:** Fundamental principles of accounting - assets and capital; general classification of assets and equity; fixed and current assets; owner's equity and liabilities.<br>**W3:** Balance sheet method and its significance: property balance sheet as a compound of assets and capital; balance sheet equation as the fundamental model of accounting; business activity and its impact on the balance sheet.<br>**W4:** Economic operations and their results: double effect of accounting transactions and the balance sheet method; analysis of simple transactions; results of transactions in financial statement; relationships between elements of financial statement.<br>**W5:** Recording operations on ledger accounts: elements and forms of ledger accounts; elements of entries and principles of making entries on accounts (double entry bookkeeping); list of turnover and balances.<br>**W6:** Characteristics of basic categories influencing income of merchandising company: revenues and their recognition; deferred revenues; costs and their recognition; cost of goods sold and period costs; prepaid and accrued expenses.<br>**W7:** Classification of revenues and costs: revenue from sales; role of Value Added Tax; costs of basic |

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|---|---|
| | operational activity; variants of costs registration (by nature and by function).<br>**W8:** Association between accounts, their balances and financial statements – accounting procedures from opening balance to closing balance – accounting cycle in case of merchandising enterprise.<br>**W9:** Organization of book keeping: chronological and systematic entries; general and subsidiary ledgers; documentation of transactions; inventory taking; auditing and publication of financial statements.<br>**C1:** Classification of assets, equity and liabilities.<br>**C2:** Balance sheet method and its significance, business activity and its impact on the balance sheet, recording operations on ledger accounts.<br>**C3:** Assessment test I.<br>**C4:** Revenues and their recognition, costs and their recognition, cost of goods sold and period costs, costs classification and registration by nature and by function.<br>**C5:** Assessment test II. |

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|---|---|
| **1** | Nazwa przedmiotu |
| | **Best Practices in Software Development** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student has general knowledge of the semantics of program structure and its content, and of its importance in the team working on the code in prevention of errors related to the human personality features<br>**E2:** Student is able to perform basic refactoring of existing code of program as well as its design according to standard best practices<br>**E3:** Student is ready to use commonly accepted good principles of software design and development to ensure quality in IT product development. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Software quality and its aspects related to the source code. The concept of software architecture, modular design structure, the organization of the source code. Syntactic and semantic code layer, expressiveness of programming language and programmer's intentions communication. The role of abstraction in the implementation of the code. Design and editorial principles dedicated to maintain transparency of the code. Aesthetic criterion in programming.<br>**C2:** Software errors, their types, causes and prevention. Syntactic and semantic errors prevention mechanisms. Software Testing Methods. TDD methodology and possibilities of its use in IT enterprises. Unit tests design. Code refactoring, classical methods of refactoring. Programming based on contracts, the role of invariants, input and output requirements.<br>**C3:** Teamwork on the code of the program and its coordination tools. Popular cooperation management systems. Source code management systems, their operation principle and destiny. Working with a remote repository, creating and merging drafts, conflict resolution. Fundamentals of agile software development methodologies, methods, tools and practices used in developers teams. |

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| **1** | Nazwa przedmiotu |
| | **Business Law** |
| **2** | Język prowadzenia zajęć |

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| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows basic characteristic of civil and commercial regulations.<br>**E2:** Student is able to characterize basic institutions of commercial law, find legal sources and apply them.<br>**E3:** Student is ready to make self-assessment of their competence and improve their skills in commercial matters. |
| **4** | Treści programowe przedmiotu |
| | **W1:** The concept and significance of law. Public law versus civil law. Provision and norm. Legal relationship. Kinds and hierarchy of normative acts.<br>**W10:** Consumer protection in adherence agreements. Consumer protection in contracts concluded on distance. The form of legal transaction – the types, the specifics in commercial relations. The basic forms of contract performance. General principles of contractual responsibility.<br>**W11:** The concept of business and commercial law. The concept of economic activity and an entrepreneur. The legal concept of an enterprise. The types of enterprises according to National Court register. The concept of a firm. The concept of firm's exclusiveness. Sanctions in cases of infringing right to a firm. Procuration – the concept, the scope, form, limitations and cancellation. Economic Activity Record - who is included, record-keeping organs, the character and the time of entry, application for entry. CIDG, National Registry of Partnerships – types of registers, application for registration, character and time of registration, principle of free access to records.<br>**W12:** The principle of economic freedom and the principle of prompt procedure. The right to the interpretation of regulations. The right to suspend economic activity. Concessions – the scope, the authority, granting concessions, promissory note. Regulated activity –entry in the registry and the consequences of the absence of entry. Permits, licenses, permissions – the scope and principles of regulation. The obligation for entrepreneur identification. Special duties. Control of entrepreneurs.<br>**W13:** Natural person as an entrepreneur. Status of civil partnership. Types of commercial partnerships. Differences between commercial partnerships and commercial companies. The principles of representation and partner's liability for partnerships' debts. EEIG and State Enterprises – specification of regulations. Transformations of partnerships. Other entrepreneurs – co-operatives, state enterprises, branches of entrepreneurs. Liquidation of an entrepreneur – the principles, the difference from insolvency.Insolvency and corrective proceedings – general principles.<br>**W2:** The principles of the application of law. Conflicts of laws. Presumption of law and presumption of fact. Interpretation of the law and types of interpretation, loopholes, the power of interpretation. Winding force of law.<br>**W3:** General characteristics of civil law as a branch of the legal system. The subjects in civil law. The objects of civil law. The concept and types of entrepreneurs.<br>**W4:** The principles of representation of subjects. Civil law instances – legal procedures and declaration of will. Limitation of claims and deadlines.<br>**W5:** The concept and specific character of property law. Kinds of things. Types of property rights.<br>**W6:** Property – the concept, purchase, encumbrance, transfer, legal protection, co-ownership.<br>**W7:** Usufruct. Limited property rights. Collateral and mortgage. Possession and leasing. Land and mortgage register and land registry. Digitalization of land and mortgage registers.<br>**W8:** The concept of obligation and its elements. The sources of obligations.<br>**W9:** Torts and liability in tort. Groundless enrichment. Concluding traditional and electronic contracts. |

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| **1** | Nazwa przedmiotu |

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| | **Computer Networks** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows the structure and understands the functioning of modern computer networks and network operating systems of Windows, Linux and Unix families.<br>**E2:** Student is able to efficiently use current standards to the extent that allows designing and configuring local networks, using Internet services and making their network services available to external users using the Internet.<br>**E3:** Student is ready to follow the development of computer network techniques and constantly expand his professional competences in this field. |
| **4** | Treści programowe przedmiotu |
| | **W1:** Introduction. Purpose and scope of the subject. Organization of classes and assessment method. Consolidation of concepts in the area of basic concepts of modern information technologies. Computer networks as a modern technical infrastructure for automating the process of data exchange between devices connected to the network (and thus information between people, network users). Communication infrastructure based on Internet access. Network documentation standards and tools (network diagrams, DIA program)<br>**W2:** Layered models (ISO OSI, TCP / IP, IEEE-802) [ISO-OSI.pdf] as an abstraction of each of the existing computer networks. Description of the network functioning as the interaction of protocol stacks. The principle of encapsulation (encapsulation) ISO OSI model and technical realities. Network support in operating systems -> physical, logical and service (application) networks. Standardization organizations and major computer network related standards. LAN and WAN networks in the context of physical networks standards and technologies<br>**W3:** The application layer role in the ISO OSI model. Basic TCP / IP (Internet) network applications such as DNS, DHCP, HTTP, FTP, etc. as the application layer protocols of the TCP / IP model.<br>**W4:** Tasks of the transport layer. The network as an automation of data exchange between distributed processes. Socket-based network communication. A variety of addressing ways in computer networks. User addresses (domain) - UNC and URL schemes. User (URL & UNC, DNS), logical (e.g. IP, IPX, NETBEUI) and physical (MAC in IEEE 802 and other ITU standards) adresses.<br>**W5:** Network layer (ISO OSI) / internetwork (TCP / IP). Data transfer. Tasks and protocols. IPv4 vs IPv6 addressing. Static and dynamic (DHCP) configuration of network interfaces. Automatic address translation (role of ARP and DARP protocols).<br>**W6:** Network layer (ISO OSI) / internetwork (TCP / IP). Shaping packet traffic on the network (routing). Tasks and routing mechanisms: dynamic / static, class / classless (CIDR). The most important routing protocols.<br>**W7:** Channel layer (TCP / IP) / data link layer and physical (ISO OSI). IEE802.2 and ITU-T standards (protocols). Tasks of data and physical link layers. IEEE (LAN, MAN, PAN) and ITU-T (WAN) standards. Two techniques and protocols for access to the medium: competitive versus token based. Physical addresses variety. Collision domains<br>**W8:** A summary of the subject matter.<br>**C1:** "Computer Networks" Lab Workshops Organizational Issues and requirements. Requested skills on work in the operating system environment. "Operating Systems" course skills recall.<br>**C10:** Packet routing & filtering. Firewalls.<br>**C11:** Data Link & Physical Layer (LAN-WAN-Wireless). IEEE802.2 Standards<br>**C12:** Computer Networks Revisited<br>**C2:** Intro to computer network virtualization using VirtualBox. Setting up a virtual computer using |

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| | VirtualBox package.<br>**C3:** Intro to Virtual Computers LANs in the Virtualbox Environment & Installing Network OS (the newest Debian distro).<br>**C4:** Setting up Network Services. Debian Package Management Tools at work.<br>**C5:** Installing & Using VirtualBox "shared folders" as a basic and the easiest way of data exchange with the host (real) computer.<br>**C6:** LAN Services . Mass storage sharing. SMB (CIFS) and NFS protocols. The SAMBA package for the Unix/Linux boxes.<br>**C7:** Network Layered Models: ISO OSI , TCP/IP & IEEE802. Computer Network Addressing Principles. Static & Dynamic (DHCP) NIC configuration.<br>**C8:** Advanced IP addressing and network services: NAT, DHCP and DNS.<br>**C9:** Wireshark Sniffer & TCP/IP Protocols Revisited |

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| **1** | Nazwa przedmiotu |
| | **Computer Programming 1** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows the basic concepts of syntax and semantics of modern general-purpose programming languages<br>**E2:** Student is able to choose and use appropriate syntax structures to express intentions and implement an algorithm.<br>**E3:** Student is ready to understands the role of programming language semantics in communicating in a development team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Types and variables<br>**C10:** Program Testing<br>**C2:** Control Structures<br>**C3:** Subroutines and recursion<br>**C4:** Arrays as a data structures<br>**C5:** File handling<br>**C6:** Dictionaries, Stacks nad Queues<br>**C7:** Classes and Objects<br>**C8:** Class inheritance<br>**C9:** Object Oriented Programming Paradigms |

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| **1** | Nazwa przedmiotu |
| | **Computer Programming 2** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |

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| | **E1:** Student has basic knowledge about the methods of communication of computer programs with their environment as well as IT standards and conventions adopted in this area.<br>**E2:** Student is able to plan and implement a solution to a problem in the form of a program communicating with the environment.<br>**E3:** Student is ready to describe the stages of work on the project and prepare its documentation actively using professional literature, documentation and Internet resources to search for solutions to the encountered problems. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Installation, configuration and testing of the work environment.<br>**C2:** Principles of operation and practical use of version control systems.<br>**C3:** Use of common file formats for storing and exchanging data between programs.<br>**C4:** Communication with the web environment, the use of online data and documents.<br>**C5:** The program's text-based interface for communication with the environment.<br>**C6:** Refactoring the application code - defining functions, handling errors, adapting the program to recommended standards.<br>**C7:** Basics of analysis and presentation of data extracted from the web.<br>**C8:** The use of the framework as the basis of application development.<br>**C9:** The program's web interface for communication with the environment. |

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| **1** | Nazwa przedmiotu |
| | **Computer Programming 3** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student understands the software development in high-level object-oriented languages with independent software and hardware architecture.<br>**E2:** Student is able to make the necessary configuration of the computer workstation to access the Internet, install and configure a software to develop applications.<br>**E3:** Student is ready to choose, apply and evaluate the usefulness of tools for application development. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Organization of classes, creating user accounts<br>**C10:** Program testing<br>**C2:** Classes and Objects<br>**C3:** Class Structure<br>**C4:** Data Encapsulation<br>**C5:** Conceptual Modeling<br>**C6:** Aggregation and Composition<br>**C7:** Inheritance and Polymorphism<br>**C8:** Abstract Classes<br>**C9:** Interfaces |

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| **1** | Nazwa przedmiotu |

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| | **Computer Programming 4** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows main technologies used for web applications development.<br>**E2:** Student is able to choose and use Internet technologies to design and create web applications.<br>**E3:** Student is ready to continuously develop his/her knowledge and skills. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Introduction. The differences between storing web description files on local hard disk and server side.<br>**C10:** Practical test. Evaluation.<br>**C11:** Re-taking exam test.<br>**C2:** Technologies for web pages developing on client side.<br>**C3:** Validation of data typed or selected by users in web forms.<br>**C4:** Implementation of database in selected DBMS.<br>**C5:** Using client-side technologies for web pages development.<br>**C6:** Interaction of the internet user with databases via web browser window.<br>**C7:** Performing CRUD operations with the use of web applications.<br>**C8:** Using disk files on server side. Saving data in disk files in selected format. Files uploading and downloading.<br>**C9:** Summary. Example of practical test. |

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| **1** | Nazwa przedmiotu |
| | **Computer Programming 5** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows what is the framework and how to use it to create functional web application.<br>**E2:** Student is able to prepare, based on predefined requirements, a project of web application that uses the database system, web framework and version control systems.<br>**E3:** Student is able to distribute responsibility and to cooperate in the development of applications with others. |
| **4** | Treści programowe przedmiotu |
| | **C1:** IDE configuration and testing.<br>**C10:** Integration with third party software<br>**C11:** Unit, integration, functional testing<br>**C12:** Final projects.<br>**C2:** Version control systems.<br>**C3:** Java programming environment, Project management tools<br>**C4:** Object-oriented programming in Java language, development of model based on provided requirements<br>**C5:** Design patterns in object-oriented programming. |

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| | **C6:** Best practices in object-oriented programming.<br>**C7:** Introduction to Spring framework. Spring installation and configuration.<br>**C8:** Data representation in Web application, HTTP, REST<br>**C9:** Working with a database, SQL queries, ORM |

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| **1** | Nazwa przedmiotu |
| | **Computer System Administration** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows the most important modern IT tools supporting the administration and management of complex information systems of the company or enterprise.<br>**E2:** Student is able to combine and effectively use in practice their knowledge of methods, tools for computer science and economics to configure administration systems for complex management information systems in a way that optimizes the assumed economic indicators.<br>**E3:** Student is ready to constantly improve their professional competences in the field of computer systems administration in accordance with the changes generated by technological progress. |
| **4** | Treści programowe przedmiotu |
| | **W1:** Introduction. Main objectives and scope of the subject. Definitions of basic concepts. A reminder of the most important concepts in the field of modern operating systems and computer networks (Network operating systems). Network standards and models. A variety of network solutions. Physical, logical and service networks). Introduction to virtualization of computer systems.<br>**W2:** Basic issues of installation, configuration, and tuning operating systems. Open Source (GPL) and proprietary systems. Configuring and rebuilding the Linux kernel versus configuring proprietary systems (MS Windows, Novell Netware). Distributed systems and a variety of network solutions. A reminder of the most important aspects of configuring modern TCP / IP networks.<br>**W3:** System administration foundations and standards. Administrator's tasks in system resources, system security, and users management. Tools for automating the distributed system management process. Local area network services (sharing of resources). Administration problems of a multi-server corporate network environment.<br>**W4:** Main architectures of distributedsystems. Centralization of management in distributed systems - directory services. Selected issues of corporate network management using directory services systems.<br>**W5:** Standards, techniques, and monitoring tools. Automation of monitoring the current system status. Management information database (MIB) and SNMP.i protocol for administering distributed resources. Selected security issues.<br>**W6:** Data security management in computer systems. Backup and recovery systems. Prevention and antivirus protection of the company network. IDS systems. Creating and implementing a coherent security policy.<br>**W7:** Summary of computer systems administration issues.<br>**C1:** System configuration management. Tools and services: 1. routing & NAT in IP networks, 2. DHCP & DNS.<br>**C2:** Fundamentals of Linux operating systems management. The role and meaning of system scripts.<br>**C3:** Basics of MS Windows 2012 Server operating system management.<br>**C4:** Administration of heterogeneous (Ms Windows / Linux) LANs providing storage resources (CIFS and NFS protocols): 1. NAS client-server based on CIFS, 2. User and authorization management (local |

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| | versus network resources). 3. CIFS versus NFS (comparison)<br>**C5:** Directory services. X.500 and LDAP standards. Configuration and administration of an Active Directory domain controller based on the capabilities of the Samba version 4.x package.<br>**C6:** MS Server 2012. Service configuration and administration of an Active Directory domain controller.<br>**C7:** Computer system security issues. Backup copies, firewalls, automation of the current system state monitoring process, system logs. The SNMP protocol usage principles.<br>**C8:** The final, voluntary practical test that allows increasing the number of the credit to pass the lab exercises in the subject |

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| **1** | Nazwa przedmiotu |
| | **Computer System Architecture** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows the structure and functioning of computer devices and knows what are the possibilities of using them in various areas of economic activity<br>**E2:** Student is able to properly present, select and use computer devices in various areas of economic activity.<br>**E3:** Student is ready to constantly follow and learn about the development of equipment and information technology. |
| **4** | Treści programowe przedmiotu |
| | **W1:** Binary form of information. Computer arithmetic: fixed point and floating-point representation and arithmetic, numbers conversion, ASCII and other standards of character and symbols coding.<br>**W2:** Construction of the computer: Von Neumann Architecture, organization and architecture of memory systems, input/output systems, and processor.<br>**W3:** Digitals circuits: Boolean algebra, logic gates, logical synthesis by minimization of Boolean functions, combinational circuits, sequential circuits (synchronous and asynchronous).<br>**W4:** Intel x86 processors family and personel computer (PC) architecture. Low level programming Intel IA x86 processors. Instruction execution cycle. Internal processor language structure. Interrupt system. Construction, role and functioning of the stack. Assemblers and other programmed languages. Fundamentals of program translation.<br>**W5:** Working with data stored in main memory ( aka Primary Storage).<br>**W6:** Optical i magnetic mass storages ( aka Secondary Storage architecture).<br>**W7:** Input/output devices (keyboard, mouse, touchpad, trackball, joystick), printers (dot matrix, inkjet, laser), scanners (characteristics and types of scanners, and other peripherals.<br>**W8:** Computer graphics hardware components. Computer graphics descriptive characteristics and parameters.<br>**C1:** Arithmetic and logic operations in binary and hexadecimal system<br>**C2:** Turbo Assembler and Debugger environment: compiling assembly code using Turbo Assembler and Turbo Linker, running programs in the step mode and observation of processor registers and memory state using Turbo Debugger.<br>**C3:** Programming in Assembler: memory addressing, interrupts, operations on numbers bits and tables, conditional instructions, loops, input/output, operations of computer peripherals, graphics mode. |

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| 1 | Nazwa przedmiotu |
| | **Contemporary Trends in Computer Science** |
| 2 | Język prowadzenia zajęć |
| | angielski |
| 3 | Realizowane efekty uczenia się |
| | **E1:** Student has knowledge of the scope, level and directions of development of issues that are nowadays included in the broadly understood area of information technology.<br>**E2:** Student is able to analyze the current level and directions of development of a selected issue, prepare a study using various sources, properly assessing their reliability, and then present the results of this analysis.<br>**E3:** Student is ready to independently identify gaps in their knowledge and fill them.<br>**E5:** Student is ready to independently formulate an opinion on a selected topic and present it, arguing it properly, understanding the complexity of issues and remaining open to the possibility of the existence of other opinions. |
| 4 | Treści programowe przedmiotu |
| | **C1:** Explanation of general vision of IT as a technical, economical and social phenomenon. Identification and brief characteristic of major topics and their assignment to individual students. Presentation of basic principles of approach to prepare the elaboration and presentations List of topics (example) divided into 3 sections: A. Hardware: 1. Concept of computers and processors - current status and future concepts such as quantum optical and biological ones. 2. “Big Data 1” - Processing large amounts of data - from supercomputers to "server farms" – parallel processing. 3. “Big Data 2” – Storage of large amounts of data - how to store petabytes. 4. Miniaturization : build-in computers, dedicated computers and others 5. Advanced I/O equipment: extreme applications (e.g., 3D scanners and printers) 6. Biocybernetics - virtual reality - extended reality 7. Computer Networks - Present and Future 8. Barriers of hardware development - challenges for the future – new materials and ideas. B. Software 9. Operating systems - current state and future visions 10. Types of computer programs - from “single side” though “client-server” architecture to the concept of " agents" 11. Real-time systems - rarely noticed the face of computers 12. Text Retrieval and Processing - Algorithms of " search engines" 13. Programming the "artificial intelligence" - genetic algorithms , neural networks, fuzzy logic and arithmetic 14. Pattern Recognition - methods and fields of application C. Using the TI 15. Multimedia – digital video and audio - WMP, TV on demand, Web TV, IPTV 16. Legal aspects of the IT usage 1- the copyright of the content available on the web 17. Legal aspects of the use of TI 2 - types of licenses and their impact on the free use of computer programs 18. Outsourcing IT – from the lease of hardware to the "cloud computing" 19. Computer software in the company 1- from single application to integrated systems 20. Computer software in the company 2 - CRM systems as an example of parts of integrated systems : the concept and solutions 21. Computer networks in business - from e -mail to the concept of B2B , B2C , C2B and other 22. Web business and e-business - how to earn online. 23. Money in the web - how to safely pay in web. 24. GIS - digital reflection of the real world 25. "Smart Solutions" - from the phones to the buildings 26. Data - information - knowledge - wisdom. Knowledge management and knowledge workers. 27. Big Brother is watching - that privacy in the Internet era. 28. Computers in entertainment - from video games to the "Avatar” 29. Security of computer systems and networks 30. Information Society - what does it mean?<br>**C2:** Student presentations on given topics (after achieving positive mark from elaboration) and discussion. |

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| 1 | Nazwa przedmiotu |
| | **Data Mining** |
| 2 | Język prowadzenia zajęć |
| | angielski |
| 3 | Realizowane efekty uczenia się |
| | **E1:** Student knows main types of data mining problems, basic tools used in data mining including statistical methods and neural networks, and knows general rules of utilisation of these tools in selected data mining problems.<br>**E2:** Student is able to properly use the sufficient data mining tools in given problems and solve mid-advanced data mining problems, performing correctly the whole data exploration process.<br>**E3:** Student is ready to carry out smaller projects without the help of others and properly evaluate his/her ability in this regard. |
| 4 | Treści programowe przedmiotu |
| | **W1:** 1. Principles and features of data mining, 2. Basic tasks of data mining, 3. CRISP-DM methodology 4. Artificial intelligence and its main issues, 5. Neural networks and their application, 6. Applications of neural networks in selected problems, 7. Preliminary data transformation (pre-processing), 8. Processing of qualitative information, 9. Prediction and evaluation (regression problems), regression analysis, 10. Classification, 11. Clustering, 12. Association rules, Apriori algorithm, 13. Text mining, 14. Web mining and opinion mining.<br>**C1:** Solving various data mining problems (evaluation, prediction, classification, clustering, searching for association rules) with use of relatively simple data files. Developing simple and mid-advanced data mining models based on: - multiple regression, - k – nearest neighbour algorithm, - classification and regression trees, - neural networks, - selected methods of hierarchical clustering, - Kohonen (SOM) networks. Evaluation and analysis of created data mining models. Application of selected software packages (e.g. Statistica Data Miner). Analysis of subsequent steps of a data mining model creation (with special emphasis on data pre-processing).<br>**C2:** Solving mid-advanced data mining tasks in form of students' projects: solving selected data mining problems concerning economy and management (e.g. real estate market analysis, customers classification, financial data analysis). Discussion of correctness of data mining process and its results. |

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| 1 | Nazwa przedmiotu |
| | **Decision Support Systems** |
| 2 | Język prowadzenia zajęć |
| | angielski |
| 3 | Realizowane efekty uczenia się |
| | **E1:** Student knows definitions of decision problems under certainty, uncertainty and risk.<br>**E2:** Student is able to specify models used as a basis for optimal statistical decisions.<br>**E3:** Student is ready to implement using the R programming language, models used as a basis for optima statistical decisions. |
| 4 | Treści programowe przedmiotu |
| | **W1:** Introduction. Decisions under certainty, decisions under uncertainty, decisions under risk. Objective function, loss function, gain function: deterministic and stochastic variants. Intelligent decision systems: short review (deductive reasoning and logical inference, with Prolog |

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| implementation as an example) **W2:** Decisions under uncertainty: decision criteria (e.g. Wald, Hurwicz, Savage, Laplace criteria), axioms specifying requested properties of decision rules. Entropy and entropy maximizing distribution, when real one is unknown, in a case of decisions under uncertainty. **W3:** Decision under risk: statistical decision theory, total probability conditional probability, Bayes' theorem. **W4:** Optimal (Bayesian) statistical decisions. Value of information metrics for random variables: Value of information (VOI), Expected value of perfect information (EVPI), Expected value of including uncertainty (EVIU), Expected value of sample information (EVSI). **W5:** Parametric models of cluster analysis (mixture models) and classification (discriminant models) as a basis for optimal statistical decisions. **W6:** Bayesian Networks as models for optima statistical decisions. Joint density of distribution factorization using conditional indepence property of random variables. Algorithms for Bayesian Networks specification and parameter estimation. Statistical inference using Bayesian Networks. **W7:** Selected nonparametric classification models in optimal statistical decisions.<br><br>**C1:** Introduction. Decisions under certainty, decisions under uncertainty, decisions under risk. Introduction to the R programming language (basic data structures, user's functions and elementary computations ). **C2:** Elements of a probability theory supported by the R language (random events, total and conditional probability). Basic distributions of discrete and continuous random variables implemented in the R language (`stats` package) and pseudo random number generators (PRNGs). **C3:** Decisions under uncertainty – decisions rule implementations (e.g. Wald, Hurwicz, Savage, Laplace criteria) using R user's function. Entropy maximizing probability distributions (with possibile constraints on moments' values). **C4:** Optimal statistical decisions (Bayesian Theorem, risk minimization) and value of information metrics – using R user's functions and R packages: `decisionSupport`, `decision`, `bdpopt`.<br>C5: Cluster analysis model parameters estimation (mixture models: `mclust` packane, estimation using EM algorithm) and classification models (discriminant models: pakiet `mclust` package, `EDDA` function) **C6:** Bayesian Networks: specification, parameter estimation and statistical inference using `bnlearn` R package (eventually also `wiseR` package). **C7:** Selected nonparametric statistical models implemented for decisions under risk problems. |

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| **1** | Nazwa przedmiotu |
| | **E-business** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student understands e-business and the role it plays in the information economy.<br>**E2:** Student is able to apply concepts and models of e-business in the design and implementation of IT enabled organizational change.<br>**E3:** Student is ready to design and implement an e-business venture. |
| **4** | Treści programowe przedmiotu |

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| | **W1:** Introduction. E-business theoretical foundations. Technology related empirical laws. Maturity models. Transaction cost theory.<br>**W2:** E-business environment. PEST analysis method. Transformation of the economy.<br>**W3:** E-business strategies and models. Different e-business typologies. Sell-side and buy side strategies. Revenue models.<br>**W4:** User Experience and Web-usability<br>**C1:** Case study: Ross J. W., (2001), E-business at Delta Air Lines – Extracting value from a Multi-Faceted Approach, Center for Information Systems Research, Sloan School of Management, Massachusetts Institute of Technology, Cambridge, Massachusetts, Working Paper No. 317.<br>**C2:** Case study: Orlikowski W., Thompson S., (2010), Leveraging the Web for Customer Engagement: A Case Study of BT's Debatescape, Center for Information Systems Research, Sloan School of Management, Massachusetts Institute of Technology, Cambridge, Massachusetts, Working Paper No. 380.<br>**C3:** Case study: Wixom, B. H., Ross, J. W., Beath, C. M., (2013), comScore, Inc.: Making Analytics Count, CISR WP No. 392 and MIT Sloan WP No. 5233-13.<br>**C4:** E-business venture team project. |

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| **1** | Nazwa przedmiotu |
| | **Economics and Corporate Finance** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows basic concepts in the field of business management as well as understands the impact of marketing, human resources, operational and quality management on the achieved results.<br>**E2:** Student is able to determine individual factors, economic and financial parameters on costs, financial liquidity and results of each enterprise under corporation and analyse the functioning of the corporation in basic aspects.<br>**E3:** Student is ready to develop the attitude of future responsibility for the decisions made in corporation and is aware of the necessity of having knowledge in the field of management. |
| **4** | Treści programowe przedmiotu |
| | **W1:** Introduction to Corporate Economics and Finance<br>**W10:** Long-Term Financing: An Introduction<br>**W11:** Capital Structure: Basic Concepts<br>**W12:** Mergers, Acquisitions, and Divestitures. International Corporate Finance<br>**W2:** The Corporate Firm - The Sole Proprietorship, The Partnership, The Corporation, A Corporation by Another Name<br>**W3:** The Agency Problem and Control of the Corporation<br>**W4:** Financial Statements and Cash Flow<br>**W5:** Valuation and Capital Budgeting<br>**W6:** Making Capital Investment Decisions<br>**W7:** Risk Analysis, Real Options, and Capital Budgeting<br>**W8:** Stock Valuation<br>**W9:** Efficient Capital Markets and Behavioral Challenges<br>**C1:** The Corporate Firm - Goals and Management Strategy<br>**C2:** Determination of Objectives in the Structure of the Strategy of Corporation |

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| | **C3:** Financial Statements and Cash Flow<br>**C4:** Financial Statements Analysis and Financial Models<br>**C5:** Discounted Cash Flow Valuation. Net Present Value and Other Investment Rules<br>**C6:** Making Capital Investment Decisions<br>**C7:** Risk Analysis, Real Options, and Capital Budgeting<br>**C8:** Risk, Cost of Capital, and Capital Budgeting<br>**C9:** Long-Term Financing. Leasing |

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| **1** | Nazwa przedmiotu |
| | **Electronic Data Interchange** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows the basis of electronic data interchange standards, document formats, web technologies, and web services.<br>**E2:** Student is able to design a syntactically correct document that reflects a fragment of reality and convert documents between different formats using basic web technologies and services.<br>**E3:** Student is ready to use the available communication media and resources to broaden their knowledge and skills and is aware of the importance of meeting deadlines and the necessity of acquiring certain skills. |
| **4** | Treści programowe przedmiotu |
| | **W1:** An introduction to Electronic Data Interchange.<br>**W2:** Document formats (TXT, CSV, XML, JSON).<br>**W3:** An introduction to web technologies (HTML, JavaScript).<br>**W4:** Document Object Model.<br>**W5:** An introduction to web services.<br>**C1:** An introduction to the course. Course organisation – presentation of the course syllabus and getting acquainted with the Moodle platform, that will be used for the publication of course materials and two-way communication.<br>**C2:** Document formats (TXT, CSV, XML, JSON).<br>**C3:** An introduction to web technologies (HTML, JavaScript).<br>**C4:** Document Object Model.<br>**C5:** An introduction to web services.<br>**C6:** Practical assignment / Project presentation. |

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| **1** | Nazwa przedmiotu |
| | **English Language 1.1** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies. |

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| | **E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in English to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Writing skills according to CEFR scale.<br>**C2:** Reading skills according to CEFR scale<br>**C3:** Listening skills according to CEFR scale<br>**C4:** Speaking skills according to CEFR scale<br>**C5:** Umiejętności typu soft skills oraz komunikacja międzykulturowa |

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|---|---|
| **1** | Nazwa przedmiotu |
| | **English Language 1.2** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies.<br>**E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in English to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Writing skills according to CEFR scale.<br>**C2:** Reading skills according to CEFR scale<br>**C3:** Listening skills according to CEFR scale<br>**C4:** Speaking skills according to CEFR scale<br>**C5:** Umiejętności typu soft skills oraz komunikacja międzykulturowa |

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|---|---|
| **1** | Nazwa przedmiotu |
| | **English Language 1.3** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies. |

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| | **E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in English to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Writing skills according to CEFR scale.<br>**C2:** Reading skills according to CEFR scale<br>**C3:** Listening skills according to CEFR scale<br>**C4:** Speaking skills according to CEFR scale<br>**C5:** Umiejętności typu soft skills oraz komunikacja międzykulturowa |

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|---|---|
| **1** | Nazwa przedmiotu |
| | **English Language 1.4** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies.<br>**E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in English to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Writing skills according to CEFR scale.<br>**C2:** Reading skills according to CEFR scale<br>**C3:** Listening skills according to CEFR scale<br>**C4:** Speaking skills according to CEFR scale<br>**C5:** Umiejętności typu soft skills oraz komunikacja międzykulturowa |

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| **1** | Nazwa przedmiotu |
| | **Enterprise Systems** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student understands the nature of Enterprise Systems and complexity of implementation process of such systems. |

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| | **E2:** Student is able to identify and evaluate organizational considerations and threats to Enterprise Systems implementation project and indicate solutions to these threats.<br>**E3:** Student is ready to continuously improve and update their knowledge of contemporary enterprise systems in both theoretical and practical aspects. |
| **4** | Treści programowe przedmiotu |
| | **W1:** Course organization. Characteristics and evolution of ES<br>**W2:** Motivations for ES adoption and their use in companies. ES market<br>**W3:** ES adoption process: Participants, phases, tasks<br>**W4:** Success in ES adoption<br>**W5:** Critical success factors for ES adoption<br>**W6:** Benefits from ES adoption<br>**W7:** Problems and barriers to ES adoption and use<br>**W8:** Evaluation of ES adoption<br>**W9:** Directions for future development of ES<br>**C1:** System choice<br>**C2:** ES lifecycle<br>**C3:** Determinants of ES implementation: Comparing developed and emerging/transition economies<br>**C4:** Organization of ES implementation – from motivations to success: case study<br>**C5:** ES in healthcare: case study<br>**C6:** ES in the public sector: case study<br>**C7:** ES in manufacturing: case study<br>**C8:** Critical success factors for ES implementation<br>**C9:** Group project presentation and evaluation |

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| **1** | Nazwa przedmiotu |
| | **French Language 2.1** |
| **2** | Język prowadzenia zajęć |
| | francuski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies.<br>**E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in French to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Writing skills according to CEFR scale.<br>**C2:** Reading skills according to CEFR scale<br>**C3:** Listening skills according to CEFR scale<br>**C4:** Speaking skills according to CEFR scale<br>**C5:** Umiejętności typu soft skills oraz komunikacja międzykulturowa |

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|---|---|
| **1** | Nazwa przedmiotu |
| | **French Language 2.2** |
| **2** | Język prowadzenia zajęć |
| | francuski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies.<br>**E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in French to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Writing skills according to CEFR scale.<br>**C2:** Reading skills according to CEFR scale<br>**C3:** Listening skills according to CEFR scale<br>**C4:** Speaking skills according to CEFR scale<br>**C5:** Umiejętności typu soft skills oraz komunikacja międzykulturowa |

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|---|---|
| **1** | Nazwa przedmiotu |
| | **French Language 2.3** |
| **2** | Język prowadzenia zajęć |
| | francuski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies.<br>**E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in French to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Writing skills according to CEFR scale.<br>**C2:** Reading skills according to CEFR scale<br>**C3:** Listening skills according to CEFR scale<br>**C4:** Speaking skills according to CEFR scale<br>**C5:** Umiejętności typu soft skills oraz komunikacja międzykulturowa |

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|---|---|
| **1** | Nazwa przedmiotu |
| | **French Language 2.4** |
| **2** | Język prowadzenia zajęć |
| | francuski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies.<br>**E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in French to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Podstawowe zagadnienia ekonomii i biznesu (rekrutacja, zarządzanie, marketing, sprzedaż, ICT, organizacja i finanse firmy, kultura korporacyjna, etyka w biznesie) zgodnie z sylabusem dostępnym na stronie internetowej SJO oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C2:** Szczegółowe zagadnienia specyficzne dla kierunku Informatyka stosowana zgodnie z sylabusem dostępnym na stronie internetowej SJO oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C3:** Odpowiednie dla poziomu językowego elementy wiedzy systemowej języka (gramatyka, składnia, frazeologia, fonetyka) zgodnie z sylabusem dostępnym na stronie internetowej SJO oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C4:** Korespondencja handlowa / służbowa z uwzględnieniem specyfiki kierunku Informatyka stosowana zgodnie z sylabusem dostępnym na stronie internetowej SJO oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C5:** Umiejętności typu soft skills i komunikacja międzykulturowa zgodnie z sylabusem dostępnym na stronie internetowej SJO oraz z uwzględnieniem poziomu językowego wg skali CEFR. |

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|---|---|
| **1** | Nazwa przedmiotu |
| | **German Language 2.1** |
| **2** | Język prowadzenia zajęć |
| | niemiecki |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies.<br>**E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in German to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |

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|---|---|
| | **C1:** Podstawowe zagadnienia ekonomii i biznesu (rekrutacja, zarządzanie, marketing, sprzedaż, ICT, organizacja i finanse firmy, kultura korporacyjna, etyka w biznesie) zgodnie z sylabusem dostępnym na stronie internetowej CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C2:** Odpowiednie dla poziomu językowego elementy wiedzy systemowej języka (gramatyka, składnia, frazeologia, fonetyka) zgodnie z sylabusem SJO oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C3:** Korespondencja handlowa/służbowa z uwzględnieniem specyfiki kierunku zgodnie z sylabusem CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C4:** Umiejętności typu soft skills i komunikacja międzykulturowa zgodnie z sylabusem CJ. |

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|---|---|
| **1** | Nazwa przedmiotu |
| | **German Language 2.2** |
| **2** | Język prowadzenia zajęć |
| | niemiecki |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies.<br>**E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in German to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Podstawowe zagadnienia ekonomii i biznesu (rekrutacja, zarządzanie, marketing, sprzedaż, ICT, organizacja i finanse firmy, kultura korporacyjna, etyka w biznesie) zgodnie z sylabusem dostępnym na stronie internetowej CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C2:** Odpowiednie dla poziomu językowego elementy wiedzy systemowej języka (gramatyka, składnia, frazeologia, fonetyka) zgodnie z sylabusem SJO oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C3:** Korespondencja handlowa/służbowa z uwzględnieniem specyfiki kierunku zgodnie z sylabusem CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C4:** Umiejętności typu soft skills i komunikacja międzykulturowa zgodnie z sylabusem CJ. |

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| **1** | Nazwa przedmiotu |
| | **German Language 2.3** |
| **2** | Język prowadzenia zajęć |
| | niemiecki |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies. |

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| | **E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in German to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Podstawowe zagadnienia ekonomii i biznesu (rekrutacja, zarządzanie, marketing, sprzedaż, ICT, organizacja i finanse firmy, kultura korporacyjna, etyka w biznesie) zgodnie z sylabusem dostępnym na stronie internetowej CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C2:** Szczegółowe zagadnienia specyficzne dla kierunku Informatyka Stosowana zgodnie z sylabusem dostępnym na stronie internetowej CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR<br>**C3:** Odpowiednie dla poziomu językowego elementy wiedzy systemowej języka (gramatyka, składnia, frazeologia, fonetyka) zgodnie z sylabusem dostępnym na stronie internetowej CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C4:** Korespondencja handlowa / służbowa z uwzględnieniem specyfiki kierunku Informatyka stosowana zgodnie z sylabusem dostępnym na stronie internetowej CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C5:** Umiejętności typu soft skills i komunikacja międzykulturowa zgodnie z sylabusem dostępnym na stronie internetowej CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR |

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|---|---|
| **1** | Nazwa przedmiotu |
| | **German Language 2.4** |
| **2** | Język prowadzenia zajęć |
| | niemiecki |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies.<br>**E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in German to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Podstawowe zagadnienia ekonomii i biznesu (rekrutacja, zarządzanie, marketing, sprzedaż, ICT, organizacja i finanse firmy, kultura korporacyjna, etyka w biznesie) zgodnie z sylabusem dostępnym na stronie internetowej CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C2:** Szczegółowe zagadnienia specyficzne dla kierunku Informatyka Stosowana zgodnie z sylabusem dostępnym na stronie internetowej CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR<br>**C3:** Odpowiednie dla poziomu językowego elementy wiedzy systemowej języka (gramatyka, składnia, frazeologia, fonetyka) zgodnie z sylabusem dostępnym na stronie internetowej CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C4:** Korespondencja handlowa / służbowa z uwzględnieniem specyfiki kierunku Informatyka |

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| | stosowana zgodnie z sylabusem dostępnym na stronie internetowej CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C5:** Umiejętności typu soft skills i komunikacja międzykulturowa zgodnie z sylabusem dostępnym na stronie internetowej CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR |

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|---|---|
| **1** | Nazwa przedmiotu |
| | **Information System Security** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows IT/IS security management problems in relationship to legal and standard compliance requirements, occurring threats and appropriate countermeasures.<br>**E2:** Student is able to manage the security of a given information system thanks to appropriate usage of legal norms and standards, discovering and analysis of occurring threats and vulnerabilities and selecting relevant countermeasures.<br>**E3:** Student is ready to continuously promote appropriate security activities through the use of relevant norms, standards, law and ethical behaviour. |
| **4** | Treści programowe przedmiotu |
| | **W1:** Definitions, attributes and IS security models.<br>**W2:** IT governance and IS security<br>**W3:** IS security assessment methods<br>**W4:** IS security standards, norms and guidelines<br>**W5:** Information system security threats and vulnerabilities<br>**W6:** IS security countermeasures<br>**W7:** IS security management<br>**C2:** ITBO Case Study presentation<br>**C3:** Identification and analysis of IS security threats and vulnerabilities<br>**C4:** Identification and analysis of available IS security countermeasures<br>**C5:** Final IS security protection system proposal |

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| **1** | Nazwa przedmiotu |
| | **Information Systems Analysis and Design** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student understands need of IT applications, the role of information in an organization, and is aware of the importance of proper data flow.<br>**E2:** Student is able to analyse and design information system using specific methods, structure problems and define requirements, solve the problems with use of IT.<br>**E3:** Student is ready to work in teams, communicate and cooperate with other team members. |
| **4** | Treści programowe przedmiotu |

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| | **W1:** Course organization; Basic introduction to the topics<br>**W2:** Basic terminology: data and information, system information systems, organization; Role of information systems in organization<br>**W3:** Project and system development life cycle phases and description; System life cycle phases, changing efficiency of IS<br>**W4:** Project planning and feasibility study: Objectives definition, Feasibility assessing, Conclusions to the project development<br>**W5:** IS methodologies: methodologies background, types and classifications; IS development models: Evolution of IS development models; Types of most popular models<br>**W6:** Types of IS (hierarchical and functional)<br>**C1:** Course rules and requirements. Basic terminology of information systems<br>**C2:** Phases of project development life cycle (PDLC) from the perspective of students project. Teamwork on project topic<br>**C3:** Feasibility study - teamwork: Objectives of organization, IS and Project – definition. Project limitations and conditions (categories). Determining feasibility and conclusions.<br>**C4:** Information needs and requirements analysis and alternative solutions - teamwork: Categories of data within organization. Information requirements definition. Setting alternative solutions. Choosing a solution and justification<br>**C5:** Process modeling in the modeling tool - teamwork: Company map. Detailed models of processes (business process models). Setting relation among processes. Process description.<br>**C6:** Business process logic description methods -teamwork: Algorithms. Decision table. Decision tree. Structured English<br>**C7:** Data dictionary - teamwork: Rules of data dictionary design. Rules of data description.<br>**C8:** Summery of classes and teamwork: Discussion of experiences and opinions, Summary of obtained skills |

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| **1** | Nazwa przedmiotu |
| | **Integrated Systems** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student has knowledge of the norms and rules (legal, organizational, moral, ethical) effectively building social structures and institutions<br>**E2:** Student is able to use acquired knowledge for realization of assigned tasks and solving problems in professional work<br>**E3:** Student is ready to consistently adhere to the principles of professional diligence and fairness, with due respect to co-workers and stakeholders |
| **4** | Treści programowe przedmiotu |
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|---|---|
| **1** | Nazwa przedmiotu |
| | **Internship** |
| **2** | Język prowadzenia zajęć |

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| | angielski |
| 3 | Realizowane efekty uczenia się |
| | **E1:** Student has knowledge about details concerning integrated management systems and organization of the implementation process. Student understands the complexity of the implementation process, is aware of changing conditions in time.<br>**E2:** Student is able to recognize and assess the organizational conditions of an integrated system implementation project. Student is able to assess the threats of an implementation project and indicate countermeasures. Student is able to create a framework schedule of implementation of an integrated system and define its participants.<br>**E3:** Student is ready to update knowledge, concerning modern integrated systems both in theoretical and practical range. |
| 4 | Treści programowe przedmiotu |
| | **W1:** Characteristics and evolution of integrated systems: definitions, process approach to enterprise management, MRP systems, closed loop MRP, MRPII, ERP, CRM, SCM, ERPII; ERPII components.<br>**W2:** Motivations of enterprises to implement the IS. Reasons why enterprises do not decide to implement IS. Reasons for using the IS depending on the size of an enterprise. Reasons for migration to a new system version. Motivations for system implementation in the context of implementation effects. Benefits of implementation depending on the business or technological approach. Motivations of Polish enterprises to implement integrated systems.<br>**W3:** IS implementation process: participants, stages, tasks. Implementation participants. Stages of implementation work. Implementation strategies. Types of implementation. Examples of implementation methodologies.<br>**W4:** Success factors in IS implementation. Success in information systems implementation. DeLone and McLean models. Success IS based on DeLone's and McLean's model. Success of IS depending on project phase. MRP II implementation class – ABCD Method.<br>**W5:** Success factors for implementing integrated systems. Definition of success factors. General model of success factors. Survey results among Polish companies and experts. Success factors depending on the type of implementation. Success factors in Polish companies versus highly developed countries.<br>**W6:** Benefits of deploying an IS in the enterprise. Benefits of implementations. Highly developed economies. Benefits over time. Dimensions of benefits. Benefits achieved by Polish enterprises.<br>**W7:** IS application evaluation and development directions. IS evaluation requirements and criteria. IS evaluation methods. Comprehensive IS evaluation. Criteria and stages. Directions and dimensions of IS development. The future of IS-managed organizations.<br>**C1:** MRP algorithm: Substance of MRP and sources of information for the algorithm. MRP record and GHP record. Concepts in MRP. MRP procedure. Organizational implications of the MRP model at strategic, tactical, operational levels. Implications for implementation project.<br>**C2:** System selection. Criteria for system selection. Procedure for system selection. Stakeholders involved in the selection process. Differences between small and medium-sized enterprises (SMEs) and large companies. Differences between economies: transitive and highly developed economies.<br>**C3:** The life cycle of an integrated system: Two basic models of the system life cycle (Cooper & Zmud 1990; Markus & Tanis 2000): model comparison, phase mapping. Activities occurring in each phase of the system life cycle. Stakeholders in the life cycle, the changing role of stakeholders depending on the phase. Similarities and differences between phases of the system life cycle in transitive and highly developed economies.<br>**C4:** Good practices of implementations - A case study in a distribution company. Diagnosis of mistakes and their consequences. Identifying stakeholders and relations between them. Recognizing threats and success factors. Formulating recommendations for implementation projects.<br>**C5:** Problems and barriers connected with implementation and exploitation of the IS. Reasons for |

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| | failure of implementation projects. Problems from the Polish enterprises and Western countries point of view. Problems of suppliers and recipients point of view. Problems during system's life cycle. Cause-effect relations between problems and their source problems. Barriers and risk factors.<br>**C6:** Determinants of IS implementation. Definition of the determinants concept. The most important determinants of IS implementation in the opinion of Polish practitioners. Perception of determinants by different stakeholders. The most important relationships between stakeholders. Differences between determinants in transitive and highly developed economies.<br>**C7:** Differentiating the determinants of EIS implementations. Analyse the determinants of integrated systems implementations depending on the following criteria: the size of the company (SME / large), the scope of implementation (partial / full), the level of development of the national economy (transitive / highly developed), stakeholder group (in particular in terms of: customer /supplier), phase of the system life cycle. |

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| **1** | Nazwa przedmiotu |
| | **Introduction to Database Systems** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to design databases and process them.<br>**E2:** Student is able to design database and is familiar with SQL functional and selecting commands.<br>**E3:** Student is ready to communicate to share experiences and knowledge to design appropriate database system. |
| **4** | Treści programowe przedmiotu |
| | **W1:** Relational model, table as a structure for data collecting.<br>**W2:** Relationships: their types and other attributes. Case study: designing database on the basis of information being the result of system analysis and interviews conducted among users for whom the database is designed.<br>**W3:** Logical design. Creating logical design of a database on the basis of textual information describing data that is going to be stored in the database.<br>**W4:** SQL language: description, introduction and classification. Description of CREATE TABLE and the statements used for performing functional operations on data (INSERT, UPDATE, DELETE).<br>**W5:** Database designing process - from needs analysis to conceptual, logical and physical design of a database.<br>**W6:** Selecting queries. Project, selection, calculated fields, cartesian product, inner join, outer join, groupping and aggregate functions.<br>**W7:** SELECT statement of SQL language. Syntax, project operation, select conditions, ordering, joins, self-joins, aliases, sub-queries, negative queries, correlated sub-queries, unions, intersects, calculated fields, groupping and aggregate functions, HAVING clause.<br>**C1:** Introduction. Description of relational model.<br>**C10:** SELECT statement of SQL language - examples.<br>**C11:** Selecting queries and SELECT statement - summary.<br>**C12:** Practical test – selecting queries and SELECT statement.<br>**C13:** Evaluation.<br>**C2:** Data structures: various kinds of keys, tables and non-atomic fields. Indexes. The problem of integrity.<br>**C3:** Entity relationship diagrams. The process of database designing. |

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| | **C4:** Logical design of a database. Implementation of database for films renting.<br>**C5:** Selected problems connected with database designing.<br>**C6:** Functional statements of SQL language: using CREATE TABLE statement for physical database project designing. Statements for data manipulation. VBA programming basics.<br>**C7:** Logical database designing and functional statements of SQL language - summary.<br>**C8:** Logical database designing and functional statements of SQL language - practical test.<br>**C9:** Using QBE tool for selecting queries designing. |

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| **1** | Nazwa przedmiotu |
| | **Introduction to Information Systems** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows the principles of design, development and management of information systems and associated technologies in an organized human enterprise.<br>**E2:** Student is able to effectively and efficiently analyse and define information requirements<br>**E3:** Student is ready to develop the skills of critical thinking and team-working. |
| **4** | Treści programowe przedmiotu |
| | **W1:** Introduction<br>**W10:** The role of IT/IS function within the organization<br>**W2:** Basic concepts<br>**W3:** Strategic significance of IT<br>**W5:** Typology of information systems<br>**W6:** Enterprise systems<br>**W7:** CRM Systems<br>**W8:** IT governance<br>**W8:** Cloud Computing<br>**W9:** SCM Systems<br>**C1:** Introduction to the subject matter<br>**C2:** Planning the activities of the organization and market characteristics<br>**C3:** Business strategy and hierarchy of goals as the basis for defining an IT project<br>**C4:** Feasibility study and pre-implementation study<br>**C5:** Feasibility study: project objectives and scope, feasibility constraints, venture profitability study, feasibility and conclusions<br>**C6:** Establishing the overall scope of the project |

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| **1** | Nazwa przedmiotu |
| | **Introduction to Mathematics** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |

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| | **E1:** Student knows the goals and role of mathematical methods in computer science and economics, and knows the basic concepts and ways of solving typical problems in these areas.<br>**E2:** Student is able to use basic mathematical tools to solve problems related to economic models and IT issues.<br>**E3:** Student is ready for an individual and team analysis of IT and economic issues with the use of mathematical methods and the recognition of the primacy of using strict mathematical methods in solving these problems. |
| **4** | Treści programowe przedmiotu |
| | C1: Elements of logic and set theory<br>1.1. Introduction of basic notation of logic operators and quantifiers<br>1.2. Basic logical laws<br>1.3. Relationship between operation on sets and logic operators<br><br>C2: Properties of elementary functions<br>2.1. Definition of function<br>2.2. Domain, range, roots<br>2.3. Monotonicity, eveness, periodicity<br>2.4. Composition of function<br>2.5. Inverse function<br>C3: Elementary functions, properties and their inverse functions<br>3.1. Exponential function<br>3.2. Logarithmic function<br>3.3. Trigonometric functions and reduction formulas<br>3.4. Operations on graphs of functions<br><br>C4: Sequences<br>4.1. Definition of number sequence and its properties<br>4.2. Application of sequences in financial mathematics<br>4.3. Concept of limit of sequence and its properties<br>4.4. Limits of some particular sequences<br>4.5. Squeeze theorem<br>4.6. Cluster points of sequence<br>C5: Limit of function<br>5.1. Heini definition of limit of function at point and in infinity<br>5.2. Properties of limits<br>5.3. Continuity of functions<br>5.4. Darboux and Weierstrass theorem<br>5.5. Asymptotes of graph of function<br><br>C6: Derivative of function and its applications<br>6.1. Definition of derivative, its geometric application and basic properties<br>6.2. Continuity vs. differentiability<br>6.3. Application of derivatives in economics (marginality and elasticity)<br>6.4. de ľ Hospital rule<br>6.5. Monotonicity and local extrema<br>6.6. The least and the greatest values on compacts<br>6.7. Convexity and inflextion points of graph of function<br>6.8. Investigation of function<br>6.9. Differential and approximation of value of function |

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| | C7: Power series<br>7.1. Definition of power series<br>7.2. Sufficient condition for convergence<br>7.3. Open inerval of convergence for power series (Cauchy and d'Alambert criteria)<br>7.4. Expansion of function in power series (Taylor theorem, Lagrange remainder, Maclaurin series)<br>7.5. Differentiation of power series<br><br>C8: Relations<br>8.1. Definition of Cartesian product of sets<br>8.2. Definition of relation<br>8.3. Ordering relations<br>8.4. Definition of equivalence relation and equivalence classes<br>8.5. The rule of partitioning<br>8.6. Utility and indifference curves |

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| **1** | Nazwa przedmiotu |
| | **IT Project Management** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows the role of information technology in the functioning of the organization as a tool for achieving the goals of this organization.<br>**E2:** Student knows what an IT project is, knows its complexity and the role of various factors influencing the final result of the project.<br>**E3:** Student is able to define the scope of an IT project and prepare its plan, which includes the scope of work, definition of tasks and processes, estimated necessary resources and a work schedule.<br>**E4:** Student is ready to use his knowledge in the field of forms and methods of group work to implement IT projects (projects), understanding that success is possible only with the concerted cooperation of all team members. |
| **4** | Treści programowe przedmiotu |
| | **W1:** 1. IT project as a kind of investment: - role of strategy and its operationalization (goals hierarchy) in process of establishing (starting) the project, - using the opportunities, pre-feasibility and feasibility study, - using the economic criteria in process of project definition (estimate of effectiveness)<br>**W2:** 2. Principles of project management: - definition of the IT project objectives and results, the main area of project management (based on PMI approach) - basic models of management and development processes in IT projects and their impact on project management approach (traditional, extreme, adaptive, agile, etc.) - examples of the most common IT project management methodologies (frameworks)<br>**W3:** 3. Using the results of IT project: - implementation and usage of IT systems, typical activities and their technological and organizational determianants - maintenance, its different kinds and the problem of "continues delivery"<br>**C1:** 1. Organization strategy and its operationalization: - strategy as vision of organization in the future, - strategy operationalization and goals hierarchy, - organizational goals as a reason of undertaking the IT project: the opportunity, pre-feasibility and feasibility study and its role |

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| | **C2:** 2. Elements of Requirements Engineering: - different kinds of requirements (business, users and software ones) - relations between the requirements and their characteristic - sources of requirements and their elicitation - preparation of Requirements Specification (and its kinds)<br>**C3:** 3.Project resource estimation: - the importance of project resource estimation and different approaches to it - the function point based estimation as an example of IT project resource estimation - preparation of resource estimation for a given case<br>**C4:** 4. Project planning and scheduling: - determining the structure of work (task, activities, etc.) - Work Breakdown Structure (WBS), - determining the interdependence inside identifying structure of work - Project Evaluation and Review Technique (PERT), - preparation of project schedule - Gantt charts |

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| **1** | Nazwa przedmiotu |
| | **Italian Language 2.1** |
| **2** | Język prowadzenia zajęć |
| | włoski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies.<br>**E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in Italian to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Basic issues of economics and business (recruitment, management, marketing, sales, ICT, organisation and finance of the company, corporate culture, business ethics) according to the CJ syllabus and to the CEFR scale.<br>**C2:** Suitable for the language level elements of systemic language knowledge (grammar, syntax, phraseology, phonetics) according to the CJ syllabus and to the CEFR scale.<br>**C3:** Commercial/business correspondence taking into account the specificity of the subject according to the CJ syllabus and to the CEFR scale.<br>**C4:** Soft skills and intercultural communication according to the CJ syllabus. |

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| **1** | Nazwa przedmiotu |
| | **Italian Language 2.2** |
| **2** | Język prowadzenia zajęć |
| | włoski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies. |

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| | **E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in Italian to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Writing skills according to CEFR scale.<br>**C2:** Reading skills according to CEFR scale<br>**C3:** Listening skills according to CEFR scale<br>**C4:** Speaking skills according to CEFR scale<br>**C5:** Umiejętności typu soft skills oraz komunikacja międzykulturowa |

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| **1** | Nazwa przedmiotu |
| | **Italian Language 2.3** |
| **2** | Język prowadzenia zajęć |
| | włoski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies.<br>**E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in Italian to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Writing skills according to CEFR scale.<br>**C2:** Reading skills according to CEFR scale<br>**C3:** Listening skills according to CEFR scale<br>**C4:** Speaking skills according to CEFR scale<br>**C5:** Umiejętności typu soft skills oraz komunikacja międzykulturowa |

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| **1** | Nazwa przedmiotu |
| | **Italian Language 2.4** |
| **2** | Język prowadzenia zajęć |
| | włoski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies. |

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| | **E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in Italian to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Writing skills according to CEFR scale.<br>**C2:** Reading skills according to CEFR scale<br>**C3:** Listening skills according to CEFR scale<br>**C4:** Speaking skills according to CEFR scale<br>**C5:** Umiejętności typu soft skills oraz komunikacja międzykulturowa |

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| **1** | Nazwa przedmiotu |
| | **Knowledge Management** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student understands the concept of knowledge-based organizations and knowledge economy, knowledge management tools and systems.<br>**E2:** Student is able to identify and resolve knowledge management problems and carry out processes of knowledge sharing and generation.<br>**E3:** Student becomes involved in knowledge generation and sharing processes. |
| **4** | Treści programowe przedmiotu |
| | **W1:** Knowledge definition and attributes, types of knowledge<br>**W2:** Knowledge management definitions, history and development<br>**W3:** Organizational learning and organizational memory<br>**W4:** Knowledge work and knowledge managers<br>**W5:** Knowledge based organizations<br>**W6:** Knowledge economy<br>**W7:** Organization's knowledge resources<br>**W8:** Knowledge Assets and intellectual capital<br>**W9:** Market for know-how and knowledge<br>**C1:** Knowledge management processes and knowledge processes<br>**C10:** Strategic knowledge management<br>**C11:** Knowledge management systems<br>**C12:** Knowledge management implementation<br>**C2:** Identifying of knowledge<br>**C3:** Knowledge transfer<br>**C4:** Acquisition of knowledge<br>**C5:** Distribution of knowledge<br>**C6:** Knowledge keeping (collecting, recording)<br>**C7:** Knowledge mapping |

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| | **C8:** Knowledge creation<br>**C9:** Organizational culture and knowledge management |

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| **1** | Nazwa przedmiotu |
| | **Mathematical Analysis and Linear Algebra** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows the basic issues, definitions and theorems in the field of linear algebra and mathematical analysis as well as examples of its applications in the fields of economics and information technology.<br>**E2:** Student is able to solve problems from the discussed range of linear algebra and mathematical analysis and apply its tools in practical IT and economic problems.<br>**E3:** Student is ready to act in accordance with generally accepted ethical principles both in terms of study and subsequent professional career. |
| **4** | Treści programowe przedmiotu |
| | **W1:** Complex numbers: complex numbers - basic concepts, different forms of complex numbers (algebraic, trigonometric, exponential), powers and roots of complex numbers, solving quadratic equations in the field of complex numbers.<br>**W2:** Matrices and determinants: definition of a matrix, types of matrices, complex matrices, matrix operations, and their properties, the definition of the determinant and properties of determinants, definition of the inverse matrix and methods of its evaluation (elementary operations and cofactors), matrix equations.<br>**W3:** Systems of linear equations: rank of a matrix, the matrix form of a system of linear equations, types of systems of linear equations, Cramer's system and methods of solving it (inverse matrix method and Cramer's rule), general systems of linear equations, Kronecker-Capelli theorem and its application. Gauss and Gauss-Jordan methods of solving systems of linear equations.<br>**W4:** Eigenvalues and eigenvectors, dominant eigenvalue, Cayley-Hamilton theorem, Frobenius-Perron theorem. Scalar product and norm of a vector. Matrix diagonalization, orthogonal matrices, diagonalization of orthogonal matrices. Applications of eigenvalues and eigenvectors: difference equations, Google Page Rank algorithm.<br>**W5:** Differential calculus of functions of several variables: definition of a function of several variables and its domain, partial derivatives, the economic interpretation of partial derivatives, local extrema - definition and theorems, least squares method, constrained extrema - definition and theorems, total differential of a function.<br>**W6:** Integrals of functions of one variable: antiderivative an indefinite integral, rules of integration, integration formulae, Riemann's definite integral - definition, properties, improper integral, economic and geometric applications of integrals.<br>**W7:** Ordinary differential equations: definition and basic concepts, differential equations with separated variables, linear differential equations of the first order, substitution method.<br>**W8:** Phase portraits. Systems of differential equations, Hartman-Grobmann theorem, stability of stationary points.<br>**C1:** Gauss plane, forms of a complex number, powers and roots of a complex number.<br>**C10:** The least squares method, application of total differential, simple linear programming problems.<br>**C11:** Calculation of basic integrals, integration by parts, integration by substitution. |

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| | **C12:** Definite integrals, average value of a function, convergence of integrals, application of integrals in evaluation of the area of a region.<br>**C13:** Solving simple differential equations and Cauchy problems, solving equations with separated variables, solving linear equations of the first order, solving differential equations using the substitution method, applications of differential equations in practical problems.<br>**C14:** Phase portraits. Solving simple systems of differential equations, application of Hartman-Grobmann theorem to determine the stability of stationary points.<br>**C2:** Solving equations in the set of complex numbers, applications of complex numbers.<br>**C3:** Real and complex matrices, matrix operations, matrix equations.<br>**C4:** Determinant of a square matrix, inversion of matrices (cofactors and elementary operations), matrix-valued functions.<br>**C5:** Calculations of the rank of a matrix (including matrices with parameters), solving systems of linear equations (including systems with parameters) with Cramer's rule, Gauss and Gauss-Jordan methods.<br>**C6:** Calculation of eigenvalues and eigenvectors of a matrix, application of Cayley-Hamilton theorem for calculation of the inverse matrix, matrix diagonalization, scalar product and norm of a vector.<br>**C7:** Diagonalization of orthogonal matrices. Applications of eigenvalues and eigenvectors: difference equations.<br>**C8:** Determination of the domain of a function of several variables, calculation of partial derivatives, the economic interpretation of partial derivatives - marginal values and partial elasticity.<br>**C9:** Local extrema and conditional extreme of a multivariable function. |

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| **1** | Nazwa przedmiotu |
| | **Numerical Methods** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows the goals and role of numerical methods in analysis of mathematical models and can state basic problems in this area and methods of solving them.<br>**E2:** Student is able to use the tools of numerical methods and for each method recognizes the possibility of its usage and can implement them with stating error estimate for a result, also giving result interpretation.<br>**E3:** Student is ready to perform individual and team analysis of economic phenomena with the use of mathematical methods. |
| **4** | Treści programowe przedmiotu |
| | **W1:** Error theory - sources of computational errors. Absolute and relative errors. Methods of calculating the errors and inverse problem of error theory. Basis of computational complexity, notation O.<br>**W2:** Direct methods of solving the systems of linear equations: LU decomposition and Cholesky methods. Numerical complexity in comparison with Gauss and Gauss-Jordan elimination methods.<br>**W3:** Approximate methods of solving the systems of linear equations: simple iteration and Seidel iteration methods.<br>**W4:** Eigenvalues and eigenvectors - localisation theorems and power method.<br>**W5:** Approximate methods of solving the nonlinear equations: bisection, iteration, falsi and Newton methods. Newton method for systems of nonlinear equations.<br>**W6:** Polynomial interpolation: Lagrange, Newton and Hermit methods. Error of interpolation. |

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| | Chebyshev polynomials.<br>**W7:** Numerical differentation and integration. Trapezoid, 1/3 Newton and 3/8 Newton methods.<br>**C1:** Error theory - sources of computational errors. Absolute and relative errors. Methods of calculating the errors and inverse problem of error theory. Basis of computational complexity, notation O.<br>**C2:** Direct methods of solving the systems of linear equations: LU decomposition and Cholesky methods. Numerical complexity in comparison with Gauss and Gauss-Jordan elimination methods.<br>**C3:** Approximate methods of solving the systems of linear equations: simple iteration and Seidel iteration methods.<br>**C4:** Eigenvalues and eigenvectors - localisation theorems and power method.<br>**C5:** Approximate methods of solving the nonlinear equations: bisection, iteration, falsi and Newton methods. Newton method for systems of nonlinear equations.<br>**C6:** Polynomial interpolation: Lagrange, Newton and Hermit methods. Error of interpolation. Chebyshev polynomials.<br>**C7:** Numerical differentation and integration. Trapezoid, 1/3 Newton and 3/8 Newton methods. |

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| **1** | Nazwa przedmiotu |
| | **Object-Oriented Analysis and Design** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows rules and principles of object-oriented analysis and design, and understands the main differences between structural and object-oriented programming.<br>**E2:** Student is able to use UML notation in object-oriented analysis and design process and to draw a use case diagram for a particular problem.<br>**E3:** Student is ready to continuously improve and update their knowledge of system analysis and design in both theoretical and practical aspects. |
| **4** | Treści programowe przedmiotu |
| | **W1:** Basic concepts in object-oriented analysis and design (OOAD) (object, class, inheritance, polymorphism, encapsulation)<br>**W2:** UML in OOAD. UML diagrams: use cases, classes and objects<br>**W3:** Evolution of programming methods<br>**W4:** Software development methodologies<br>**W5:** Principles of OOAD<br>**W6:** The Macro Process of OOAD: The Software Development Lifecycle<br>**W7:** The Micro Process of OOAD: The Analysis and Design Process<br>**C1:** Principles of object-oriented analysis and design<br>**C2:** Use Case diagrams<br>**C3:** Class and object diagrams<br>**C4:** Relating classes and objects<br>**C5:** Aggregation and Composition<br>**C6:** Generalization<br>**C7:** Complex class diagrams<br>**C8:** Rules of object-oriented design |

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| 1 | Nazwa przedmiotu |
| | **Occupational Safety and Health and Ergonomics** |
| 2 | Język prowadzenia zajęć |
| | angielski |
| 3 | Realizowane efekty uczenia się |
| | **E1:** Student has basic knowledge in the area of ergonomics and occupational health.<br>**E2:** Student is able to introduce and apply legal standards in the field of occupational safety and health in their professional environment.<br>**E3:** Student is ready to use different techniques of job enrichment based on their practical experience by different case studies. |
| 4 | Treści programowe przedmiotu |
| | **W1:** Evolution of ergonomics and dehumanization at work<br>**W2:** The effects of the deep division of labor and ergonomic ways to improve work processes<br>**W3:** Enrichment techniques at work, shift work - advantages and disadvantages and areas/criteria of diagnosis in ergonomics<br>**W4:** Recommendations for healthy working at the computer , contemporary phenomena experienced by workers and threats connected with teleworking and e-learning<br>**W5:** Directions for preventing and restricting dehumanization of work and characteristics of a humanized organization |

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| 1 | Nazwa przedmiotu |
| | **Operating Systems** |
| 2 | Język prowadzenia zajęć |
| | angielski |
| 3 | Realizowane efekty uczenia się |
| | **E1:** Student knows the structure and has understanding of the functioning of modern operating systems on the example of Linux and Windows families.<br>**E2:** Student is able to install, configure and effectively use the most important modern operating systems.<br>**E3:** Student is ready to effectively support the users of modern computer techniques and solve common problems related to the use of computer systems. |
| 4 | Treści programowe przedmiotu |
| | **W1:** OS definition and overview of modern operating systems structures. Kernel organization. System startup and shutdown. Device drivers. Identification and mitigation of potential security threats.<br>**W2:** Process concept and management. Process vs threat. CPU scheduling. Multiprogramming (context switching). Process synchronization. Deadlocks and how to avoid them.<br>**W3:** Memory Management. Main Memory. Virtual Memory concept. Physical and logical addresses.<br>**W4:** Mass Storage Management. File system interface. File system implementation (i.e. FAT, NTFS, ext2 etc.). Mass storage structure.<br>**W5:** I/O Systems |

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| | **W6:** OS Shell and System Scripts Programming<br>**C1:** OS installation and configuration process (recent Debian Distro, VirtualBox environment). Operating system tuning. Typical OS structure<br>**C2:** OS shell (=Microsoft: Command Interpreter). Shell as a structural programming language interpreter: system script concept. Working with Linux Bash and Microsoft CMD interpreter.<br>**C3:** Vim editor and regular expressions<br>**C4:** Advanced shell programming: control instruction set(conditional statements, loops), arithmetic calculations, system (environment) variables, data stream processing, shell commands pipelining, batch processing, command line parameters processing schema.<br>**C5:** Process as a general abstraction of a computer program execution in an operating system environment. Programming experiments using C with processes and threats handling.<br>**C6:** Mass storage management. File systems.<br>**C7:** Input/Output devices management. Controller and drivers concept.<br>**C8:** User management principles. Protection and security main issues. |

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| **1** | Nazwa przedmiotu |
| | **Physical Education** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows selected areas of physical culture and knows the range of physical exercises and their impact on the harmonious development and healthy lifestyle of a person.<br>**E2:** Student is able to participate in specific team games, individual sports, qualified tourism and has acquired motor and coordination potential to perform technical and tactical tasks in specific sports disciplines.<br>**E3:** Student possesses an attitude based on values found in sport, recreation and tourism, such as commitment, responsibility, respect and fair play. |
| **4** | Treści programowe przedmiotu |
| | **F1:** Pozyskanie wiedzy na temat wybranych dziedzin kultury fizycznej, organizacji imprez oraz wpływu aktywności ruchowej na harmonijny rozwój i zdrowy styl życia człowieka. Wytworzenie oraz rozwój umiejętności ruchowych dla uczestnictwa w wybranych dyscyplinach sportowych, utrzymania kondycji fizycznej, podnoszenia sprawności, pomnażania zdrowia i propagowania zdrowego stylu życia poprzez aktywność fizyczną, sport, rekreację i turystykę. Rozwijanie wszechstronnej sprawności, wydolności i tężyzny fizycznej studentów. Kształtowanie postaw moralnych i społecznych w oparciu o wartości tkwiące w sporcie, rekreacji i turystyce m.in. systematyczność, odpowiedzialność, szacunek dla przeciwnika, gra "fair play" (czysta gra), umiejętność zachowania się w sytuacji zwycięstwa i porażki, a także nabycie świadomości i motywacji do podejmowania samodzielnych działań na rzecz racjonalnej troski o zdrowie i sprawność fizyczną oraz czynnego udziału w imprezach o charakterze sportowym, rekreacyjnym, turystycznym. |

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| **1** | Nazwa przedmiotu |
| | **Polish for Foreigners 2.1** |
| **2** | Język prowadzenia zajęć |

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| | polski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies.<br>**E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in Polish to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Podstawowe zagadnienia ekonomii i biznesu (rekrutacja, zarządzanie, marketing, sprzedaż, ICT, organizacja i finanse firmy, kultura korporacyjna, etyka w biznesie) zgodnie z sylabusem dostępnym na stronie internetowej CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C2:** Odpowiednie dla poziomu językowego elementy wiedzy systemowej języka (gramatyka, składnia, frazeologia, fonetyka) zgodnie z sylabusem SJO oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C3:** Korespondencja handlowa/służbowa z uwzględnieniem specyfiki kierunku zgodnie z sylabusem CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C4:** Umiejętności typu soft skills i komunikacja międzykulturowa zgodnie z sylabusem CJ. |

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| **1** | Nazwa przedmiotu |
| | **Polish for Foreigners 2.2** |
| **2** | Język prowadzenia zajęć |
| | polski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies.<br>**E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in Polish to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Writing skills according to CEFR scale.<br>**C2:** Reading skills according to CEFR scale<br>**C3:** Listening skills according to CEFR scale<br>**C4:** Speaking skills according to CEFR scale<br>**C5:** Umiejętności typu soft skills and intercultural communication |

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| **1** | Nazwa przedmiotu |

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| | **Polish for Foreigners 2.3** |
| **2** | Język prowadzenia zajęć |
| | polski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies.<br>**E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in Polish to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Writing skills according to CEFR scale.<br>**C2:** Reading skills according to CEFR scale<br>**C3:** Listening skills according to CEFR scale<br>**C4:** Speaking skills according to CEFR scale<br>**C5:** Umiejętności typu soft skills and intercultural communication |

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| **1** | Nazwa przedmiotu |
| | **Polish for Foreigners 2.4** |
| **2** | Język prowadzenia zajęć |
| | polski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies.<br>**E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in Polish to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Writing skills according to CEFR scale.<br>**C2:** Reading skills according to CEFR scale<br>**C3:** Listening skills according to CEFR scale<br>**C4:** Speaking skills according to CEFR scale<br>**C5:** Soft skills and intercultural communication |

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| **1** | Nazwa przedmiotu |

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| | **Probability and Statistics** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows the main concepts of statistical research and basic concepts of probability and statistics including estimation and hypothesis testing, correlation, regression and dynamical analysis.<br>**E2:** Student is able to calculate and interpret selected distributions of random variables, parameters of these distributions, and can also use estimation and hypothesis testing procedures and other selected statistical analysis methods.<br>**E3:** Student is ready to identify practical problems that require the use of acquired knowledge and ability in the field of probability and statistics. |
| **4** | Treści programowe przedmiotu |
| | **W1:** Introduction to probability and statistics, including probability calculus and statistics, basic statistical concepts, random variables, distribution of random variables, statistical series, graphical representation of statistical series.<br>**W2:** Parameters of random variable distribution, empirical distribution parameters (arithmetic mean, modal, median quartiles, variance, standard deviation, coefficient of variation, asymmetric measures)<br>**W3:** Basic random variable distributions, two-dimensional random variable, multivariate variable, distribution parameters of selected random variables, linear regression function<br>**W4:** Basic concepts of mathematical statistics, statistical estimation rules, point estimation, interval estimation rules, confidence interval construction for selected parameters<br>**W5:** The theory of statistical hypothesis testing, basic concepts, the definition of statistical test, a schema of the test, the selected test parameters for single and two-dimensional variable, selected non-parametric tests<br>**W6:** Methods of analysis of phenomena dynamics, dynamics measures, economic indicators, indexes, methods of extracting the trend<br>**C1:** Statistical series and methods of graphical presentation of data, calculation of parameters of empirical distribution (arithmetic mean, modal, median, quartiles, variance, standard deviation, coefficient of variation, asymmetry)<br>**C2:** Basic distributions of the random variable (distribution 0.1, binomial distribution, Poisson distribution, normal distribution), ability to apply these distributions in practice.<br>**C3:** Methods of analysis of the interdependence of phenomena (correlation and regression of two variables, correlation and regression of many variables)<br>**C4:** Statistical estimation methods, point estimation, confidence intervals for basic parameters, determination of the necessary sample size<br>**C5:** Statistical tests for basic parameters, selected nonparametric tests<br>**C6:** Methods of dynamics analyze of socio-economic phenomena (economic indicators, indexes, analysis of development tendencies and periodic fluctuations) |

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| **1** | Nazwa przedmiotu |
| | **Russian Language 2.1** |
| **2** | Język prowadzenia zajęć |
| | rosyjski |

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| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies.<br>**E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in Russian to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Writing skills according to CEFR scale.<br>**C2:** Reading skills according to CEFR scale<br>**C3:** Listening skills according to CEFR scale<br>**C4:** Speaking skills according to CEFR scale<br>**C5:** Umiejętności typu soft skills oraz komunikacja międzykulturowa |

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| **1** | Nazwa przedmiotu |
| | **Russian Language 2.2** |
| **2** | Język prowadzenia zajęć |
| | rosyjski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies.<br>**E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in Russian to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Writing skills according to CEFR scale.<br>**C2:** Reading skills according to CEFR scale<br>**C3:** Listening skills according to CEFR scale<br>**C4:** Speaking skills according to CEFR scale<br>**C5:** Umiejętności typu soft skills oraz komunikacja międzykulturowa |

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| **1** | Nazwa przedmiotu |
| | **Russian Language 2.3** |
| **2** | Język prowadzenia zajęć |
| | rosyjski |

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| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies.<br>**E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in Russian to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Basic subjects of economics and business (recruitment, management, marketing, sales, ICT, Corporate and corporate finance, corporate culture, business ethics) according to the syllabus available on website CUE Lenguage Center and with regard to CEFR language level scale.<br>**C2:** Language-specific elements of system knowledge (grammar, syntax, Phraseology, phonetics) according to the syllabus available on website CUE Lenguage Center and with regard to CEFR language level scale<br>**C3:** Commercial / business correspondence according to the type of studies and syllabus available on website CUE Lenguage Center and with regard to CEFR language level scale<br>**C5:** Soft skills and intercultural communication according to the CEFR scale. |

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| **1** | Nazwa przedmiotu |
| | **Russian Language 2.4** |
| **2** | Język prowadzenia zajęć |
| | rosyjski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows how to express in a way appropriate to his language skills, both abstract as well as concrete ideas found in texts, also from the area of studies.<br>**E2:** Student knows how to express the content in writing as well as a presentation, taking part in a business meeting or engaging in business negotiations.<br>**E3:** Student is able to retrieve facts and arguments from various sources, both written and spoken, as well as to prepare a brief summary thereof.<br>**E4**: Student is ready to interact in Russian to initiate and sustain business contacts, resolve personal conflicts and work in a team. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Writing skills according to CEFR scale.<br>**C2:** Reading skills according to CEFR scale<br>**C3:** Listening skills according to CEFR scale<br>**C4:** Speaking skills according to CEFR scale<br>**C5:** Umiejętności typu soft skills oraz komunikacja międzykulturowa |

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| **1** | Nazwa przedmiotu |
| | **Spanish Language 2.1** |

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| **2** | Język prowadzenia zajęć |
| | hiszpański |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student understands the target language system appropriate to their level, as defined in the European System for the Description of Languages, which enables the understanding of oral and written communication, as well as verbal and written communication in Spanish in their study domain.<br>**E2:** Student is able to express in a manner adequate to the required level of Spanish the essential aspects of the problems presented in complex texts, including a specialist discussion in the field of professional topics, and is able to convey the substantive content in the form of a presentation or as part of a business meeting.<br>**E3:** Student is ready to establish a communicative interaction in Spanish both to initiate and maintain business contacts and is ready to deal with conflict situations. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Podstawowe zagadnienia ekonomii i biznesu (rekrutacja, zarządzanie, marketing, sprzedaż, ICT, organizacja i finanse firmy, kultura korporacyjna, etyka w biznesie) zgodnie z sylabusem dostępnym na stronie internetowej CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C2:** Odpowiednie dla poziomu językowego elementy wiedzy systemowej języka (gramatyka, składnia, frazeologia, fonetyka) zgodnie z sylabusem CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C3:** Korespondencja handlowa/służbowa z uwzględnieniem specyfiki kierunku zgodnie z sylabusem CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C4:** Umiejętności typu soft skills i komunikacja międzykulturowa zgodnie z sylabusem CJ . |

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| **1** | Nazwa przedmiotu |
| | **Spanish Language 2.2** |
| **2** | Język prowadzenia zajęć |
| | hiszpański |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student understands the target language system appropriate to their level, as defined in the European System for the Description of Languages, which enables the understanding of oral and written communication, as well as verbal and written communication in Spanish in their study domain.<br>**E2:** Student is able to express in a manner adequate to the required level of Spanish the essential aspects of the problems presented in complex texts, including a specialist discussion in the field of professional topics, and is able to convey the substantive content in the form of a presentation or as part of a business meeting.<br>**E3:** Student is ready to establish a communicative interaction in Spanish both to initiate and maintain business contacts and is ready to deal with conflict situations. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Podstawowe zagadnienia ekonomii i biznesu (rekrutacja, zarządzanie, marketing, sprzedaż, ICT, organizacja i finanse firmy, kultura korporacyjna, etyka w biznesie) zgodnie z sylabusem dostępnym |

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| | na stronie internetowej CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C2:** Odpowiednie dla poziomu językowego elementy wiedzy systemowej języka (gramatyka, składnia, frazeologia, fonetyka) zgodnie z sylabusem CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C3:** Korespondencja handlowa/służbowa z uwzględnieniem specyfiki kierunku zgodnie z sylabusem CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C4:** Umiejętności typu soft skills i komunikacja międzykulturowa zgodnie z sylabusem CJ . |

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| **1** | Nazwa przedmiotu |
| | **Spanish Language 2.3** |
| **2** | Język prowadzenia zajęć |
| | hiszpański |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student understands the target language system appropriate to their level, as defined in the European System for the Description of Languages, which enables the understanding of oral and written communication, as well as verbal and written communication in Spanish in their study domain.<br>**E2:** Student is able to express in a manner adequate to the required level of Spanish the essential aspects of the problems presented in complex texts, including a specialist discussion in the field of professional topics, and is able to convey the substantive content in the form of a presentation or as part of a business meeting.<br>**E3:** Student is ready to establish a communicative interaction in Spanish both to initiate and maintain business contacts and is ready to deal with conflict situations. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Podstawowe zagadnienia ekonomii i biznesu (rekrutacja, zarządzanie, marketing, sprzedaż, ICT, organizacja i finanse firmy, kultura korporacyjna, etyka w biznesie) zgodnie z sylabusem dostępnym na stronie internetowej CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C2:** Odpowiednie dla poziomu językowego elementy wiedzy systemowej języka (gramatyka, składnia, frazeologia, fonetyka) zgodnie z sylabusem CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C3:** Korespondencja handlowa/służbowa z uwzględnieniem specyfiki kierunku zgodnie z sylabusem CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C4:** Umiejętności typu soft skills i komunikacja międzykulturowa zgodnie z sylabusem CJ . |

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| **1** | Nazwa przedmiotu |
| | **Spanish Language 2.4** |
| **2** | Język prowadzenia zajęć |
| | hiszpański |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student understands the target language system appropriate to their level, as defined in the European System for the Description of Languages, which enables the understanding of oral and |

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| | written communication, as well as verbal and written communication in Spanish in their study domain.<br>**E2:** Student is able to express in a manner adequate to the required level of Spanish the essential aspects of the problems presented in complex texts, including a specialist discussion in the field of professional topics, and is able to convey the substantive content in the form of a presentation or as part of a business meeting.<br>**E3:** Student is ready to establish a communicative interaction in Spanish both to initiate and maintain business contacts and is ready to deal with conflict situations. |
| **4** | Treści programowe przedmiotu |
| | **C1:** Podstawowe zagadnienia ekonomii i biznesu (rekrutacja, zarządzanie, marketing, sprzedaż, ICT, organizacja i finanse firmy, kultura korporacyjna, etyka w biznesie) zgodnie z sylabusem dostępnym na stronie internetowej CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C2:** Odpowiednie dla poziomu językowego elementy wiedzy systemowej języka (gramatyka, składnia, frazeologia, fonetyka) zgodnie z sylabusem CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C3:** Korespondencja handlowa/służbowa z uwzględnieniem specyfiki kierunku zgodnie z sylabusem CJ oraz z uwzględnieniem poziomu językowego wg skali CEFR.<br>**C4:** Umiejętności typu soft skills i komunikacja międzykulturowa zgodnie z sylabusem CJ . |

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| **1** | Nazwa przedmiotu |
| | **Theoretical Foundations of Computer Science** |
| **2** | Język prowadzenia zajęć |
| | angielski |
| **3** | Realizowane efekty uczenia się |
| | **E1:** Student knows the methods of computer data representation, the concept of an algorithm and classical techniques of constructing algorithms, as well as the basic data structures used in algorithms.<br>**E2:** Student is able to apply proper techniques of constructing algorithms to solve a given problem, can estimate the complexity of the algorithm, assess its practical usefulness, and can choose sufficient data structures.<br>**E3:** Student is ready to explain the fundamental relationships between computer science, mathematics and scientific cognition. |
| **4** | Treści programowe przedmiotu |
| | **W1:** Information and methods of its recording. Text encoding. Encoding of integers.<br>**W2:** Two's complement coding. Coding real numbers in computer memory. Data encryption. Introduction to algorithmics. The concept and features of the algorithm.<br>**W3:** Algorithms. Methods of writing algorithms. Programming languages and their evolution. Fundamentals of computer programming.<br>**W4:** Algorithms. Basic algorithmic constructs, iterations, recursion. Fundamentals of computer programming - cont. Sorting algorithms.<br>**W5:** Algorithms - cont. Computational complexity of algorithms. Types of computational problems. P, NP, NP-complete problems.<br>**W6:** Data structures. Static and dynamic data structures. Queues, lists, trees, graphs. Operations used in dynamic data structures. |

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| | **W7:** Finite automata, regular expressions, formal grammars and formal languages.<br>**C1:** Algorithms and algorithmic strategies. Computational complexity of algorithms, measures and classes of complexity. Review of classical algorithms in computer science.<br>**C2:** Formal grammars, formal language processing tools. Syntax elements of programming languages. Interpretation of expressions, styles and effects of evaluation.<br>**C3:** Data structures and their applications. Ways of implementing a collection, iteration, advantages and disadvantages of various structures and their implementation.<br>**C4:** Automata, their applications and methods of implementation.<br>**C5:** Data types, representation and its limitations. Hierarchies and type systems, security, type control, polymorphism. |

**UKOŃCZENIE STUDIÓW**

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| Wymogi związane z ukończeniem studiów (praca dyplomowa / egzamin dyplomowy / inne) | Praca dyplomowa |