



Zittau/Görlitz
University
of Applied Sciences

*Faculty of Electrical Engineering
and Computer Sciences*

Technical
University
of Liberec



*Faculty of Mechatronics, Informatics
and Interdisciplinary Studies*



Technical University of Liberec
Studentská 1402/2 // CZ – 461 17 Liberec 1
www.tul.cz



Zittau/Görlitz University of Applied Sciences
Theodor-Körner-Allee 16 // DE – 02763 Zittau
www.hszg.de



Master Study Program Guide »Mechatronics«

Contents

1	Preface	3
2	Master Course Structure and Modules	3
2.1	First semester	3
2.1.1	Winter Term, Study load, Credits	3
2.1.2	Module Explanations	4
2.2	Second Semester	5
2.2.1	Summer semester, Study load, Credits	5
2.2.2	Module Explanations	6
2.3	Third Semester	8
2.3.1	Winter semester, Study load, Credits, Form of Examination	8
2.3.2	Module Explanation	9
2.3.3	Abstracts from the "Master Mechatronics" examination regulations	11
2.4	Fourth Semester	11
2.4.1	Summer semester, Study load, Credits	11
2.4.2	Module Explanation (TU Liberec)	12
3	Policy and Legal Procedures	14
3.1	Common boards	14
3.2	Students	14
3.3	Study Structure	14
3.3.1	Place of Hosting University	14
3.3.2	Master's Thesis at HS Zittau/Görlitz – Procedure	15
3.3.3	Diploma Thesis at TU Liberec – procedure	16
3.3.4	State Final Examination in the Field of Mechatronics at TU Liberec	17
3.4	Study and Examination Guidelines	18
3.4.1	Study Guidelines	18
3.4.2	ECTS-guidelines	19
3.5	Admission and Application Procedure	19
3.5.1	Admission Requirements	19
3.5.2	Application Procedure	20
3.5.3	Required Documents for Application at TU Liberec	20
3.5.4	Required Documents for Application at HS Zittau/Görlitz	20
3.6	Administration, Examination Results, Diploma	22
3.6.1	Student Administration by Home University	22
3.6.2	Student Administration by the Hosting University	22
3.6.3	Diploma	22
3.7	Fees	22
3.8	Funding	23
3.9	Finding Accommodation	23
3.10	Execution of the Study Programs	23
3.11	Administrative Formalities	24
3.11.1	Czech Administrative Formalities	24
3.11.2	German Administrative Formalities	24

Attachments

- Attachment 1 – Master Certificate HS Zittau/Görlitz (2 pages)
- Attachment 2 – Transcript of records HS Zittau/Görlitz (2 pages)
- Attachment 3 – Diplom Certificate TU Liberec
- Attachment 4 – Summary of Student Data TU Liberec (3 pages)
- Attachment 5 – Diploma Supplement TU Liberec (4 pages)

1 Preface

The **“Mechatronics”** study program is based on the joint cooperation between the **partner universities** Technical University of Liberec (TU Liberec), Faculty of Mechatronics, Informatics and Interdisciplinary Studies (Faculty FM) and the Zittau/Görlitz University of Applied Sciences (HS Zittau/Görlitz), Faculty of Electrical Engineering and Computer Sciences (Faculty F-EI). Applicants for this study program have been enrolled at the HS Zittau/Görlitz or the TU Liberec. The university, where a student got enrolled for the first time, is called **“Home University”**. The other partner university is then called **“Host University”**. During his/her stay at the Host University, the student is both registered at the “Host University” and enrolled at the “Home University”.

The main objective of this new joint **“Mechatronics”** study program is to connect the great diversity of expertise in mechatronics at TU Liberec and HS Zittau/Görlitz to a common higher education platform in the European Region Neisse according the Bologna Declaration. Students from European countries and students of TU Liberec and HS Zittau/Görlitz holding a bachelor’s degree will be offered the possibility to study mechatronic engineering within the framework of the “Mechatronics” master study program. They will be fully integrated into research projects and the cooperation with the regional industry at both institutions of higher education. Students will participate in design and development of new engineering products and processes by integration of electronic and electrical engineering, computer technology and control engineering.

Besides the study qualification, another objective is to provide the students a cross-disciplinary perspective from laboratories and computer environment to industrial and research projects gaining also international experience, acquiring the English language and picking up a new cultural lifestyle.

To study a master in “Mechatronics” will bring benefits to the European Region Neisse and the European industry because the graduates will get familiar with the specific features of the region and the host countries.

2 Master Course Structure and Modules

Figure1 gives an overview of the master study semesters in Mechatronics.

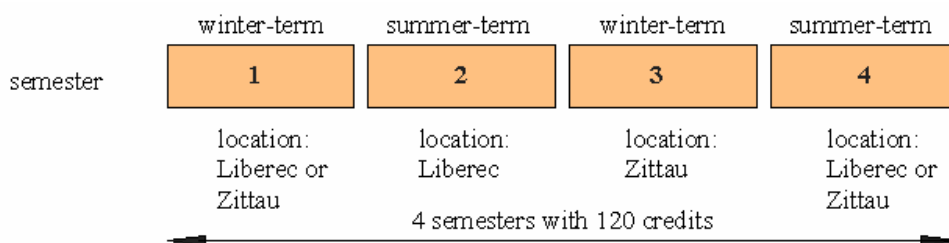


Figure 1 Scheme of the master study semesters in Mechatronics

2.1 First semester

2.1.1 Winter Term, Study load, Credits

The first semester is preparatory and valued with a minimum of 30 ECTS (see 3.4.2). The bachelor’s degrees are valued with 180 ECTS credits at TU Liberec and with 210 ECTS

credits at HS Zittau/Görlitz. The credit results from HS Zittau/Görlitz can be valued as the preparatory first semester. Students having these credits can directly enter the second semester of master study in Mechatronics [see 3.5.1 (3.)]. The modules to be selected by students registered at TU Liberec are given in the Table 1.

Table 1. Semester: 1. (winter) 30 ECTS credits				
TU Liberec				
Nr.	Subject names		Study load/ ECTS	Exami- nation
compulsory Subjects				
1	Applied Mathematics	Maryška J. jiri.maryska@tul.cz Šembera J. jan.sembera@tul.cz	3+3 / 6	WO
2	Probability and Statistics-N	Březina J. jan.brezina@matfyz.cz	2+1 / 4	CC
3	Continuum Mechanics and Thermodynamics	Hokr M. milan.hokr@tul.cz	2+2 / 4	WO
4	Electromagnetic Field and Optics	Richter A. ales.richter@tul.cz Kopecký V. vasek.kopecky@tul.cz	2+2 / 6	W
5	Electric drives	Kubín J. jiri.kubin@tul.cz	3+2 / 5	WO
6	Laboratory I	Potěšil A. antonin.potesil@tul.cz	0+4 / 5	CC

Type of Examination: W – written, O – oral, WO – written and oral, CC – Classified credit

2.1.2 Module Explanations

Applied Mathematics

The aim of the course is to give a mathematical basis for other courses of MSc studies. The core topics are

- Basics of functional analysis
- Hilbert and Banach spaces, Sobolev spaces,
- Systems of ordinary differential equations
- Runge - Kutta methods, selected numerical methods
- Partial differential equations, finite difference method.

Probability and Statistics

The module provides a comprehensive overview of engineering probability and statistics. It is mainly focused on

- Probability distribution functions, parameter estimates, hypothesis testing
- Regression analysis, variance analysis
- Classification methods
- Bayesian methods
- Random processes, Markov chains
- Monte Carlo Methods

Continuum Mechanics and Thermodynamics

The aim of the course is to provide understanding of the basic principles of physics and of their applications to typical engineering problems in continuum mechanics and thermodynamics.

- Stress and strain tensors with interpretation, principal values and directions, generalizations

- Hooke's law, equations and formulation of boundary value problems in elasticity, technical problems - bending and torsion.
- First and second law of thermodynamics, basic quantities and equations.

Electromagnetic Field and Optics

Aim of the course is to provide mathematical bases of electromagnetic fields and electromagnetic theory of light. After completion of this module students will be familiarized with

- the theory of electrical circuits, lumped and distributed electrical circuits
- Maxwell's equations, static electric field, time-varying fields, electromagnetic waves
- Transient response of transmission lines
- Optics– electromagnetic theory of light, wave equation in homogeneous and in-homogeneous medium, monochromatic electromagnetic waves
- Helmholtz equation, interference and multiple interference
- Fourier optics – optical Fourier transformation, diffraction, holography.

Electric drives

The aim of the subject is to give students theoretical and practical knowledge about the overall arrangement, function and characteristic properties of basic parts of electric drives in technological systems:

- Electric drives – configuration, requirements on electric and working machines
- Kinematics of electric drives, losses and dimensioning
- Analysis of regulating systems, control algorithms, optimization of systems
- DC motors - properties, mathematical models, control of velocity and simulation
- AC motors – properties, mathematical modeling, control of velocity and simulation
- Power semiconductor converters, properties and characteristic
- Components of control circuits
- Electric drives in the distributed control system.

Laboratory I

Objective of the course is to introduce laboratory technology planning used for characteristics, identification and electromagnetic system responses to students. The laboratory topics are:

- Theory and practical solutions of a variety of experimental work and functional telemetry
- Demonstration of measuring chains used in experimental and developing units of industrial subjects and engineering companies.

2.2 Second Semester

2.2.1 Summer semester, Study load, Credits

The modules to be selected by the students in the summer term are given in Table 2. At least one compulsory elective subject has to be chosen! Minimum number of students in a compulsory elective subject is **6**.

Table 2. Semester: 2. (summer) 30 ECTS credits					
TU Liberec					
Nr.	Subject names			Study load/ ECTS	Examination
compulsory subjects					
1	Robotics	Záda V.	vaclav.zada@tul.cz	2+2/ 5	WO
2	Programmable Controllers	Tůma P. Diblík M.	petr.tuma@tul.cz martin.diblik@tul.cz	2+2/ 5	WO
3	Drives and Servomechanisms	Rydlo P. Černohorský J.	pavel.rydlo@tul.cz josef.cernohorsky@tul.cz	2+2/ 5	WO
4	Control Systems in Mechatronics	Modrlák O.	osvald.modrlak@tul.cz	2+2/ 5	WO
5	Semester Project			0+4/ 5	CC
compulsory elective subjects ttt((to select one subject)					
1	Smart Sensors and Actuators	Nosek J. Mokrý P.	jaroslav.nosek@tul.cz pavel.mokry@tul.cz	2+2/ 5	WO
2	Laboratory 2	Potěšil A. Koprnický J.	antonin.potesil@tul.cz jan.koprnický@tul.cz	0+4/ 5	CC
3	Design of the Electrotechnic Systems	Novák M. Plíva Z.	miroslav.novak@tul.cz zdenek.pliva@tul.cz	2+2/ 5	WO
4	Digital Signal Processing 1	Koldovský Z.	zdenek.koldovsky@tul.cz	2+2/ 5	CC
5	Hardware Software Codesing	Novák O. Plíva Z.	ondrej.novak@tul.cz zdenek.pliva@tul.cz	2+2/ 5	WO

Type of Examination: W – written , O – oral, WO – written and oral, CC – Classified credit

2.2.2 Module Explanations

Robotics

The subject *Robotics* is oriented to deep student knowledge relating the problems of analysis and control of robot manipulators using sensors.

- Matrix methods of kinematics of robot manipulators, quaternion methods.
- Direct and inverse kinematics, using analytical and numerical methods.
- Dynamics of robots, differential equations of motion, matrix methods.
- Using kinematics and dynamic equations for robots control from point to point.
- Robot motion control on defined trajectories or surfaces, classical trajectory robot planning.
- Adaptive and adaptive-learning iterative control in robotics.
- Numerical solution of robots dynamics and simulation of robot motions.

Programmable Controllers

The module provides a comprehensive overview of programmable control systems with accent on Programmable Logical Controllers and communication in networks. After completion the students should

- have good knowledge and overview of implemented hardware and systems
- be familiar with the modern languages and software (STEP 7)
- have good knowledge about communication in networks
- be familiar with fundamental approach to industrial implementation
- know about implementation of hybrid control

Drives and Servomechanisms

Students acquire knowledge of basic electric drive principles, basic knowledge of servomechanisms like servo systems, drive and motion controllers and industrial communication networks used in motion control. Students will be familiarized with

- characteristics and usage of drives in industry
- control structure of servo drives for torque, speed, position mode, master slave, electronic gearbox and electronic cams
- Pulse width modulation
- Sensor-less speed control, direct torque control, speed and position sensors
- Industrial bus systems, controlling systems, drive tuning

Control systems in Mechatronics

The module provides a comprehensive overview of control systems with accent on an appropriate balance between theoretical concepts and engineering practice in analysis, synThesis and identification of dynamic systems. After completion the students should

- have good knowledge of practical parameter estimation for determined model structure
- be able to apply design methods of single loop control and its enhancements
- understand fundamental approaches to robust control
- be familiar with description of multi-input multi-output systems
- be familiar with the modern software tools MATLAB for analysis and synThesis.

Semester Project

1. Semester projects are announced by institutes at TU Liberec or HS Zittau/Görlitz from begin to the end of the summer term.
2. Students are supposed to pick one.
3. The last date for project assigning is given by notice of the dean.
4. The project will be assigned by the chief of the project in writing.
5. The project has to be closed by project defense. The date of project defense is given by notice of the dean.

Smart Sensors and Actuators

In this subject, there will be given both theoretical and practical experience in the area of selected electric transducers of physical quantities. After completion of this module the students should know about

- smart materials and their fabrication
- piezoelectric wide band (aperiodic) and resonant transducers
- piezoelectric resonators and their applications
- piezoresistive transducers,
- smart sensors and actuators, and an overview of modern trends in the design of electrical transducers based on the application of ferroelectric thin films including processing of micro-electro-mechanical systems (MEMS),
- design of complex mechatronic systems.

Laboratory II

The objective of the advanced course is to introduce laboratory technology planning used for identification of characteristics and electromagnetic systems responses to students. Through suitably chosen laboratory topics the theory and practical solutions of a variety of experimental work and functional telemetry is introduced to students. Practice:

- Laboratory of car electronic systems
- Research Laboratory of VUTS Liberec (Research Institute of Textile Machines Liberec Co.)

Design of Electrotechnical Systems

This subject teaches students necessary theory of electrotechnics needed for design of distribution boards and electrical equipment of machines and buildings.

- CAD/CAE/CAM systems in electrotechnics
- Electrotechnics legislative and standards
- Conductor and cable design
- Protection devices, design, selectivity of protection
- Overvoltage protection
- Switchboard parts, control parts, measuring devices, oversupplies, properties of low voltage power net
- Switch board cooling, thermal behavior

Digital Signal Processing 1

The main goal of this course is to deepen student's knowledge in the field of digital signal processing. It is mainly focused on

- digital filter design methods,
- transformation of single and/or multidimensional signals (FFT, DCT)
- processing of random signals
- identification and modeling of random processes.

Hardware Software Co-Design

The aim of the course is to present techniques for concurrent hardware and software development - so called hardware/software co-design. Students will be familiarized with

- models for behavioral description of hardware and software
- H/S cooperation, algorithms partitioning tasks into hardware and software
- simulation, synThesis and verification techniques
- labs, student will use FPGA circuits and Xilinx or Mentor design tools.

2.3 Third Semester

2.3.1 Winter Semester - Study Load – Credits - Form of Examination

The modules to be selected by students in the third term at HS Zittau/Görlitz are given in table 3. At least one subject of compulsory elective subjects and the mechatronics project have to be chosen! Minimum number of students in an obligatory elective subject is 6.

Table 3. Semester: 3. (winter)				
HS Zittau/Görlitz				
Nr.	Subject names		Study load / ECTS	Examination
compulsory subjects				
1	Automatic Control Technology	Proske D. d.proske@HSZG.de	2+2/ 5	C/W 180
2	Fuzzy - Control	Kästner W. w.kaestner@HSZG.de	2+2/ 5	W 150
3	Image Processing	Bischoff S. s.bischoff@HSZG.de	2+2/ 5	W 150
4	Digital Communication Technology	Scharf D. d.scharf@HSZG.de	2+2/ 5	W 120
5	Digital Signal Processing 2	Thiele R. r.thiele@HSZG.de	2+2/ 5	W 120
compulsory elective subjects and Mechatronical Project				
1	Wind and Water Power	Weise V. v.weise@HSZG.de	2+2/ 5	O

Type of Examination: W – written, O – oral, WO – written and oral, CC – Classified credit, C – Credit,

2.3.2 Module Explanation

Automatic Control Theory

In this course students learn about modern methods of Automatic Control. Accent will be put on practical use and implementation of these methods. Students will acquire knowledge of

- analysis of controlled systems by state space description
- state estimation
- synthesis of state space controller
- multi-loop control design
- digital control

Fuzzy – Control

The aim of this course is to give consolidated knowledge about fuzzy set theory, fuzzy systems and their application in control theory. Main topics are:

- Foundations of fuzzy set theory
- Fuzzy systems and their components, fuzzy system of Mamdani type (structure, example of demonstration, practical realization, software tool DynStar)
- Fuzzy system of Takagi-Sugeno-Kang type (structure, example of demonstration, practical realization, analogy to Artificial Neural Networks)
- Requirements for application in control theory (consideration of dynamic components)
- Development of fuzzy controller
- Application of fuzzy controller and comparison to classical controller

Image Processing

This course provides a general introduction to the fundamental techniques of computer vision and image processing and illustrates their practical application. The main topics are:

- Image acquisition and representation
- Preprocessing methods: transformations of pixel brightness and geometry, camera calibration, local operators
- Video and audio compression

- Image segmentation
- Feature extraction: color, texture and shape descriptors; Principal Component Analysis
- Classification: prototypes, cluster analysis, statistical methods, classifiers
- Teachable image evaluation: supervised and non-supervised learning, neural networks, Support-Vector-Machine (SVM)
- Multi-sensor technology, Fusion
- Current practical application areas

Digital Communication Technology

Digital communication systems have seen tremendous developments throughout the past decade. Particularly improvements in signal processing, source and channel coding have led to high data rates via cable and wireless.

In this course the basics of modern communication systems are highlighted, especially source coding, channel coding, cryptography and adaptive filters.

Source coding is the optimal representation of information. Channel coding means the generation of signals which are robust against channel distortions.

Cryptography is the theory of hiding information. This course presents modern principles as symmetric and asymmetric methods.

Adaptive filters are widely used in digital communication and control systems. Within the course the basics of analysis and synthesis of adaptive systems as transversal filters or lattice structures are developed. The students get information about the mathematical description of least mean squares and recursive least squares algorithms. Moreover, the course shows the convergence and stability analysis of design rules.

Digital Signal Processing II

In this course, the basics of digital signal processing are developed.

These are time-based signals and systems, a mathematical description of signals and systems in the time, frequency and screen domain, including totals and integral transformations. The main emphasis here is the discrete and fast Fourier transform for signal and system analysis. Another subject of education is the design of recursive and non-recursive digital filters and also wave digital filters. For this purpose, the impulse-invariance and bilinear method, the Fourier approximation and the wave description for digital filter design is being conveyed.

Wind and Water Power

The aim of the course is to provide knowledge of wind and water power utilization. The module contains the following parts:

- Wind energy and conversion, system components of wind energy converters, power control of wind energy converters
- Economic and environmental aspects of wind energy utilization
- Principles of water turbines and their properties, system components of water power stations, electricity generation and grid linkage for water power stations
- Economic and environmental aspects of water power

2.3.3. Abstracts from the “Master Mechatronics” examination regulations

§ 7 Passing or failing

- (4) A module examination is considered as finally failed, if the second re-examination has not been graded as at least “sufficient” (grade 4).

§ 16 Repetition of module examinations

- (1) A failed module examination can be repeated once within the period of one year after the first examination attempt. Upon expiry of this period, it is considered as failed. If a module examination consists of several examination performances, examination achievements graded as at least “sufficient” (grade 4) are not repeated but accepted for the repetition of a module examination as failed.
- (2) With the notification of failure to pass the module examination the candidate is automatically registered for re-examination.
- (3) A second repetition of a modular examination or of an individual examination performance part of a modular examination is admissible upon application. The participation in a second repetition of the examination has to be requested at the examination office in writing within the period of one month after notification of the result of the first repetition examination to the candidate.

2.4 Fourth Semester

2.4.1 Summer semester, Study load, Credits

The students will do their Master’s Thesis work at their chosen higher education institution, which is either TU Liberec or HS Zittau/Görlitz [Details see 3.3.2].

Students registered at HS Zittau/Görlitz do their Master’s Thesis work valued at 30 ECTS during the fourth semester. They are working on their Master’s Thesis in the Industry without any subjects (see Table 4.) [Details see 3.3.2] According to §21 (9) ... the Master’s Thesis can be repeated only once.

Students registered in the fourth semester at TU Liberec write their Diploma Thesis valued at 12 ECTS and Diploma Colloquium at 3 ECTS. Further they have to take 3 compulsory elective subjects valued altogether at 15 ECTS that are shown in the Table 4.

During the fourth semester they will have 30 ECTS [Details see 3.3.2 (2.)].

Table 4 Semester: 4. (summer) 30 ECTS credits					
TU Liberec				HS Zittau/Görlitz	
Nr.	subject names	Study load / ECTS	Examination	subject names	Study load / ECTS
compulsory subjects				compulsory Subjects	
1	Diploma Seminar Richter A. ales.richter@tul.cz	0+ 3/3	CC	Master Thesis	0+15/30
2	Diploma Thesis Supervisor	0+12/12	C		
compulsory elective subjects				compulsory elective subjects	
1	Robust and Fuzzy Control Modrlák O. osvald.modrlak@tul.cz	2+2/ 5	WO		
2	Intelligent Robotics Záda V. vaclav.zada@tul.cz	2+2/ 5	WO		
3	Applications of Automatics Control Methods Hlava J. jaroslav.hlava@tul.cz	2+2/ 5	WO		
4	Technical Diagnostics Jaksch I. ivan.jaksch@tul.cz	2+2/ 5	WO		
5	Control systems of Vehicles Malý M. miroslav.maly@tul.cz	2+2/ 5	WO		
6	Human-computer Interaction Jeníček J. jjiri.jenicek@tul.cz	2+2/ 5	WO		

Type of Examination: W – written, O – oral, WO – written and oral, CC – Classified credit, C – Credit,

2.4.2 Module Explanations (TU Liberec)

Diploma Thesis

1. Writing the diploma Thesis
2. Consulting with supervisor and experts from industry and research institution

Diploma Colloquium

- Communication skills for diploma Thesis work
- Preparation: six key points: objectives, audience, content, organization, visual information, practice
- Giving talks and presentations
- Presentation, signposting language, submission

Robust and Fuzzy Control

This subject offers basic ideas and principles of robust and fuzzy control.

- Introduction. Uncertainty of controlled system, sources of discrepancy. Unstructured uncertainties, types of uncertainties, uncertainty models, multiplicative
- certainty, uncertainty tolerance zone
- Robust stability for complex unstructured uncertainty
- Generalized feedback control loop, control loop with weighting function (penalty function)
- H₂ optimal control, H_∞ optimal and suboptimal control
- Robust control for unstructured uncertainty, robust performance. Mix-sensitivity H_∞ control.
- Fuzzy sets and linguistic variables, operation with fuzzy sets, inference rules
- Fuzzy PID controllers, implementation of the fuzzy PI controller in Simulink

Intelligent Robots

The subject *Intelligent Robots* is focused to the use of some methods of artificial intelligence in the area of robotics, firstly in the trajectory planning and task planning.

- Task-level programming
- Gross-motion and Fine motion planning
- Predicate logic
- Task solving in robotics and heuristics
- Task-planning, source and global scene, scene analysis, task planner simulation.

Applications of Automatic Control Methods

This course is focused on practical applications of automatic control methods. Particular emphasis is put on those features present in controlled plants and systems that complicate or even exclude the application of classical linear finite dimensional control theory. Such features include

- time delay systems including systems with internal delays
- non-linear behavior and interaction of continuous and logical controls
- hybrid control

Technical Diagnostics

The subject deals with industrial technical diagnostics methods including advanced method of signal processing

- Diagnostics models, system reliability, statistics methods, expert systems
- Analysis of diagnostic signals in time and frequency domain
- Cyclical machine and sound diagnostics
- Hilbert transform and its use in diagnostics, modulation and demodulation
- Vibro-diagnostics systems, accelerometers, spectral analysis.

Control Systems of Vehicles

The subject is focused to fundamental properties of driving system elements and their parts. The module contains the following parts:

- Drive train, function, design, diverting elements, transmissions
- Hydrostatic transmission of mobile machines
- Vehicle systems: Steering, Braking, Stabilization, Antilock and Control systems
- Safety systems, information and communication

Human-computer Interaction

The subject Human-Computer Interaction offers an overview of design of virtual environments

(3-D-objects) with interactive components

- Introduction of VRML, navigation, shapes, appearance
- Special nodes, variable types, prototypes
- Sensors
- Animations
- Scripts

3 Policy and Legal Procedures

3.1 Common boards

1. The Faculty of Mechatronics, Informatics and Interdisciplinary Studies of TU Liberec and the Faculty Electrical Engineering and Computer Science of HS Zittau/Görlitz created a common **“Board Master of Mechatronics”** in Liberec, **January 28, 2008**. This board authorizes organization structure and administration rules of the study program “Master in Mechatronics” at both faculties.
2. “Board Master in Mechatronics” is governed by the deans of both faculties: Faculty of Mechatronics, Informatics and Interdisciplinary Studies and the Faculty of Electrical Engineering and Computer Science and includes two members of each faculty that are appointed by the Vice-Rector for Academic Affairs and International RelationsHS at Zittau/Görlitz and at TU Liberec by the dean of Faculty of Mechatronics, Informatics and Interdisciplinary Studies.
3. Both deans of the Home Universities will create the **“State Final Examination Boards of Mechatronics”** and **“Admission Board of Mechatronics”** and they have the right to appoint the members of both boards from both faculties.

3.2 Students

1. The study program of master in “Mechatronics” is determined for students of TU Liberec and HS Zittau/Görlitz, European and third-country students.
2. The number of students is supposed to be about 25 Master’s students (10 TU Liberec, 10 HS Zittau/Görlitz and 5 European).
3. There will possibly be an increase in the amount of European and third-country students.

3.3 Study Structure

3.3.1 Place of Hosting University

1. In each semester all students of the study program master in “Mechatronics” have jointly defined the **Hosting University** by the pattern of the semester (see **Fig.1**). An exception is made by the first and fourth semester.

- The TU Liberec and HS Zittau/Görlitz students will pass the first semester at this university, where they got their Bachelor's degree.
- European and third-country students with less than 210 CP will pass the first semester at the TU Liberec.
- European and third-country students with 210 CP can start at the second semester. They can choose either TU Liberec or HS Zittau/Görlitz for Home University, but for HS Zittau/Görlitz it is urgently necessary to be skilled in German language at least at level B2.
- At the beginning of the third semester (end of October) students have to choose one of the Home Universities, where they will do their **Diploma Thesis / Master's Thesis**. Start of working on the Diploma Thesis at TU Liberec begins within the third semester (see 3.3.3) and the Master's Thesis at HS Zittau/Görlitz in the fourth semester (see 3.3.2).

2. Thesis Work can be assigned and worked out at HS Zittau/Görlitz or at TU Liberec.

3.3.2 Master's Thesis at HS Zittau/Görlitz – Procedure

For consideration: Students who write their Master's Thesis at HS Zittau/Görlitz must registrate for the next term in time. The information about registration for the coming term is to find here:

<http://www.hszg.de/studium/studienorganisation/rueckmeldung.html>

§ 24 Special prerequisite for admission, subject, type and scope of the finale module

- (1) The candidate is to be granted admission to the final module after he/she completed all course-related modules as per §§13 ff.; 23. In case of compliance with the prerequisite mentioned, the examination office issues a notice of admission to the candidate.
- (2) The subjects of the final module examination are the following two examination performances:
 1. Master's Thesis (Examination regulations) (§21) and
 2. Defense of the Master's Thesis (Examination regulations)
- (3) The defense of the Master's Thesis takes place as an oral examination performance according to §§17 (1) p. 1Nos. 1, 18, within the context of an oral examination interview. As a rule, the oral examination in the form of the defense of the Master's Thesis takes place in the language of the Master's Thesis.

§ 21 Master's Thesis

- (2) The preparation of a Master's Thesis is to be supervised by an examining person as per § 11 (1) and (2). As a rule, the supervising person is a member of the HS Zittau/Görlitz. Should the supervising person not be a member of HS Zittau/Görlitz, the second opinion at least is to be provided by a member of HS Zittau/Görlitz. The candidate's interests will be considered in the selection of a topic for his/her Master's Thesis. This, however, does not substantiate a claim for a particular subject. If the candidate failed to express his/her wishes within a period of three months following his/her admission

- to the final module, he/she will be given a topic ex officio.
- (3) The Master's Thesis can be prepared in cooperation with an enterprise, a professional association or a scientific institution.
 - (4) The topic to be dealt with the Master's Thesis will be issued by the Dean of the Faculty of Electrical Engineering and Computer Science, provided that the following conditions are fulfilled:
 1. Application to be given a topic for the Master's Thesis was filed and
 2. The notice of admission to the final module as per § 24 (1) is submitted.
The topic, issuing date, submission date and examiners have to be recorded on the admission notice when the topic is issued. The topic can be returned only once within a period of two months after it was issued.
 - (5) The period for preparing the Master's Thesis is four months. For experimental and empirical subjects, it may be fixed from four to six months at the time the topic is issued. The period begins with the day of issue of the topic. The Master's Thesis then is to be submitted within the period required at the place of submission mentioned in the document stating the topic, in the form of two bound copies and one recorded on an electronic data storage medium. In the event of sending the paper by mail, the relevant date is the date of dispatch evidenced by the postmark. If the deadline cannot be kept for reasons not attributable to the candidate, the period can be extended by up to two months if applied for in writing in due time. With the submission of the Master's Thesis the candidate must confirm in writing that he prepared the Thesis on his/her own, using no others than the sources and auxiliary means he has stated. When the Master's Thesis is submitted, the date of submission is to be filed on record. In case that the candidate does not comply with the deadline as per sentences 1, 2 or 6, respectively, the Master's Thesis will be graded "insufficient" (grade 5).
 - (6) Generally, the Master's Thesis is to be prepared in German language. In the "Mechatronics" Master Study Program according to the cooperation agreement between TU Liberec and HS Zittau/Görlitz the Diploma Thesis and Master's Thesis have to be written in English.

3.3.3 Diploma Thesis at TU Liberec – Procedure

Principles for assignment and management of Master's Thesis/Diploma Thesis

- 1) Assignment by: HS Zittau/Görlitz (Master's Thesis), or TU Liberec (Diploma Thesis), deadline:
 - HS Zittau/Görlitz - February 15 (in the last year of study),
 - TU Liberec - October 30, (if the student wants to make The State Final Examination in June of that academic year at TU Liberec).
- 2) Supervisor: Professor at HS Zittau/Görlitz, Professor at TU Liberec
place of work in Germany or EU selected by student himself/herself. Working out Diploma Thesis in Czech Republic will not be supported by Erasmus program.
- 3) Submission of the Master's Thesis to the HS Zittau/Görlitz: August
Defense 1 in Zittau: Autumn next academic year
Transcript of records (of 3rd and 4th semester) prepared by HS Zittau/Görlitz and sent to the TU Liberec (to the dean of the Faculty of Mechatronics): December 15, next ac. year; recognition of learning outcomes by TU Liberec: January 5, next academic year
State Final Examination (including Defense 2) at TU Liberec: February next academic year

- 4) If a student chooses and writes his/her Diploma Thesis at TU Liberec he/she will enter the summer semester of the academic year at TU Liberec and do the "Mechatronics" study program (see table 4). The defense of his/her Diploma Thesis takes place in June in Liberec.

Student's obligations:

- a. Student must report the results after the 3rd semester by "Transcript of records" at Erasmus Office of TU Liberec! (Minimum 30 ECTS)
 - b. Student has to issue his/her Diploma Thesis in electronic form by given deadline in the information system STAG.
 - c. Students must register for the State Examination. The deadline is determined by the dean of the Faculty of Mechatronics
 - d. After the defense at HS Zittau/Görlitz and obtaining 120 ECTS the Department of Academic Administration of HS Zittau/Görlitz issues a document Transcript of Academic Record about achieving 60 ECTS in winter and 60 ECTS in the summer semester. This is the basis for recognition of results achieved at the HS Zittau/Görlitz. The process will be closed by inserting the Transcript of Academic Record into the Information System STAG at TU Liberec, Faculty Mechatronics This document must be submitted to the Study Department of the Faculty of Mechatronics at TU Liberec (Vice dean of study).
 - e. After completion of b, c and d the State Final Examination may start, according to 3.3.4.
 - f. After e), students may submit the study book of the TU Liberec Faculty of Mechatronics and quit studying formally. A Czech student remains a student of the Faculty Mechatronics of TU Liberec until he passes the State Final Examination.
- 5) Subsequently, all documents (Diploma and Diploma-Supplement) are forwarded in copy to the HS Zittau/Görlitz. The recognition of results at HS Zittau/Görlitz is the base for awarding the degree "Master in Engineering".
- 6) In accordance with Law No. 111/1998 Coll., and with the "Study and examination rules and regulations at TU Liberec", students who complete this programme successfully will receive the final Diploma issued by the Technical University of Liberec (degree "Inženýr"- abbreviated "Ing.", including the "Diploma supplement") in the accredited study programme "Electrical Engineering and Informatics", study field of "Mechatronics".
- 7) Students who successfully complete this programme will receive the final diploma issued by the Zittau/Görlitz University of Applied Sciences (degree "Master in Engineering" - abbreviated "MEng"), in the accredited study field of "Mechatronics".
Find sample diplomas in the attachment.

3.3.4 State Final Examination in the Field of Mechatronics at TU Liberec

1. The "State Final Examination of Mechatronics" is led by a chairman. The chairman is appointed by the dean of the Faculty of Mechatronics, Informatics and Interdisciplinary studies at TU Liberec.
2. The State Examination Committee consists of 5-7 members that are appointed by the dean of the Faculty of Mechatronics. Usually, one or two professors from HS Zittau/Görlitz may be appointed as committee members. The State Final Examination of mechatronics consists of the
 - a) "Defense of a Thesis"
 - b) "State Rigorous Examination"

3. The “State Final Examination of Mechatronics” always starts with the defense of the master Thesis. The examination will be credited by “European Credit Transfer System: ECTS”. The letter grades and grade points are used for grading as shown in table 1. Students who defended their Master’s Thesis at HS Zittau/Görlitz will be given only brief information about his/her Master’s Thesis and that the Master’s Thesis was recognized.

Tab. 1 Grading Table

A	B	C	D	E	F
1	1-	2	2-	3	failed

4. The supervisor and the chosen reviewer prepare a written evaluation and a review of the Master’s Thesis. Both, the review and the evaluation include a grade. The student, who will defend his/her Master’s Thesis by the State Final Examination of Mechatronics, must get both – a written evaluation and a review three days before the defense.
5. The chairman can put the grade of the defense to the vote, if the committee members have very different views on the classification or on the evaluation “succeeded/failed”. The defense of the Thesis is concluded with one resulting grade as shown in table 1.
6. The State Rigorous Examination continues after passed defense of the Thesis. Students are examined on four thematic domains:
- General electrical engineering, electric drives, servomechanism
 - Measurement, electronic and PLC-systems
 - Control systems in mechatronics
 - Applied computer sciences, Image processing and computer vision
- Students can find details about the thematic domain in “**Topics for Master degree state examination Mechatronics**” on Internet.*
7. The chairman of the committee shall determine which individual member of the commission will examine the student on a particular thematic domain.
8. Each examiner will evaluate the student’s knowledge with a grade from the scale given in table 1. The committee awards the resulting grade of the State Rigorous Examination on the basis of the examination results of the thematic domain.

3.4 Study and Examination Guidelines

3.4.1 Study Guidelines

1. The study and examination guidelines satisfy the local law, standards and rules of the Hosting University.
For HS Zittau/Görlitz:
<https://web.hszg.de/Modulkatalog/index.php?activTopic=3&activNav=2&stid=182&frei=1&kennz=suche&activCont=1>
2. Courses, including course material, instruction, examination, and study counseling are English at both universities.
3. Lecturers and educational staff, time table, the form of examination in the given semester will be determined by the Hosting University. Time table for HS Zittau/Görlitz:
<https://service.hszg.de//stundenplan/index.php?sel=Stundenplan>
Please search under your shorthand logogram of semester grade (f.e: EMm13)

4. Thesis Work will be made up in accordance with the local rules and laws at the university selected. Please consider the according abstracts of examination regulations included in this guide. It is the student's responsibility to get familiar with these rules.
5. The Diploma Thesis is written and defended in English. In a special case it can be defended in German, the State Rigorous Examination must be in English [Details see 3.3.2 and 3.3.3].

3.4.2 ECTS- Guidelines

1. Modules and examination will be credited by "**European Credit Transfer System ECTS**". Semester project, Semester work, Lab protocol and papers have to be determined in examination and study rules.
2. The master study program of "Mechatronics" is valued within two years at a minimum of **120 ECTS**. The total has to consist of the following parts:
 - minimum of 30ECTS at the TU Liberec FM in the first preparatory semester
 - minimum of 30ECTS at the TU Liberec FM in the second semester
 - minimum of 30ECTS at the HS Zittau/Görlitz F-EI in the third semester
 - 30 ECTS by writing their Thesis Work either at TU Liberec or HS Zittau/Görlitz.
 - Students registered in the fourth semester at HS Zittau/Görlitz have their Master's Thesis work valued at 30 ECTS. They are working on their Master's Thesis only in the industry (see Table 4).
 - Students registered in the fourth semester at TU Liberec have their Diploma Thesis valued at 12 ECTS and Diploma Colloquium at 3 ECTS. Further they have to take 3 obligatory elective subjects valued altogether at 15 ECTS. They are shown in the Table 4. So during the fourth semester they will have 30 ECTS, too.
3. This program has to be completed by the "State Final Examination of Mechatronics" involving the "**Defense of a Thesis**" and "**State Rigorous Examination**" of four thematic domains appointed by the "State Final Examination Board of Mechatronics" as the "Topic of Master degree state examination Mechatronics".
4. Students, who successfully complete the Master in the Mechatronics program, will receive a **Double Master's Degree**.

3.5 Admission and Application Procedure

3.5.1 Admission Requirements

1. The selection process will be carried out by the **Admission Board of Mechatronics and the Admission office of the appropriate University**.
Admission requires:
 - An appropriate Bachelor's degree at HS Zittau/Görlitz, at TU Liberec (home universities) or a Diploma (D), Diploma (F), First Degree (E) valued in 180 ECTS (min. 6 Semesters) with a certificate of successful completion.
 - Passing the entrance requirements of
 - Consecutive two-level study master program mechatronics at HS Zittau/Görlitz
 - Consecutive two-level study program *Electrical Engineering and Informatics* in the academic discipline "Mechatronics" at the TU Liberec.

- Passing the entrance exam by the examining board of the **Master in Mechatronics** at TU Liberec.
2. Students enrolled by their home university have to register at the host university according the pattern of semesters.
 3. The bachelor's degree at HS Zittau/Görlitz valued with 210 ECTS is recognized as the preparatory first semester. It enables students to directly enter the second semester of Master in Mechatronics.

3.5.2 Application Procedure

1. The home and European students follow the local routines for enrolment at TU Liberec and HS Zittau/Görlitz. For information on application at HS Zittau/Görlitz see: www.hszg.de/international/incomings/auslaendische-studierende.html
2. **At TU Liberec** the deadline for third-land students is **on April 28th**.
Deadline for Czech and third-land students: **at HS Zittau/Görlitz on June 15th**!

3.5.3 Required Documents for Application at TU Liberec

The following documents requested must be submitted in English.

1. Application form to find here (please select English):
http://www.tul.cz/uchazeci/prijimaci-rizeni/elektronicka-prihlaska-ke-studiu_89
2. Official transcript of the university records and the official Bachelor's degree certificate. All documents must be copies that are officially certificated true. All translations must be officially certified and accompanied by the copy of the original.
3. Letter of motivation
4. Language test report
5. Curriculum Vitae in English.
6. Copy of the passport
7. Name, address and kind of relation to nearest relative.

3.5.4 Required Documents for Application at HS Zittau/Görlitz

The following documents requested must be submitted in English (or German).

1. Application form to find here:
www.hszg.de/international/incomings/auslaendische-studierende.html
2. Copy of Bachelor's Degree (Mechatronics)
3. Copy of Major course assessment – first term Master mechatronics at TU Liberec
4. One current photo

European students and third-country students send their Application to:

Technical University of Liberec
Faculty of Mechatronics, Informatics and Interdisciplinary Studies
Studentská 2
CZ – 461 17 Liberec 1
Czech Republic

Deadline: April 30 for the next academic year

e-mail: dagmar.militka@tul.cz
(Secretary of the Faculty of Mechatronics, Informatics and Interdisciplinary Studies)

or

Hochschule Zittau/Görlitz (FH)
Akademische Verwaltung
Theodor-Körner-Allee 16
02763 Zittau
Germany

Deadline: June 15th for winter term

e-mail: s.kuehne@hs-zigr.de
(Head of Academic Administration)

Please consider: For concurrent application Dual-Degree and Erasmus-Participation it is necessary to apply for ERASMUS-Program separately!

Please find information and application here:

<http://www.hszg.de/international/incomings/erasmus-gaststudierende.html>

3.6 Administration, Examination Results, Diploma

3.6.1 Student Administration by Home University

1. The administration of information about student's semester thesis and examination results at both universities and also the study and student documentation will be run at the home university using ECTS.
2. The home university also runs the documentation of registered students of the Hosting University.

3.6.2 Student Administration by the Hosting University

1. The Hosting University is the primary contact point for all student affairs.
2. The Hosting University runs the documentation of registered students of the Home University.
3. Regulations for the exchange of information about the students especially their examination results have been established within the applicable local law.
4. The Hosting University is responsible for delivering examination results and other information to the Home University.

3.6.3 Diploma

1. Students who successfully complete this program will receive a **Certificate of successful completion** from their Home University
 - TU Liberec see attachment 1
 - University Zittau/Görlitz see attachment 2
2. The Home University awards the Double Degrees with Diploma Supplements.
 - Diploma degree "**Master of Engineering**" from the consecutive two-level study program "**Master in Mechatronics**" at the HS Zittau/Görlitz see attachment 3 and
 - Diploma degree "**Inženýr**", (Master of Engineering) briefly "**Ing.**" from the consecutive master study program **Electrical Engineering and Informatics** in the academic discipline/field "**Mechatronics**" at the TU Liberec attachment
3. The universities TU Liberec and HS Zittau/Görlitz make out the Diploma-Supplement attachment.

3.7 Fees

1. The universities TU Liberec and HS Zittau/Görlitz will charge tuition fees according to their national legislation. The student has to inform herself/himself about possibly arising fees.
2. The third-country-students (students with a visa requirement) are asked to consult the tuition fee with TU Liberec.)
3. A student has to pay the administrative fees as required by local law at the Hosting University (75,30 €/semester at HS Zittau/Görlitz, for the first semester at HS Zittau/Görlitz and additionally 10,00 € for student-ID, which is a total of 85,30 €).

4. All fees will be collected and owned by the Hosting University and managed according to the local rules and regulations. It is the student's responsibility to inform himself/herself about these rules.

3.8 Funding

1. The EU-students will be supported by Erasmus+- Program according to its structure and rules. Support is always provided from Home University.
2. The both Partner University will endeavor to find possible financial fundings.

3.9 Finding Accommodation

1. Both partner universities operate their own halls of residence.
2. The cost of such accommodation varies depending on its quality from 90 €–105 € in the Czech Republic and around 200 € in Germany. Application to Studentenwerk Dresden/Außenstelle Zittau/Görlitz is obliged. Please additionally consider the deposit of 300 €. You'll get this amount back by leaving the room completely and clean at the end of your stay (both at HS Zittau/Görlitz and TU Liberec). Please find information here:
<http://www.studentenwerk-dresden.de/goerzitt/wohnen/>
3. Admitted students ask for the accommodation in the Harcov dormitory in Liberec at the study department at Faculty of Mechatronics, Informatics and Interdisciplinary Studies.
4. There is also the possibility to find accommodation within the private sector.

3.10 Execution of the Study Programs

1. The students registered in this study program at the Hosting University, have the same rights and duties as other enrolled university students in other programs.
2. All students of the Partner University have to inform themselves about the regulations and obey the rules and regulations of the Hosting University.
3. The State Final Examination Board of Master in Mechatronics, matriculation department and other institutions of the Hosting University are responsible for the execution of the jointly developed regulations for this study program.
4. It is the responsibility of the Hosting University to equip the modules with sufficiently qualified persons in accordance with the local laws and regulations.
5. The Hosting University is responsible to observe local laws about safety rooms, laboratory equipment etc.

3.11 Administrative Formalities

3.11.1 Czech Administrative Formalities

In general:

1. Before departure, citizens from non-EU countries coming to the Czech Republic for study purposes need to contact the Czech embassy or consulate in their home country for information about the health insurance and for visa conditions. They have to enter the Czech Republic with a visa for study purposes (long term permission for Czech Republic)!
2. All students have to provide a statutory health insurance of an EU-country or have to apply for one in Czech Republic!
3. All students are required to register at the Liberec foreign police office –within the first two weeks after arrival!

3.11.2 German Administrative Formalities

In general:

1. Citizens from non-EU countries need a visa for study purposes or the long term permission for the Czech Republic to enter Germany. The Zittau Foreigners Authority will then grant them an extension of visa or expansion of their permission for Czech Republic to Germany (within the European Union).
2. All students have to possess a statutory health insurance of an EU-country or have to apply for one in Germany!
3. All students are required to register at the registration office in Zittau – within the first two weeks after arrival!