# Mechatronics
# 1 cycle
# Professional Higher Education study programme

## 1 General description of the programme

The first cycle program mechatronics is a Professional Higher Education study three year program with several subjects which can be divided into three main groups. In the first group are basic science subjects, in the second group specific engineering subjects and in the third group non-technical subjects. The program provides in the second and the third year a specific subject Project I and II where students are motivated for solving real engineering tasks. In the third year students have to work for two months in selected engineering companies outside of the faculty. In this specific companies they are confronted with real engineering problems and can find there thesis for the diploma work. The Professional Higher Education study programme Mechatronic "weights" 180 ECTS.

## 2 Short description of the study modules

The Professional Higher Education study programme of Mechatronics has no modules.

## 3 General learning outcomes and competencies of the students

A graduate student of this programme obtains the following general competencies:

- An ability to manage processes in the wider field of mechanical engineering, electrical engineering, computer science and informatics,
- An ability to use practical skills in the field of mechatronics, which are indispensable in the development of new products with high added value and modernization of production technologies in the industry, in management of production, service activities.
- An ability to analyze and solve practical problems in the design, management and implementation of professional tasks in the broad field of mechatronics,
- An ability of professional criticism, responsibility, initiative and independence in decision-making and managing of the less demanding and medium-challenging tasks.
- An ability to communicate with experts, colleagues and partners, and customers in the domestic and international arena. An ability to design, develop and construct of mechatronic elements, less complex devices, machines, plants and mechatronic systems.

## 4 The main subject-specific learning outcomes and competencies of the students

The main subject-specific competencies that can be obtained by the Professional Higher Education study programme of MECHATRONICS:

- The ability to design, develop and construct of mechatronic elements, less complex devices, machines, plants and mechatronic systems,
- ability to perform computer-aided design and programming of control systems,
- the ability to use, manage and maintain mechatronic systems, production technology and automated and robotized manufacturing systems,
- the ability to provide measures for flawless operation, maintenance and environmental compatibility of mechatronic systems,
- the ability to provide adequate quality of products through the implementation of appropriate measurement and quality control,
- the ability to use modern computer, information and communication technologies in the field of expertise.

# 5 General curriculum

The first cycle Professional Higher Education study programme of Mechatronics is divided into the following parts:

| **Part** | **Part of study** | **Duration** | **ECTS credits** |
|---|---|---|---|
| 1 | Courses | 6 semesters | 145 |
| 2 | Project work | 1 year (2 semester) | 10 |
| 3 | Practical training | 1 semester | 15 |
| 4 | Diploma work | 1 semester | 10 |
| | **Total:** | **3 years** | **180** |

# 6 Detailed curriculum

| 1. year | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Subject | 1st semester | | | | Cont. hours | Individ. work | Hours | ECTS |
| | L | S | T | Lab | | | | |
| Mathematics for Engineers 1 | 30 | 0 | 50 | 0 | 80 | 70 | 150 | 5 |
| Principles of Electrical Engineering for Mechatronics | 30 | 0 | 30 | 0 | 60 | 90 | 150 | 5 |
| Measurement | 40 | 0 | 5 | 40 | 85 | 95 | 180 | 6 |
| Engineering materials | 40 | 0 | 12 | 25 | 77 | 103 | 180 | 6 |
| Technical Documentation | 40 | 5 | 25 | 5 | 75 | 75 | 150 | 5 |
| Technical Computing | 15 | 0 | 2 | 28 | 45 | 45 | 90 | 3 |
| Together semester: | 195 | 5 | 124 | 98 | 422 | 478 | 900 | 30 |

| Subject | 2nd semester | | | | Cont. hours | Individ. work | Hours | ECTS |
|---|---|---|---|---|---|---|---|---|
| | L | S | T | Lab | | | | |
| Mathematics for Engineers 2 | 30 | 0 | 35 | 0 | 65 | 55 | 120 | 4 |
| Machine Elements | 50 | 0 | 40 | 12 | 102 | 138 | 240 | 8 |
| Technical Mechanics for Mechatronics | 40 | 0 | 25 | 0 | 65 | 85 | 150 | 5 |
| Computer Science | 30 | 0 | 9 | 36 | 72 | 108 | 180 | 6 |
| Internet Technologies | 30 | 0 | 6 | 24 | 60 | 60 | 120 | 4 |
| English for specific purposes | 30 | 15 | 0 | 0 | 45 | 45 | 90 | 3 |
| Together semester: | 210 | 15 | 115 | 72 | 409 | 491 | 900 | 30 |
| **Together year:** | **405** | **20** | **239** | **170** | **834** | **966** | **1800** | **60** |

| 2. year | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Subject | 3rd semester | | | | Cont. hours | Individ. work | Hours | ECTS |
| | L | S | T | Lab | | | | |
| Technological Systems | 40 | 5 | 12 | 35 | 92 | 118 | 210 | 7 |
| Computer-aided Engineering | 12 | 5 | 0 | 20 | 37 | 53 | 90 | 3 |
| Control Techniques I | 40 | 0 | 3 | 27 | 70 | 80 | 150 | 5 |
| Fundamentals of Process Engineering and Environmental protection | 18 | 0 | 14 | 3 | 35 | 55 | 90 | 3 |
| Design of Mechatronics Systems | 40 | 0 | 5 | 40 | 85 | 95 | 180 | 6 |
| Project I | 0 | 60 | 0 | 0 | 60 | 120 | 180 | 6 |
| Together semester: | 150 | 70 | 34 | 125 | 379 | 521 | 900 | 30 |

| Subject | 4th semester | | | | Cont. hours | Individ. work | Hours | ECTS |
|---|---|---|---|---|---|---|---|---|
| | L | S | T | Lab | | | | |
| Sensor Technology I | 30 | 0 | 3 | 27 | 60 | 90 | 150 | 5 |
| Controllers and Microcomputers | 40 | 0 | 3 | 27 | 70 | 80 | 150 | 5 |
| Industrial Electronics | 30 | 0 | 3 | 27 | 60 | 90 | 150 | 5 |
| Logic Control Engineering | 12 | 5 | 10 | 12 | 39 | 111 | 150 | 5 |
| Elective Subject* | 25 | 0 | 0 | 25 | 50 | 130 | 180 | 6 |
| Project II | 0 | 60 | 0 | 0 | 60 | 60 | 120 | 4 |
| Together semester: | 137 | 65 | 19 | 118 | 339 | 561 | 900 | 30 |
| **Together year:** | **287** | **135** | **53** | **243** | **718** | **1082** | **1800** | **60** |

| 3. year | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Subject | 5th semester | | | | Cont. hours | Individ. work | Hours | ECTS |
| | L | S | T | Lab | | | | |
| Elective Subject** | 25 | 0 | 12 | 40 | 77 | 103 | 180 | 6 |
| Production Systems Automation | 30 | 0 | 3 | 27 | 60 | 120 | 180 | 6 |
| Motion Mechanisms | 25 | 12 | 40 | 0 | 77 | 103 | 180 | 6 |
| Elective Subject FEECS*** | 30 | 0 | 3 | 27 | 60 | 120 | 180 | 6 |
| Elective Subject FME**** | 30 | 0 | 3 | 27 | 60 | 120 | 180 | 6 |
| Together semester: | 140 | 12 | 61 | 121 | 334 | 566 | 900 | 30 |

| Subject | 6th semester | | | | | Cont. hours | Individ. work | Hours | ECTS |
|---|---|---|---|---|---|---|---|---|---|
| | L | S | T | K | Lab | | | | |
| Robotics II | 30 | 0 | 3 | 0 | 27 | 60 | 90 | 150 | 5 |
| Practical work | 0 | 0 | 0 | 0 | 0 | 0 | 450 | 450 | 15 |
| Diploma work | 0 | 0 | 0 | 20 | 0 | 20 | 280 | 300 | 10 |
| Together semester: | 30 | 0 | 3 | 20 | 27 | 80 | 820 | 900 | 30 |
| **Together year:** | **170** | **12** | **64** | **20** | **148** | **414** | **1386** | **1800** | **60** |
| **Together 3 years:** | **862** | **167** | **356** | **20** | **561** | **1966** | **3434** | **5400** | **180** |

L – lectures, S – seminar; T – tutorial; K- konsultation; Lab- laboratory

## ELECTIVE SUBJECTS

***Elective subjects 2nd year, 4th semester**:

| Subject | 4th semester | | | | Cont. hours | Individ. work | Hours | ECTS |
|---|---|---|---|---|---|---|---|---|
| | L | S | T | Lab | | | | |
| Control Engineering II | 30 | 0 | 3 | 27 | 60 | 120 | 180 | 6 |
| Flexible Manufacturing Systems | 25 | 5 | 0 | 10 | 40 | 140 | 180 | 6 |
| Engine Equipment and Diagnostic | 20 | 10 | 0 | 10 | 40 | 140 | 180 | 6 |
| Maintenance of Mechatronics Systems | 20 | 5 | 5 | 10 | 40 | 140 | 180 | 6 |

**** Elective subject 3rd year, 5th semester:**

| Subject | 5th semester | | | | Cont. hours | Individ. work | Hours | ECTS |
|---|---|---|---|---|---|---|---|---|
| | L | S | T | Lab | | | | |
| Industrial Robotics | 25 | 0 | 12 | 40 | 77 | 103 | 180 | 6 |
| Robotics I | 40 | 0 | 3 | 27 | 70 | 110 | 180 | 6 |

***Elective subjects FEECS** (Faculty of Electrical Engineering and Computer Science), **3rd year, 5th semester:**

| Subject | 5th semester | | | | Cont. hours | Individ. work | Hours | ECTS |
|---|---|---|---|---|---|---|---|---|
| | L | S | T | Lab | | | | |
| Analysis II | 45 | 0 | 30 | 15 | 90 | 90 | 180 | 6 |
| Power eletronic systems | 30 | 0 | 3 | 27 | 60 | 120 | 180 | 6 |
| Digital signal processors | 30 | 0 | 3 | 27 | 60 | 120 | 180 | 6 |

****Elective subjects FME** (Faculty of Mechanical Engineering), **3rd year, 5th semester:**

| Subject | 5th semester | | | | Cont. hours | Individ. work | Hours | ECTS |
|---|---|---|---|---|---|---|---|---|
| | L | S | T | Lab | | | | |
| Hydraulics and Pneumatics | 20 | 5 | 5 | 10 | 40 | 140 | 180 | 6 |
| Tools and Clamping Devices | 20 | 0 | 0 | 20 | 40 | 140 | 180 | 6 |
| Computer Simulations in Engineering Design | 17 | 3 | 0 | 20 | 40 | 140 | 180 | 6 |