**International University of Sarajevo, Faculty of Engineering and Natural Sciences (FENS)**

**Undergraduate Curriculum -Artificial Intelligence and Data Engineering Program**

**Academic Year: 2023-2024**

***Click on the course code or title to see its syllabus.***

**Semester I**

| Code | Title | Prerequisites | T | P | ECTS |
|---|---|---|---|---|---|
| ELIT100 | Academic English and Effective Communication | | 2 | 1 | 6 |
| MATH101 | Calculus I | | 3 | 2 | 6 |
| CS103 | Introduction to Programming | | 3 | 2 | 6 |
| xxx | University Elective I | **See Table 1** | 3 | 2 | 6 |
| ENS101 | Introduction to Engineering | | 2 | 1 | 3 |
| xxx | Foreign Language Elective I | | 0 | 2 | 3 |
| | | **Semester Total =** | | | **30** |

**Semester II**

| Code | Title | Prerequisites | T | P | ECTS |
|---|---|---|---|---|---|
| ELIT200 | Critical Reading and Writing | | 2 | 1 | 6 |
| CS105 | Advanced Programming | CS103 | 3 | 2 | 6 |
| AID101 | Fundamentals of Data Science | | 3 | 2 | 6 |
| MATH201 | Linear Algebra | MATH101 | 3 | 2 | 6 |
| xxx | University Elective II | **See Table 1** | | | 3 |
| xxx | Foreign Language Elective II | For. Lang. Ele. 1 | 0 | 2 | 3 |
| | | **Semester Total =** | | | **30** |

**Semester III**

| Code | Title | Prerequisites | T | P | ECTS |
|---|---|---|---|---|---|
| MATH203 | Introduction to Probability and Statistics | MATH101 | 3 | 2 | 6 |
| MATH204 | Discrete Mathematics | MATH101 | 3 | 2 | 6 |
| AID201 | Programming for Data Science | CS103 | 3 | 2 | 6 |
| CS206 | Data Structures | CS105 | 3 | 2 | 6 |
| xxx | Faculty Elective I | **See Table 2** | | | 6 |
| | | **Semester Total =** | | | **30** |

**Semester IV**

| Code | Title | Prerequisites | T | P | ECTS |
|---|---|---|---|---|---|
| MATH306 | Statistical Modeling | MATH203 | 3 | 2 | 6 |
| CS417 | Introduction to Data Mining | | 3 | 2 | 6 |
| CS207 | Analysis of Algorithms | | 3 | 2 | 6 |
| CS306 | Database Management | CS105 | 3 | 2 | 6 |
| xxx | Faculty Elective II | **See Table 2** | | | 6 |
| | | **Semester Total =** | | | **30** |

**Semester V**

| Code | Title | Prerequisites | T | P | ECTS |
|---|---|---|---|---|---|
| CS412 | Web Application Development | CS105 | 3 | 2 | 6 |
| EE418 | Introduction to Machine Learning | | 3 | 2 | 6 |
| xxx | Free Elective I | | | | 6 |
| IE408 | Project Management | (Junior Standing) | 2 | 2 | 6 |
| xxx | Program Elective I | See Table 3 | | | 6 |
| | | **Semester Total =** | | | **30** |

**Semester VI**

| Code | Title | Prerequisites | T | P | ECTS |
|---|---|---|---|---|---|
| AID302 | Optimization for Data Science | | 3 | 2 | 6 |
| AID304 | Big Data Analytics | | 3 | 2 | 6 |
| CS404 | Artificial Intelligence | (CS103 or AID201) and MATH201 | 3 | 1 | 6 |
| ENS309 | Ethics in Engineering and Sciences | | 3 | 1 | 6 |
| xxx | Program Elective II | **See Table 3** | | | 6 |
| | | **Semester Total =** | | | **30** |

**Semester VII**

| Code | Title | Prerequisites | T | P | ECTS |
|---|---|---|---|---|---|
| AID401 | Deep Learning | CS404 | 3 | 2 | 6 |
| xxx | Program Elective III (Senior standing) | See Table 3 | 3 | 2 | 6 |
| CS370 | Work placement/Internship | | 0 | 14 | 6 |
| xxx | Program Elective IV (Senior standing) | See Table 3 | | | 6 |
| xxx | Program Elective V (Senior standing) | See Table 3 | | | 6 |
| | | **Semester Total =** | | | **30** |

**Semester VIII**

| Code | Title | Prerequisites | T | P | ECTS |
|---|---|---|---|---|---|
| xxx | Free Elective II | | | | 6 |
| AID402 | Applied Data Engineering | | 3 | 2 | 6 |
| xxx | Program Elective VI (Senior standing) | See Table 3 | | | 6 |
| xxx | Program Elective VII (Senior standing) | See Table 3 | | | 6 |
| ENS490 | Graduation Project (Senior standing) | | 0 | 4 | 6 |
| | | **Semester Total =** | | | **30** |

| | |
|---|---|
| **Abbreviations: T (Theory), P (Practice), ECTS credit** | |
| **Total Credits Required for Graduation** | **240** |
| **Total Credits of Electives** | **81** |
| **No. of Courses** | **42** |
| **Min. ECTS Credits for Applied/Practical Component of the Curriculum** | |
| **Elective Ratio** | **34%** |

**IMPORTANT NOTES TO CSE STUDENTS**

***University elective courses and 2 Foreign language elective courses (different from native language of students) are taken from the pool of University Elective Courses, see Table 1.***

***2 Faculty Elective courses are taken from the pool of Faculty Elective Courses, see Table 2. Faculty elective courses may be selected from other FENS programmes with the approval of Program Coordinator.***

***6 Program Electives are taken from the pool of Program Elective courses, see Table 3. Two Program elective courses may be selected from other FENS programmes (including FENS graduate level courses) with the approval of***

***2 Free elective courses are taken from any faculty. It is strongly recommended that the students take MAN303 Entrepreneurship and Small Business Management.***

***Junior standing: student has successfully completed at least 108 ECTS. Senior standing: student has successfully completed at least 168 ECTS.***

***The curriculum is applicable to students who entered the freshman class in the year 2023-2024 or after.***

***In exceptional cases only, Faculty Council may make a decision for a student to bypass a prerequisite for a course.***

***Work placement/Internship is typically practiced in summer for a period of at least 25 work days, totalling at least 150 hours***

**Table 1: University Electives**

| Code | Title | Prerequisites | T | P | ECTS |
|---|---|---|---|---|---|
| | **University Electives (3 ECTS)** | | | | |
| ARCH107 | Understanding Art and Architecture | | 2 | 0 | 3 |
| CS100 | Computer Skills | | 0 | 2 | 3 |
| CULT101 | Understanding Cultural Encounters | | 2 | 0 | 3 |
| ECON105 | Understanding Business | | 2 | 0 | 3 |
| ECON107 | Python | | 1 | 1 | 3 |
| ECON108 | Matlab | | 1 | 1 | 3 |
| HUM100 | Social Responsibility and Sustainable Development | | 2 | 0 | 3 |
| IBF105 | Financial Literacy | | 2 | 0 | 3 |
| IR100 | Understanding the Contemporary World through Current | | 2 | 0 | 3 |
| NS111 | Understanding Nature and Knowledge | | 2 | 0 | 3 |
| NS112 | Understanding Science and Technology | | 2 | 0 | 3 |
| SPS140 | Understanding Religion | | 2 | 0 | 3 |
| | **Language Elective Subpool** | | | | |
| xxx | Foreign Language Elective I (&) | | 0 | 2 | 3 |
| xxx | Foreign Language Elective II (&) | For. Lang. Ele. 1 | 0 | 2 | 3 |
| | | | | | |
| | **University Electives (6 ECTS)** | | | | |
| ECON102 | Globalization and Business | | 3 | 0 | 6 |
| ECON111 | Introduction to Microeconomics | | 3 | 0 | 6 |
| ECON112 | Introduction to Macroeconomics | | 3 | 0 | 6 |
| ELIT101 | Introduction to Literature | | 2 | 1 | 6 |
| ENS105 | The Brain | | 3 | 0 | 6 |
| IBF205 | Principles of International Business | | 3 | 0 | 6 |
| IR101 | Introduction to International Relations | | 3 | 0 | 6 |
| LAW109 | Law and Ethics | | 3 | 0 | 6 |
| LAW110 | Introduction to Law I | | 3 | 0 | 6 |
| MAN102 | Introduction to Management | | 3 | 0 | 6 |
| NS102 | Physics | | 3 | 2 | 6 |
| NS103 | Biology | | 3 | 0 | 6 |
| NS104 | General Chemistry | | 3 | 2 | 6 |
| POLS102 | Introduction to Political Science | | 3 | 0 | 6 |
| PSY103 | Introduction to Psychology | | 3 | 0 | 6 |
| SOC102 | Introduction to Sociology | | 3 | 0 | 6 |
| SPS120 | Critical Thinking | | 3 | 0 | 6 |
| SPS150 | World History | | 3 | 0 | 6 |
| VA121 | History of Art I | | 3 | 0 | 6 |

***(&) Scholarship students will take either Turkish Language I and II or Bosnian Language I and II.***

**Table 2: Faculty Electives**

| Code | Title | Prerequisites | ECTS |
|---|---|---|---|
| EE325 | Embedded Systems | CS103 | **6** |
| EE331 | Introduction to Communication Systems | **MATH102** | **6** |
| EE405 | Software Engineering Project | | **6** |
| EE406 | Hardware Engineering Project | | **6** |
| EE435 | Microprocessors-I | | **6** |
| ENS203 | Electrical Circuits I | MATH101 | **6** |
| ENS205 | Materials Science | | 6 |
| ENS207 | Engineering Graphics | | 6 |
| ENS209 | Statics | **MATH101** | 6 |
| MATH102 | Calculus II | **MATH101** | 6 |
| MATH202 | Differential Equations | **MATH102** | 6 |
| MATH207 | Vector Calculus | **MATH101** | 6 |
| MATH209 | Discrete Mathematics II | **MATH204** | 6 |
| NS209 | Genetics I | | 6 |
| IE303 | Operations Research I | **MATH201** | 6 |
| IE307 | Quality and Reliability Engineering | | 6 |

***Faculty Electives may be selected from other FENS programs with the approval of Program Coordinator.***

**Table 3: Program Electives**

| Code | Title | Prerequisites | ECTS |
|---|---|---|---|
| AID403 | IoT Fundamentals | CS103 or AID201 | 6 |
| AID404 | Business Intelligence | | 6 |
| AID405 | Natural Language Processing | | 6 |
| BIO310 | Bioinformatics | NS103 or Program Coordinator's Approval | 6 |
| BIO405 | Biological Data Analysis with Python | ENS213 / CS103 | 6 |
| CS299 | Social, Legal, and Ethical Issues in Computing | | 6 |
| CS303 | Digital Design | | 6 |
| CS305 | Programming Languages | CS105 | 6 |
| CS304 | Computer Architecture | CS103 | 6 |
| CS307 | Operating Systems | CS304 | 6 |
| CS308 | Software Engineering | CS105 | 6 |
| CS313 | Theory of Computation | MATH204 and CS105 | 6 |
| CS310 | Human Computer Interaction | CS105 | 6 |
| CS402 | Introduction to Design of Compilers | CS105 and MATH204 | 6 |
| CS403 | Distributed Systems | CS307 | 6 |
| CS405 | Computer Graphics | CS302 and MATH201 | 6 |
| CS413 | Developing the Interactive Web | CS105 | 6 |
| CS414 | Computer Vision | CS103 and MATH201 | 6 |
| CS415 | Pattern Recognition | MATH201 | 6 |
| CS416 | Cryptography | CS302 and MATH204 | 6 |
| CS420 | Network Programming | CS105 and SE308 | 6 |
| CS421 | Architecture and Implementation of Database Management | CS306 | 6 |
| CS422 | Wireless Mobile Networks | SE308 | 6 |
| CS423 | Parallel Computing | CS302 and CS307 | 6 |
| CS426 | Software Engineering II | CS308 | 6 |
| CS427 | Computer and Network Security | CS307 and SE308 | 6 |
| CS428 | Principles of Quantum Computing | | 6 |
| CS429 | Cybersecurity Essentials | | 6 |
| CS498 | Special Topics in Computer Science I | | 6 |
| CS499 | Special Topics in Computer Science II | | 6 |
| EE437 | Introduction to Robotics | | 6 |
| MAN461 | Management Information Systems | | 6 |
| SE211 | Software Construction | CS103 | 6 |
| SE302 | Software Testing and Maintenance | CS105 and MATH204 | 6 |
| SE304 | Tools and Methods of CASE Technologies | CS105 | 6 |
| SE308 | Communication Systems and Networks | CS105 | 6 |
| SE322 | Software Requirements Analysis | SE211 or CS105 | 6 |
| SE403 | Development of Science and Technology | CS105 | 6 |
| SE404 | Psycho Cibernetics | CS105 | 6 |
| SE407 | Software Quality Management | SE211 or CS105 | 6 |
| SE423 | Automatics and Robotics | CS105 | 6 |

***2 Program Electives may be selected from other FENS programs (including FENS graduate level courses) with the approval of Program Coordinator.***

Last Update: 26.06.2023

Senate Decision, 26.06.2023, IUS-SENAT 11-1831/2023