| 1. | **Field of study** | **Computer Science** |
|---|---|---|
| 2. | Faculty | Faculty of Science and Technology |
| 3. | Academic year of entry | 2019/2020 (summer term) |
| 4. | Level of qualifications/degree | second-cycle studies |
| 5. | Degree profile | general academic |
| 6. | Mode of study | full-time |

## Module: Systems modelling and analysis

**Module code:** 08-IN-S2-MiAS

**1. Number of the ECTS credits:** 4

**2. Learning outcomes of the module**

| code | description | learning outcomes of the programme | level of competence (scale 1-5) |
|---|---|---|---|
| MiAS -K_8 | Can think and act creatively. | K_K01 | 2 |
| MiAS -K_9 | Can work individually and in a team. | K_U02 | 1 |
| MiAS -U_4 | Can develop a digital system and use procedure of its testing . Can elaborate diagnostic tests, design test generators and data compaction systems.<br>Uses methods and techniques enhancing systems reliability.<br>Uses hardware description languages VHDL or Verilog, can execute digital system operation simulation.<br>Uses tools for programming digital systems, can enhance testability of the developed digital system and takes into account influence of a digital system on its environment. | K_U03<br>K_U05<br>K_U06<br>K_U08<br>K_U09<br>K_U10<br>K_U13<br>K_U14<br>K_U20 | 2<br>2<br>1<br>3<br>4<br>4<br>4<br>4<br>3 |
| MiAS -U_5 | Can develop, analyze, model test and deploy software.<br>Effectively uses tools for developing, modelling and testing systems.<br>Uses development methodologies and techniques UML, OCL, BPML and BPEL to analyse and model IT systems. Can elaborate system specification and documentation.<br>Can create software source code with desired quality features and use reverse engineering. | K_U02<br>K_U03<br>K_U07<br>K_U12<br>K_U13<br>K_U14<br>K_U15 | 3<br>4<br>2<br>2<br>4<br>4<br>4 |

| | | | |
|---|---|---|---|
| | | K_U19<br>K_U20 | 3<br>4 |
| MiAS -U_6 | Can design Petri net for modelling for the system generalized modelling, perform the network operation simulation.<br>Can model operation of a concurrent system and solve typical problems of concurrent processing. | K_U07<br>K_U08 | 3<br>3 |
| MiAS -U_7 | Can prepare and give a project presentation and elaborate a report. | K_U03<br>K_U04 | 3<br>3 |
| MiAS -W_1 | Understands the meaning of reliability, availability, security and protection of systems and knows means ensuring system reliability. Possesses knowledge concerning reliability violations: failures, errors and defects, knows their interrelations. Understands the need to prevent failures, fault tolerance and removal and their prediction. Knows methods and techniques of verification, validation and testing and hardware and software diagnostics. Can describe a digital system in standard languages of hardware description VHDL and Verilog, perform simulation and the process of system testing. | K_W01<br>K_W04<br>K_W20<br>K_W21 | 4<br>1<br>4<br>2 |
| MiAS -W_2 | Knows and uses methods and techniques of development, analysis, modelling, testing and deployment of systems. Understands notation UML, OCL, BPMN and BPEL and uses it in IT and business systems development. Understands code quality meaning in the aspect of software maintenance, uses design patterns, knows object, component and event-driven programming techniques as well as basics of software engineering. | K_W10<br>K_W12<br>K_W13<br>K_W14<br>K_W20 | 4<br>2<br>2<br>3<br>3 |
| MiAS -W_3 | Knows Petri net functionality and basics of system modelling using these nets and uses techniques of their simulation. Understands operation of concurrent and parallel systems, problems of multithreading and multiprocessing, access to shared resources, scheduling, thread synchronization techniques and ensuring data integrity. Understands the need for systems functioning optimization and influence of system operation on its environment. | K_W01<br>K_W03<br>K_W07<br>K_W09<br>K_W21 | 2<br>2<br>3<br>3<br>1 |

| **3. Module description** | |
|---|---|
| **Description** | Aim of the subject is making the student familiarize with methods and techniques of developing, analysis, modelling, testing and deployment of digital, IT and business processes systems, especially using hardware description languages VHDL, Verilog, Petri nets and standard notations or software development description languages UML, OCL, BPMN, BPEL and IT systems documentation. Ensuring the systems reliability, availability, security, protection requires knowledge of methods and techniques of verification, validation, testing, diagnostics, systems modelling and analysis which constitute supplement to the course range. The subject thematic covers also concurrent systems modelling, solving typical problems of concurrence and the meaning of software source code quality, maintenance of IT systems and programming engineering. |
| **Prerequisites** | |

**4. Assessment of the learning outcomes of the module**

| code | type | description | learning outcomes of the module |
|---|---|---|---|
| MiAS _w_1 | Exam | Verification of knowledge in the form of tasks to solve | MiAS -W_1, MiAS -W_2, MiAS -W_3 |
| MiAS _w_2 | Control tests | Systematic tests checking knowledge and skills acquired during lectures and laboratory classes. | |

| | | | |
|---|---|---|---|
| | | | MiAS -U_4, MiAS -U_5, MiAS -U_6, MiAS -W_1, MiAS -W_2, MiAS -W_3 |
| MiAS _w_3 | Reports | Systematic execution of reports of laboratory works course. | MiAS -K_8, MiAS -K_9, MiAS -U_4, MiAS -U_5, MiAS -U_6, MiAS -U_7 |
| MiAS _w_4 | Project | Executing a semester project in the range of accepted education effects. | MiAS -K_8, MiAS -K_9, MiAS -U_4, MiAS -U_5, MiAS -U_6, MiAS -W_1, MiAS -W_2, MiAS -W_3 |
| MiAS _w_5 | Presentation | Giving audio-visual presentation in front of the group, discussion over assumptions and accepted solution method of the given problem, analysis ane evaluation of the project goal. | MiAS -K_8, MiAS -K_9, MiAS -U_7 |

**5. Forms of teaching**

| code | form of teaching | | | required hours of student's own work | | assessment of the learning outcomes of the module |
|---|---|---|---|---|---|---|
| | type | description (including teaching methods) | number of hours | description | number of hours | |
| MiAS _fs_1 | lecture | Module educational content with use of audio-visual aids. | 15 | Individual study over lecture subject matter and advised literature. | 15 | MiAS _w_1 |
| MiAS _fs_2 | laboratory classes | Practical realization of the module educational content concerning, among others, acquiring skills and experience of effective use of tools to develop, model and test systems. The classes are held with use of computer workstations and sufficient software. | 30 | Individual preparation for laboratory classes and periodical reports of the course of project works.<br>Systematic elaboration of reports of subsequent topics realized during laboratory classes.<br>Individual or in a group of several person execution of the project and its documentation.<br>Preparing an audio-visual presentation about the realized project and its effecting in front of the group. | 60 | MiAS _w_2, MiAS _w_3, MiAS _w_4, MiAS _w_5 |