

## Faculty of Information Systems, Visualization, Multimedia and Animation

Undergraduate FIRST CYCLE OF STUDIES

Study program: Information Systems, Visualization, Multimedia and Animation (ISVMA) 4y

Active from academic 2018/2019

After completion of 4 years of studies, with 240 ECTS credits, students will get a degree of Bachelor of Science in Information Science and Technology in the field of Information Systems, Visualization, Multimedia and Animation.

### ISVMA 4 years

| Year I                    |                     |                                      |                |      |
|---------------------------|---------------------|--------------------------------------|----------------|------|
| Semester I                |                     |                                      |                |      |
| No.                       | Code                | Course Name                          | No. of classes | ECTS |
| Core Courses              |                     |                                      |                |      |
| 1                         | 11.3.F.1101.C       | Introduction to Programming          | 3+2+2          | 6    |
| 2                         | 11.1.F.1102.C       | Mathematics 1                        | 3+2            | 6    |
| 3                         | 13.2.F.1103.C       | Physics                              | 3+2            | 6    |
| 4                         | 11.9.F.1104.C       | Discrete Mathematics                 | 3+2            | 6    |
| One Major Elective course |                     |                                      |                |      |
| 5                         | Major Elective List |                                      | 3+2            | 6    |
|                           |                     |                                      |                |      |
| Year I                    |                     |                                      |                |      |
| Semester II               |                     |                                      |                |      |
| No.                       | Code                | Course Name                          | No. of classes | ECTS |
| 1                         | 11.3.F.1201.C       | Object Oriented Programming          | 3+2+2          | 6    |
| 2                         | 11.1.F.1202.C       | Mathematics 2                        | 3+2            | 6    |
| 3                         | 11.3.F.1203.C       | Script Programming                   | 3+2            | 6    |
| 4                         | 11.3.ISVMA.1204.MR  | Introduction to Multimedia Computing | 3+2            | 6    |
| One Major Elective course |                     |                                      |                |      |
| 5                         | Major Elective List |                                      | 3+2            | 6    |
|                           |                     |                                      |                |      |

| Year II                    |                                   |                                   |                |      |
|----------------------------|-----------------------------------|-----------------------------------|----------------|------|
| Semester III               |                                   |                                   |                |      |
| No.                        | Code                              | Course Name                       | No. of classes | ECTS |
| 1                          | 11.3.ISVMA.1301.MR                | Introduction to Computer Graphics | 3+2            | 6    |
| 2                          | 11.3.ISVMA.1302.MR                | Multimedia Information Systems    | 3+2            | 6    |
| 3                          | 11.3.ISVMA.1303.MR                | Relational Databases              | 3+2            | 6    |
| One Major Elective course  |                                   |                                   |                |      |
| 4                          | Major Elective List               |                                   | 3+2            | 6    |
| Elective                   |                                   |                                   |                |      |
| 5                          | 1 Course from Minor Elective List |                                   | 3+2            | 6    |
| Year II                    |                                   |                                   |                |      |
| Semester IV                |                                   |                                   |                |      |
| No.                        | Code                              | Course Name                       | No. of classes | ECTS |
| 1                          | 11.3.ISVMA.1401.MR                | 3D Modeling and Animation         | 3+2            | 6    |
| 2                          | 11.3.ISVMA.1402.MR                | Human-Computer Interaction        | 3+2            | 6    |
| 3                          | 11.3.ISVMA.1403.MR                | Web Development                   | 3+2            | 6    |
| One Major Elective course  |                                   |                                   |                |      |
| 4                          | Major Elective List               |                                   | 3+2            | 6    |
| Elective                   |                                   |                                   |                |      |
| 5                          | 1 Course from Minor Elective List |                                   | 3+2            | 6    |
| Year III                   |                                   |                                   |                |      |
| Semester V                 |                                   |                                   |                |      |
| No.                        | Code                              | Course Name                       | No. of classes | ECTS |
| 1                          | 11.3.ISVMA.1501.MR                | User Interface Design             | 3+2            | 6    |
| 2                          | 11.3.ISVMA.1502.MR                | Visualization                     | 3+2            | 6    |
| Two Major Elective courses |                                   |                                   |                |      |
| 3                          | Major Elective List               |                                   | 3+2            | 6    |
| 4                          | Major Elective List               |                                   | 3+2            | 6    |
| Electives                  |                                   |                                   |                |      |
| 5                          | 1 Course from Minor Elective List |                                   | 3+2            | 6    |
| Year III                   |                                   |                                   |                |      |

| Semester VI                |                                   |  |                |      |
|----------------------------|-----------------------------------|--|----------------|------|
| No.                        | Code                              | Course Name  | No. of classes | ECTS |
| 1                          | 11.3.ISVMA.1601.MR                | Pattern Recognition                                | 3+2            | 6    |
| 2                          | 11.3.ISVMA.1602.MR                | Multimedia Project Management                      | 3+2            | 6    |
| Two Major Elective courses |                                   |  |                |      |
| 3                          | Major Elective List               |  | 3+2            | 6    |
| 4                          | Major Elective List               |  | 3+2            | 6    |
| Electives                  |                                   |  |                |      |
| 5                          | 1 Course from Minor Elective List |  | 3+2            | 6    |
| Year IV                    |                                   |  |                |      |
| Semester VII               |                                   |  |                |      |
| No.                        | Code                              | Course Name  | No. of classes | ECTS |
| 1                          | 11.3.ISVMA.1701.MR                | Virtual and Augmented Reality                      | 3+2            | 6    |
| 2                          | 11.3.ISVMA.1702.MR                | Cross-platform development                         | 3+2            | 6    |
| 3                          | 11.3.ISVMA.1703.MR                | Digital Signal and Image Processing                | 3+2            | 6    |
| Two Major Elective courses |                                   |  |                |      |
| 4                          | Major Elective List               |  | 3+2            | 6    |
| 5                          | Major Elective List               |  | 3+2            | 6    |
| Year IV                    |                                   |  |                |      |
| Semester VIII              |                                   |  |                |      |
| No.                        | Code                              | Course Name  | No. of classes | ECTS |
| 1                          | 11.3.ISVMA.1801.MR                | Computer Vision                                    | 3+2            | 6    |
| 2                          | 11.3.ISVMA.1802.MR                | Introduction to Digital Video and Sound Technology | 3+2            | 6    |
| Two Major Elective courses |                                   |  |                |      |
| 3                          | Major Elective List               |  | 3+2            | 6    |
| 4                          | Major Elective List               |  | 3+2            | 6    |
| 5                          | 11.9.F.1801.MaE                   | Diploma Work                                       | 3+2            | 6    |
|                            |                                   |  |                | 240  |

The first cycle of university studies recognizes the modules:

- C - mandatory (core),
- MR - mandatory specific to the faculty,

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|--|
| - MaE - elected from the scientific field of the faculty |
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| - MiE - optional from other scientific areas. |
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| List of Major Elective courses |                     |                                      |                      |      |
|--------------------------------|---------------------|--------------------------------------|----------------------|------|
| id                             | code                | Course                               | Weekly fund of hours | ECTS |
| 1                              | 11.3.F.1x04.MaE     | Algorithms and Data Structures 2     | 3+2                  | 6    |
| 2                              | 11.9.F.1x41.MaE     | Digital Electronics                  | 3+2                  | 6    |
| 3                              | 11.9.F.1x06.MaE     | System Theory                        | 3+2                  | 6    |
| 4                              | 11.9.F.1x39.MaE     | Unified Modelling Language           | 3+2                  | 6    |
| 5                              | 11.3.F.1x05.MaE     | Network Analysis and Synthesis       | 3+2                  | 6    |
| 6                              | 11.9.F.1x40.MaE     | Network Information theory           | 3+2                  | 6    |
| 7                              | 11.9.F.1x02.MaE     | Digital Communication                | 3+2                  | 6    |
| 8                              | 11.9.F.1x08.MaE     | Electromagnetic Principles           | 3+2                  | 6    |
| 9                              | 11.9.F.1x30.MaE     | Wireless Technology                  | 3+2                  | 6    |
| 10                             | 11.9.F.1x16.MaE     | Sensor Networks                      | 3+2                  | 6    |
| 11                             | 11.3.F.1x01.MaE     | Client/server system                 | 3+2                  | 6    |
| 12                             | 11.9.F.1x09.MaE     | Integrated Systems Design            | 3+2                  | 6    |
| 13                             | 11.9.F.1x31.MaE     | Visual Programming                   | 3+2                  | 6    |
| 14                             | 11.3.F.1x14.MaE     | Advanced Algorithms                  | 3+2                  | 6    |
| 15                             | 11.9.F.1x12.MaE     | Distance Learning Systems            | 3+2                  | 6    |
| 16                             | 11.9.F.1x36.MaE     | Game Theory                          | 3+2                  | 6    |
| 17                             | 11.9.F.1x37.MaE     | Optimization Theory                  | 3+2                  | 6    |
| 18                             | 11.9.F.1x18.MaE     | Antenna Theory                       | 3+2                  | 6    |
| 19                             | 11.3.F.1x13.MaE     | NoSQL Databases                      | 3+2                  | 6    |
| 20                             | 11.9.F.1x11.MaE     | Radio Network Planning               | 3+2                  | 6    |
| 21                             | 11.9.F.1x21.MaE     | Wireless ad-hoc Networks             | 3+2                  | 6    |
| 22                             | 11.9.F.1x22.MaE     | Optical Communication                | 3+2                  | 6    |
| 23                             | 11.9.F.1x23.MaE     | RF Circuits for ICT                  | 3+2                  | 6    |
| 24                             | 11.9.F.1x15.MaE     | Embedded Systems                     | 3+2                  | 6    |
| 25                             | 11.9.F.1x20.MaE     | Knowledge Based Systems              | 3+2                  | 6    |
| 26                             | 11.9.ISVMA.1804.MaE | Dynamic Databases                    | 3+2                  | 6    |
| 27                             | 11.9.F.1x32.MaE     | Web Design                           | 3+2                  | 6    |
| 28                             | 11.3.F.1x24.MaE     | Telecommunication Network Management | 3+2                  | 6    |
| 29                             | 11.9.F.1x29.MaE     | Natural Language Processing          | 3+2                  | 6    |
| 30                             | 11.9.F.1x17.MaE     | Satellite Communications             | 3+2                  | 6    |
| 31                             | 11.3.F.1x25.MaE     | Nanotechnology for ICT               | 3+2                  | 6    |
| 32                             | 11.9.F.1x03.MaE     | Data Mining                          | 3+2                  | 6    |

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|----|---------------------|--|-----|---|
| 33 | 11.9.F.1x33.MaE     | Bioinformatics                         | 3+2 | 6 |
| 34 | 11.9.F.1x26.MaE     | Internet of things                     | 3+2 | 6 |
| 35 | 11.9.F.1x27.MaE     | Network Security                       | 3+2 | 6 |
| 36 | 11.9.F.1x28.MaE     | Data Security and Privacy              | 3+2 | 6 |
| 37 | 11.9.F.1x38.MaE     | Wireless Network Security              | 3+2 | 6 |
| 38 | 11.3.F.1x34.MaE     | Modern Functional Programming          | 3+2 | 6 |
| 39 | 11.3.F.1x35.MaE     | Computer Architecture and Organization | 3+2 | 6 |
| 40 | 11.9.F.1x19.MaE     | Graph theory                           | 3+2 | 6 |
| 41 | 11.3.ISVMA.1403.MaE | Operating systems                      | 3+2 | 6 |
| 42 | 11.3.ISVMA.1503.MaE | Signals and Systems                    | 3+2 | 6 |
| 43 | 11.1.ISVMA.1504.MaE | Mathematics 3                          | 3+2 | 6 |
| 44 | 11.3.ISVMA.1505.MaE | Communication Protocols                | 3+2 | 6 |
| 45 | 11.3.ISVMA.1506.MaE | Algorithm and Data Structures          | 3+2 | 6 |
| 46 | 11.3.ISVMA.1401.MaE | Communication theory                   | 3+2 | 6 |
| 47 | 11.2.ISVMA.1401.MaE | Probability and statistics             | 3+2 | 6 |
| 48 | 11.3.ISVMA.1402.MaE | Digital signal processing              | 3+2 | 6 |
| 49 | 11.3.ISVMA.1501.MaE | Information theory                     | 3+2 | 6 |
| 50 | 11.3.ISVMA.1502.MaE | Wired networks                         | 3+2 | 6 |
| 51 | 11.3.ISVMA.1601.MaE | Communication systems                  | 3+2 | 6 |
| 52 | 11.9.ISVMA.1601.MaE | Stochastic Processes                   | 3+2 | 6 |
| 53 | 11.3.ISVMA.1701.MaE | Networking                             | 3+2 | 6 |
| 54 | 11.9.ISVMA.1701.MaE | Cryptography                           | 3+2 | 6 |
| 55 | 11.3.ISVMA.1703.MaE | Cloud computing                        | 3+2 | 6 |
| 56 | 11.3.ISVMA.1802.MaE | Cyber security                         | 3+2 | 6 |
| 57 | 06.2.ISVMA.1401.MaE | Introduction to electric circuits      | 3+2 | 6 |
| 58 | 11.9.ISVMA.1502.MaE | Digital Logical Circuits               | 3+2 | 6 |
| 59 | 06.9.ISVMA.1401.MaE | Basics of robotics                     | 3+2 | 6 |
| 60 | 11.9.ISVMA.1401.MaE | Microprocessors                        | 3+2 | 6 |
| 61 | 11.9.ISVMA.1402.MaE | Sensors and Actuators                  | 3+2 | 6 |
| 62 | 11.9.ISVMA.1501.MaE | Control Theory 1                       | 3+2 | 6 |
| 63 | 11.4.ISVMA.1501.MaE | Artificial Intelligence                | 3+2 | 6 |
| 64 | 11.9.F.1502.MaE     | Basics of electronics                  | 3+2 | 6 |
| 65 | 11.9.ISVMA.1702.MaE | Control Theory 2                       | 3+2 | 6 |
| 66 | 11.9.ISVMA.1602.MaE | Programmable Logical Controllers       | 3+2 | 6 |
| 67 | 11.9.ISVMA.1801.MaE | Machine Learning                       | 3+2 | 6 |
| 68 | 11.9.ISVMA.1802.MaE | Automotive Control Systems             | 3+2 | 6 |
| 69 | 11.3.ISVMA.1507.MaE | Software Engineering                   | 3+2 | 6 |
| 70 | 11.3.ISVMA.1404.MaE | Design and Analysis of Algorithms      | 3+2 | 6 |
| 71 | 11.9.ISVMA.1603.MaE | Internet Programming                   | 3+2 | 6 |

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|----|---------------------|--|-----|---|
| 72 | 11.3.ISVMA.1803.MaE | Parallel programming                         | 3+2 | 6 |
| 73 | 11.1.F.1401.MaE     | Numerical Methods                            | 3+2 | 6 |
| 74 | 11.9.F.1x07.MaE     | Modelling and Simulations                    | 3+2 | 6 |
| 75 | 11.3.F.1701.MaE     | Data, Information, and Knowledge Engineering | 3+2 | 6 |
| 76 | 11.3.F.1801.MaE     | Event driven programming                     | 3+2 | 6 |
| 77 | 09.0.F.xx55.MaE     | Technical Communication 1                    | 3+2 | 6 |
| 78 | 09.0.F.xx56.MaE     | Technical Communication 2                    | 3+2 | 6 |

| <b>List of Minor Elective courses</b> |                 |  |                             |             |
|---------------------------------------|-----------------|--|-----------------------------|-------------|
| <b>id</b>                             | <b>code</b>     | <b>Course</b>                                | <b>Weekly fund of hours</b> | <b>ECTS</b> |
| 1                                     | 11.9.F.xx01.MiE | 2D and 3D Modelling                          | 3+2                         | 6           |
| 2                                     | 11.9.F.xx02.MiE | 3D Modelling of an Environment and Character | 3+2                         | 6           |
| 3                                     | 08.4.F.xx59.MiE | Archaeology                                  | 3+2                         | 6           |
| 4                                     | 03.9.F.xx07.MiE | Classical Animation 1                        | 3+2                         | 6           |
| 5                                     | 03.9.F.xx08.MiE | Classical Animation 2                        | 3+2                         | 6           |
| 6                                     | 03.0.F.xx11.MiE | Digital Arts                                 | 3+2                         | 6           |
| 7                                     | 14.3.F.xx12.MiE | Digital economy                              | 3+2                         | 6           |
| 8                                     | 15.9.F.xx13.MiE | Digital Media: Introduction                  | 3+2                         | 6           |
| 9                                     | 15.9.F.xx14.MiE | Digital society                              | 3+2                         | 6           |
| 10                                    | 09.9.F.xx15.MiE | Digital Storytelling                         | 3+2                         | 6           |
| 11                                    | 03.0.F.xx16.MiE | Drawing and Composition                      | 3+2                         | 6           |
| 12                                    | 03.0.F.xx17.MiE | Drawing and Perspective                      | 3+2                         | 6           |
| 13                                    | 04.9.F.xx18.MiE | E-business                                   | 3+2                         | 6           |
| 14                                    | 04.9.F.xx19.MiE | E-commerce                                   | 3+2                         | 6           |
| 15                                    | 13.2.F.xx09.MiE | E-Ethics                                     | 3+2                         | 6           |
| 16                                    | 14.9.F.xx21.MiE | E-Gaming                                     | 3+2                         | 6           |
| 17                                    | 14.9.F.xx22.MiE | E-Governance                                 | 3+2                         | 6           |
| 18                                    | 15.1.F.xx23.MiE | E-Journalism                                 | 3+2                         | 6           |
| 19                                    | 04.7.F.xx24.MiE | e-Marketing                                  | 3+2                         | 6           |
| 20                                    | 15.9.F.xx25.MiE | E-Media                                      | 3+2                         | 6           |
| 21                                    | 11.9.F.xx26.MiE | e-Platforms                                  | 3+2                         | 6           |
| 22                                    | 07.2.F.xx33.MiE | Ecology                                      | 3+2                         | 6           |
| 23                                    | 14.3.F.xx28.MiE | Economics                                    | 3+2                         | 6           |
| 24                                    | 15.9.F.xx34.MiE | Electronic elections                         | 3+2                         | 6           |
| 25                                    | 09.2.F.xx35.MiE | English for Academic Purposes                | 3+2                         | 6           |
| 26                                    | 04.9.F.xx03.MiE | Entrepreneurship                             | 3+2                         | 6           |
| 27                                    | 04.9.F.xx36.MiE | ERP systems                                  | 3+2                         | 6           |
| 28                                    | 09.9.F.xx37.MiE | Fantastic Literature for game design         | 3+2                         | 6           |

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|----|-----------------|--|-----|---|
| 29 | 04.3.F.xx04.MiE | Financial Management   | 3+2 | 6 |
| 30 | 11.9.F.xx38.MiE | Game Interface Design  | 3+2 | 6 |
| 31 | 04.9.F.xx39.MiE | Innovation e-Business management and marketing   | 3+2 | 6 |
| 32 | 11.9.F.xx40.MiE | Interactive Design   | 3+2 | 6 |
| 33 | 04.9.F.xx05.MiE | IT Startups  | 3+2 | 6 |
| 34 | 10.9.F.xx41.MiE | Law and intellectual property  | 3+2 | 6 |
| 35 | 03.5.F.xx42.MiE | Digital Photography and Cinematography (Storytelling through the use of images)                | 3+2 | 6 |
| 36 | 03.5.F.xx43.MiE | Digital Photography and Cinematography (Storytelling through the use of images-postproduction) | 3+2 | 6 |
| 37 | 03.0.F.xx44.MiE | Level Design 1   | 3+2 | 6 |
| 38 | 03.9.F.xx45.MiE | Level Design 2   | 3+2 | 6 |
| 39 | 03.0.F.xx46.MiE | Literature, Computer Games and Animations  | 3+2 | 6 |
| 40 | 09.0.F.xx47.MiE | Macedonian Language  | 3+2 | 6 |
| 41 | 04.0.F.xx06.MiE | Management   | 3+2 | 6 |
| 42 | 04.9.F.xx10.MiE | Management of Human Resources  | 3+2 | 6 |
| 43 | 04.7.F.xx20.MiE | Market Analysis  | 3+2 | 6 |
| 44 | 04.7.F.xx27.MiE | Marketing  | 3+2 | 6 |
| 45 | 03.9.F.xx48.MiE | Motion Design 1  | 3+2 | 6 |
| 46 | 03.9.F.xx49.MiE | Motion Design 2  | 3+2 | 6 |
| 47 | 10.6.F.xx29.MiE | Open government  | 3+2 | 6 |
| 48 | 04.9.F.xx30.MiE | Product Management   | 3+2 | 6 |
| 49 | 04.9.F.xx31.MiE | Project Management   | 3+2 | 6 |
| 50 | 09.9.F.xx32.MiE | Public Speaking  | 3+2 | 6 |
| 51 | 14.0.F.xx50.MiE | Social networks  | 3+2 | 6 |
| 52 | 11.9.F.xx51.MiE | Storytelling for Animation   | 3+2 | 6 |
| 53 | 11.3.F.xx52.MiE | Visual Communication and Graphics Design   | 3+2 | 6 |
| 54 | 04.9.F.xx53.MiE | e-Banking  | 3+2 | 6 |
| 55 | 10.6.F.xx54.MiE | e-Democracy  | 3+2 | 6 |
| 56 | 10.6.F.xx57.MiE | e-Diplomacy  | 3+2 | 6 |
| 57 | 09.0.F.xx58.MiE | Academic writing   | 3+2 | 6 |