**University of Information Science and Technology**
**"St. Paul the Apostle" - Ohrid**

## Faculty of Computer Science and Engineering

Undergraduate FIRST CYCLE OF STUDIES

Study program: **COMPUTER SCIENCE AND ENGINEERING (CSE) 4 years**

Active from the academic year 2023/2024

**Four-year (240 ECTS) studies**

**Degree**: Bachelor of Science in Computer Engineering.

**Acquired skills**: The study program provides students with a strong foundation in computer science, including programming, databases, algorithms, information systems, and computer networks. Students develop practical skills in modern technologies, including web and parallel programming, cloud computing, artificial intelligence, and machine learning.

The program emphasises problem-solving, critical thinking, and real-world application of knowledge in multidisciplinary environments. Graduates gain strong communication and teamwork skills, preparing them to successfully manage and contribute to ICT projects.

# CSE 4 years

| Year I | | | | |
|---|---|---|---|---|
| Semester I | | | | |
| No. | Code | Course Name | No. of classes | ECTS |
| Core Courses | | | | |
| 1 | CSE11M01 | Introduction to Programming | 2+4 | 6 |
| 2 | CSE11M02 | Discrete Mathematics | 3+2 | 6 |
| 3 | CSE11M03 | Mathematics 1 | 3+2 | 6 |
| 4 | CSE11M04 | Computer simulation in physics | 3+2 | 6 |
| 5 | CSE11M05 | English for Technical Communication 1 | 3+2 | 6 |
| | | | | |
| Year I | | | | |
| Semester II | | | | |
| No. | Code | Course Name | No. of classes | ECTS |
| 1 | CSE12M01 | Object-Oriented Programming | 3+2 | 6 |
| 2 | CSE12M02 | Mathematics 2 | 3+2 | 6 |
| 3 | CSE12M03 | English for Technical Communication 2 | 3+2 | 6 |
| 4 | CSE12M04 | Logic circuits and digital electronics | 3+2 | 6 |
| Elective | | | | |

| | | | | |
|---|---|---|---|---|
| 5 | CSE12EXX | Course from Faculty elective list | 3+2 | 6 |
| | | | | |

| Year II | | | | |
|---|---|---|---|---|
| Semester III | | | | |
| No. | Code | Course Name | No. of classes | ECTS |
| Core Courses | | | | |
| 1 | CSE13M01 | Script Programming | 3+2 | 6 |
| 2 | CSE13M02 | Algorithms and Data Structures 1 | 3+2 | 6 |
| 3 | CSE13M03 | Databases 1 | 3+2 | 6 |
| 4 | CSE13M04 | Data Engineering | 3+2 | 6 |
| Elective | | | | |
| 5 | XXX13UXX | Course from the University elective list | 3+2 | 6 |

| Year II | | | | |
|---|---|---|---|---|
| Semester IV | | | | |
| No. | Code | Course Name | No. of classes | ECTS |
| 1 | CSE14M01 | Algorithms and Data Structures 2 | 3+2 | 6 |
| 2 | CSE14M02 | Network Technologies | 3+2 | 6 |
| 3 | CSE14M03 | Web Application Development | 3+2 | 6 |
| Elective | | | | |
| 4 | CSE14EXX | Course from the Faculty elective list | 3+2 | 6 |
| 5 | XXX14UXX | Course from the University elective list | 3+2 | 6 |

| Year III | | | | |
|---|---|---|---|---|
| Semester V | | | | |
| No. | Code | Course Name | No. of classes | ECTS |
| Core Courses | | | | |
| 1 | CSE15M01 | Modelling and Simulations | 3+2 | 6 |
| 2 | CSE15M02 | Probability and Statistics | 3+2 | 6 |
| 3 | CSE15M03 | Computer Organisation and Architecture | 3+2 | 6 |
| Elective | | | | |

| | | | | |
|---|---|---|---|---|
| 4 | CSE15EXX | Course from the Faculty elective list | 3+2 | 6 |
| 5 | XXX15UXX | Course from the University elective list | 3+2 | 6 |

| Year III | | | | |
|---|---|---|---|---|
| Semester VI | | | | |
| No. | Code | Course Name | No. of classes | ECTS |
| 1 | CSE16M01 | Internet Programming | 3+2 | 6 |
| 2 | CSE16M02 | Databases 2 | 3+2 | 6 |
| 3 | CSE16M03 | Operating Systems | 3+2 | 6 |
| Elective | | | | |
| 4 | CSE16EXX | Course from the Faculty elective list | 3+2 | 6 |
| 5 | XXX16UXX | Course from the University elective list | 3+2 | 6 |

| Year IV | | | | |
|---|---|---|---|---|
| Semester VII | | | | |
| No. | Code | Course Name | No. of classes | ECTS |
| Core Courses | | | | |
| 1 | CSE17M01 | Distributed systems | 3+2 | 6 |
| 2 | CSE17M02 | Artificial intelligence | 3+2 | 6 |
| 3 | CSE17M03 | Multiplatform Programming | 3+2 | 6 |
| Elective | | | | |
| 4 | CSE17EXX | Course from the Faculty elective list | 3+2 | 6 |
| 5 | CSE17EXX | Course from the Faculty elective list | 3+2 | 6 |

| Year IV | | | | |
|---|---|---|---|---|
| Semester VIII | | | | |
| No. | Code | Course Name | No. of classes | ECTS |
| 1 | CSE18M01 | Entrepreneurship | 3+2 | 6 |
| 2 | CSE18M02 | Parallel Programming | 3+2 | 6 |
| 3 | CSE18M03 | Data Science | 3+2 | 6 |
| 4 | CSE18M04 | Bachelor Thesis | 3+2 | 6 |
| Elective | | | | |

| | | | | |
|---|---|---|---|---|
| 5 | CSE18EXX | Course from the Faculty elective list | 3+2 | 6 |
| Total credits | | | | 240 |

The first cycle of university studies recognises the modules:

- M - mandatory (core courses),
- E - elected from the faculty list of courses
- U – elected from the university list of courses.

| List of Faculty Elective courses | | | | |
|---|---|---|---|---|
| **id** | **code** | **Course** | **Weekly fund of hours** | **ECTS** |
| 1 | CSE12E01 | Signals and Systems | 3+2 | 6 |
| 2 | CSE12E02 | Processing of multimedia data | 3+2 | 6 |
| 3 | CSE12E03 | Society and Technological Transformation | 3+2 | 6 |
| 4 | CSE14E01 | Social networks | | |
| 5 | CSE14E02 | Graph theory | 3+2 | 6 |
| 6 | CSE14E03 | Political processes and governance in the 21st century | 3+2 | 6 |
| 7 | CSE14E04 | Communication Theory | 3+2 | 6 |
| 8 | CSE14E05 | Introduction to Robotics | 3+2 | 6 |
| 9 | CSE14E06 | Software Engineering | 3+2 | 6 |
| 10 | CSE14E07 | Legal aspects of computer crime | 3+2 | 6 |
| 11 | CSE15E01 | Optical and wired networks | 3+2 | 6 |
| 12 | CSE15E02 | Digital signal processing | 3+2 | 6 |
| 13 | CSE15E03 | Linear algebra | 3+2 | 6 |
| 14 | CSE15E04 | Computer Graphics | 3+2 | 6 |
| 15 | CSE15E05 | Management theory | 3+2 | 6 |
| 16 | CSE15E06 | Multimedia information systems | 3+2 | 6 |
| 17 | CSE15E07 | Human-Computer Interaction | 3+2 | 6 |
| 18 | CSE15E08 | Business Information Systems | 3+2 | 6 |
| 19 | CSE15E09 | Music Programming | 3+2 | 6 |
| 20 | CSE16E01 | Information Theory | 3+2 | 6 |
| 21 | CSE16E02 | Numerical Methods | 3+2 | 6 |
| 22 | CSE16E03 | Microprocessors | 3+2 | 6 |
| 23 | CSE16E04 | Programmable logic controllers | 3+2 | 6 |
| 24 | CSE16E05 | Data Visualisation | 3+2 | 6 |
| 25 | CSE16E06 | User interface design | 3+2 | 6 |

| | | | | |
|---|---|---|---|---|
| 26 | CSE16E07 | Stochastic processes | 3+2 | 6 |
| 27 | CSE16E08 | Management of Information Systems | 3+2 | 6 |
| 28 | CSE16E09 | Decision Methods | 3+2 | 6 |
| 29 | CSE16E10 | Wireless networks | 3+2 | 6 |
| 30 | CSE16E11 | Music and Mathematics | 3+2 | 6 |
| 31 | CSE17E01 | Cryptography | 3+2 | 6 |
| 32 | CSE17E02 | Cloud data processing | 3+2 | 6 |
| 33 | CSE17E03 | Machine Learning | 3+2 | 6 |
| 34 | CSE17E04 | Optimization methods | 3+2 | 6 |
| 35 | CSE17E05 | Digital processing of signals and images | 3+2 | 6 |
| 36 | CSE17E06 | Platform engineering | 3+2 | 6 |
| 37 | CSE17E07 | Wireless mobile systems | 3+2 | 6 |
| 38 | CSE17E08 | Internet of Things | 3+2 | 6 |
| 39 | CSE17E09 | Economics of ERP Systems | 3+2 | 6 |
| 40 | CSE17E10 | Digital Music | 3+2 | 6 |
| 41 | CSE17E11 | Wireless Sensor Networks | 3+2 | 6 |
| 42 | CSE18E01 | Deep learning | 3+2 | 6 |
| 43 | CSE18E02 | Offensive safety | 3+2 | 6 |
| 44 | CSE18E03 | Blockchain Development | 3+2 | 6 |
| 45 | CSE18E04 | Virtual and augmented reality | 3+2 | 6 |
| 46 | CSE18E05 | Natural language processing | 3+2 | 6 |
| 47 | CSE18E06 | Digital Management | 3+2 | 6 |
| 48 | CSE18E07 | Business Intelligence and Analytics | 3+2 | 6 |
| 49 | CSE18E08 | English for Academic Purposes | 3+2 | 6 |

**University of Information Science and Technology**
**"St. Paul the Apostle" - Ohrid**

| List of University courses | | | | |
|---|---|---|---|---|
| **id** | **code** | **Course** | **Weekly fund of hours** | **ECTS** |
| 1 | CSE13U01 | Economics | 3+2 | 6 |
| 2 | CNS13U02 | Digital Arts | 3+2 | 6 |
| 3 | ICS13U03 | Ethics of electronic literature | 3+2 | 6 |
| 4 | ICS13U04 | Creative writing for media | 3+2 | 6 |
| 5 | MIR13U05 | Democracy and Technology | 3+2 | 6 |
| 6 | MIR13U06 | Open data | 3+2 | 6 |
| 7 | MIR13U07 | Law in Information Technologies | 3+2 | 6 |
| 8 | MIR14U01 | Business Law | 3+2 | 6 |
| 9 | CNS14U02 | The art of graphic design | 3+2 | 6 |
| 10 | CNS14U03 | Visual arts and 3D modeling | 3+2 | 6 |
| 11 | CSE14U04 | Economics of Electronic Banking | 3+2 | 6 |
| 12 | CSE14U05 | Economics of Business Processes and Transactions | 3+2 | 6 |
| 13 | ICS14U06 | Theory of culture | 3+2 | 6 |
| 14 | ICS14U07 | Literary theories in journalism | 3+2 | 6 |
| 15 | MIR14U08 | Diplomacy in the Modern Age | 3+2 | 6 |
| 16 | CNS15U01 | 2D and 3D techniques for concept art | 3+2 | 6 |
| 17 | CNS15U02 | Introduction to New Media Art | 3+2 | 6 |
| 18 | CSE15U03 | Economics of Electronic Commerce | 3+2 | 6 |
| 19 | CSE15U04 | Economic Analysis of Business and Financial Operations | 3+2 | 6 |
| 20 | MIR15U05 | Legal Data Protection | 3+2 | 6 |
| 21 | ICS15U06 | Animated storytelling | 3+2 | 6 |
| 22 | ICS15U07 | Intertextuality and hypertextuality in game theory | 3+2 | 6 |
| 23 | MIR15U08 | Public speaking | 3+2 | 6 |
| 24 | MIR15U09 | Elections, electoral systems and technology | 3+2 | 6 |
| 25 | CNS16U01 | Visual arts and 3D character animation | 3+2 | 6 |
| 26 | CSE16U02 | Economics of Digital Marketing | 3+2 | 6 |
| 27 | CS16U03 | Art and creativity | 3+2 | 6 |
| 28 | ICS16U04 | Creative writing | 3+2 | 6 |
| 29 | MIR16U05 | Negotiations and dispute resolution | 3+2 | 6 |
| 30 | MIR16U06 | Open government | 3+2 | 6 |
| 31 | ISVMA16U07 | English for Special Purposes | 3+2 | 6 |
| 32 | CNS16U08 | Video art and production | 3+2 | 6 |