Mechatronics, 1. cycle academic study programme

1   General description of the programme

The first cycle academic program mechatronics is a 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 specific subjects Project I, II, and III. In these specific subjects students are motivated for solving real mechatronic tasks. The program is organized with the aims to give students solid theoretical fundaments and also applicable knowledge if they intend to stop their education after the first bologna cycle. The academic first cycle program Mechatronic "weights" 180 ECTS.

2   Short description of the study modules

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3   General learning outcomes and competencies of the students

A graduate student of this programme should have the following general competencies:

- knowledge and understanding of the scientific and mathematical principles underlying mechatronics;
- a systematic understanding of the key aspects and concepts of mechatronics;
- coherent knowledge of mechatronics;
- the ability to apply their knowledge and understanding to identify, formulate and solve mechatronic problems using established methods;
- the ability to apply their knowledge and understanding to analyse mechatronic products, processes and methods;
- the ability to select and apply relevant analytic and modelling methods;
- the ability to apply their knowledge and understanding to develop and realise design to meet defined and specific requirements;
- understand the design methodologies, and an ability to use them;
- the ability to conduct searches of literature, and to use data bases and other sources of information;
- the ability to design and conduct appropriate experiments, interpret the data and draw conclusions;
- workshop and laboratory skills;
- the ability to combine theory and practice to solve engineering problems;
- an awareness of the non-technical implications of engineering practice;
- function effectively as an individual and as a member of a team.

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

The main subject-specific competencies that can be obtained by the academic study programme of MECHATRONICS.

- the ability to design complex mechatronic systems, machines and plants.
- the ability to apply and develop computer-aided design and electro-technical design as well as modern programming languages and web-based systems for tele-operation of mechatronic systems.
- the ability to apply and develop methods and tools for modeling, optimization and simulation of mechatronic systems.
- the ability to devise, develop and apply the modern mechatronic production technologies and concepts,
- the ability for managing the current mechatronics production methods and technologies, as well as their analysing, evaluating and modernising,
- the ability to organise design and manage a mechatronic production process,

- the ability to provide adequate quality of products through the implementation of appropriate measurement and quality control,
- the ability to assure measures for flawless operation, maintenance and environmental compatibility of mechatronic systems,
- the ability for interdisciplinary understand the activities in the production systems,
- the ability to permanently develop skills and expertise by application of knowledge on the specific professional area.
- knowledge and understanding of historical development of mechatronics and its disciplines,
- the ability to apply and deepen the knowledge of professional foreign language, which will enable them to communication with foreign experts as well as easier intervention in the world's store of knowledge.

5 General curriculum

The academic-level study programme of Mechatronics is divided into the following parts:

Part	Part of study	Duration	ECTS credits
1	Courses	6 semesters	150
2	Project work	2 years (3 semester)	24
4	Diploma work	1 semester	6
	Total:	**3 years**	**180**

6 Detailed curriculum

1. year

Subject	1st semester			Cont. hours	Individ. work	Hours	ECTS
	L	S	T				
Mathematical Analysis	50	0	30	80	100	180	6
Mechanics for Mechatronics	40	0	40	80	100	180	6
Materials I	25	0	15	40	50	90	3
Programming for Electrical Engineers I	30	0	45	75	105	180	6
Technical Documentation	35	5	20	60	30	90	3
Computer Practice	15	0	30	45	45	90	3
Foreign language (German) Foreign language (English)	35	5	0	40	50	90	3
Together semester:	230	10	180	420	480	900	30

Subject	2nd semester			Cont. hours	Individ. work	Hours	ECTS
	L	S	T				
Linear Algebra	25	0	12	37	53	90	3
Waves and Structure of Matter	45	0	30	75	105	180	6
Basics of Electrical Engineering	45	0	45	90	90	180	6
Electrical Engineering Measurements	45	0	45	90	90	180	6
Materials II	25	0	15	40	50	90	3
Mechatronics Systems	45	0	45	90	90	180	6
Together semester:	230	0	192	422	478	900	30
Together year:	**460**	**10**	**372**	**842**	**958**	**1800**	**60**

2. year

Subject	3rd semester			Cont. hours	Individ. work	Hours	ECTS
	L	S	T				
Vector Analysis	50	0	25	75	105	180	6
Differential Analysis	25	0	24	49	71	120	4
Machine Elements	50	0	37	87	153	240	8
Control Systems	45	0	30	75	105	180	6
Mehatronic's Electronics	45	0	30	75	105	180	6
Together semester:	215	0	146	361	539	900	30

Subject	4th semester			Cont. hours	Individ. work	Hours	ECTS
	L	S	T				
Planetary Drives	25	10	17	52	68	120	4
Open-Loop Control Technics	25	12	25	62	118	180	6
Microcontrollers	40	5	30	75	105	180	6
Sensors	45	0	30	75	105	180	6
Project 1	0	30	0	120	120	240	8
Together semester:	135	57	102	384	516	900	30
Together year:	**350**	**57**	**248**	**745**	**1055**	**1800**	**60**

3. year							

Subject	5th semester			Cont. hours	Individ. work	Hours	ECTS
	L	S	T				
Industrial Electronics	45	0	30	75	105	180	6
Robotisation #	30	0	35	65	115	180	6
Project 2	0	30	0	90	90	180	6
Elective subject 1 (FEECS)*	25	20	30	75	105	180	6
Elective subject 2 (FME)**	20	5	12	37	53	90	3
Elective subject 3 (FME)**	20	5	12	37	53	90	3
Together semester:	140	60	119	379	521	900	30

subject Robotisation can be replaced by the following subject:

Introduction to Robotics	45	0	30	75	105	180	6

Subject	6th semester				Cont. hours	Individ. work	Hours	ECTS
	L	S	T	K				
Hydraulics and Pneumatics	25	5	22	0	52	68	120	4
Elective subject 4 (FEECS)***	30	10	30	0	70	110	180	6
Elective subject 5 (FME)****	25	10	20	0	55	65	120	4
Project 3	0	30	0	120	150	150	300	10
Diploma work	0	0	0	30	30	150	180	6
Together semester:	80	55	72	150	357	543	900	30
Together year:	220	115	191	210	736	1064	1800	60
Together 3 years:	1024	188	811	210	2233	3167	5400	180

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

ELECTIVE SUBJECTS

*Elective subjects 1 FEECS (Faculty of Electrical Engineering and Computer Science):

Subject	5th semester			Cont. hours	Individ. work	Hours	ECTS
	L	S	T				
Electrical and Electromechanical Converters	45	0	30	75	105	180	6
Control of Manufacturing Systems	40	5	30	75	105	180	6

**Elective subjects 2 and 3 FME (Faculty of Mechanical Engineering):

Subject	5th semester			Cont. hours	Individ. work	Hours	ECTS
	L	S	T				
Mechatronic systems for Machining tools	25	0	15	40	50	90	3
Computer Aided Design	12	10	15	37	53	90	3
Internal Combustion Engines I	25	5	10	40	50	90	3
Computer Integrated Manufacturing	25	0	12	37	53	90	3
Machine Tools and Forming Machines	25	0	12	37	53	90	3
Production Planning and Control	25	0	12	37	53	90	3

***Elective subjects 4 FEECS (Faculty of Electrical Engineering and Computer Science):

Subject	6th semester			Cont. hours	Individ. work	Hours	ECTS
	L	S	T				
Communication in Automation	30	15	30	75	105	180	6
Digital signal Controllers in Automation	30	15	30	75	105	180	6

****Elective subjects 5 FME (Faculty of Mechanical Engineering):

Subject	6th semester			Cont. hours	Individ. work	Hours	ECTS
	L	S	T				
Product Development	25	10	15	50	70	120	4
Virtual Product Modelling	15	10	23	48	72	120	4
Renewable Energy sources	25	12	15	52	68	120	4