

Annex 1: Module Descriptions

Master's Program Organic & Molecular Electronics

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1. Compulsory Modules

Module Number	Module Name	Lecturer in Charge
OME-1.1	Concepts of Molecular Modelling	Prof. Cuniberti
Contents and Objectives	The students know the basics of the molecular dynamics simulation for theoretical description of nanophysical elements. They are familiar with the classical mechanics on the basis of numerical methods as well as with the modelling of interatomic forces (classical and quantum mechanical). They are acquainted with the description of potential energy areas, stable and meta-stable points, as well as with the discussion of various observables. The students know the mathematical approaches and the numerical methods for the characterization of molecules and can model them in computer programs.	
Teaching and Learning Methods	The module comprises lectures (2 semester hours per week), Exercises (2 semester hours per week), practical courses (2 semester hours per week) and self-study.	
Prerequisites	Knowledge of the fundamentals of mathematics (analysis and linear algebra) and physics (classical mechanics) on Bachelor-Level.	
Usability	The module is a compulsory module in the Master's programs "Nano-Biophysics" and "Organic and Molecular Electronics".	
Requirements for Acquiring Credit Points	The credit points are awarded when the module assessment is passed. The module assessment consists of a written exam in length of 90 minutes, if the number of participants exceeds 10 (1. assessment) and a project work (2. assessment). With up to 10 participants, the written exam (1. assessment) is replaced by an oral exam as individual exam in length of 20 minutes. The nature of the specific exam is announced to the students at the end of the registration period in written form. Passing the module requires passing the 1. Assessment with the grade at least "sufficient" (4,0).	
Credit Points and Grades	9 credit points can be awarded in this module. The module grade is the arithmetic average of the assessment grades. (passing the module requires passing the 1. Assessment with the grade at least "sufficient" (4,0).	
Frequency	The module is offered every winter semester.	
Work Load	The total effort amounts to 270 hours.	
Duration	The module comprises one semester.	

Module Number	Module Name	Lecturer in Charge
OME-1.2	Semiconductor Technology	Prof. Bartha
Contents and Objectives	<p>The module comprises the technological basics for the fabrication of micro- and nano-device components, as well as the concepts for manufacturing integrated circuits.</p> <p>Objectives: The students are able to</p> <ul style="list-style-type: none"> - describe the principles of operation of individual technologies for manufacturing micro- and nano-components - work with the fundamental principles for the fabrication and miniaturization of devices and integrated circuits - connect the individual technologies with complex processes and explain correlations between them. 	
Teaching and Learning Methods	The module comprises lectures (6 semester hours per week), practical course (1 semester hour per week), and self- study.	
Prerequisites		
Usability	The module is a compulsory module in the Master's programs "Nanoelectronic Systems" and "Organic and Molecular Electronics".	
Requirements for Acquiring Credit Points	The credit points are awarded when the module assessment is passed. The module assessment consists of a written exam in the scope of 120 minutes. With up to 50 participants, the written exam is replaced by an individual oral examination of 20 minutes duration. The nature of the specific exam is announced to the students in written form at the end of the registration period.	
Credit Points and Grades	10 credit points can be obtained in this module. The module grade corresponds with the grade of the examination.	
Frequency	The module is offered every academic year, starting in the winter semester.	
Work Load	The total effort amounts to 300 hours.	
Duration	The module comprises two semesters.	

Module Number	Module Name	Lecturer in Charge
OME-1.3	Organic Semiconductors	Dean of Studies
Contents and Objectives	<p>Contents:</p> <ul style="list-style-type: none"> - fundamental properties: chemical bonds, hybridization - optical properties - electronical properties - doping - comparison to classical semiconductors - concepts for device components <p>Objectives:</p> <p>The students have basic and specialized knowledge about organic semiconductors and can apply it. Furthermore, the students are familiar with the current research in this and related fields.</p>	
Teaching and Learning Methods	The module comprises a seminar (2 semester hours per week), a lecture (2 semester hours per week), and self-study.	
Prerequisites		
Usability	The module is a compulsory module of the Master's program „Organic and Molecular Electronics“.	
Requirements for Acquiring Credit Points	The credit points are awarded when the module assessment is passed. The module assessment comprises a written exam (duration of 90 minutes) and a non-graded presentation.	
Credit Points and Grades	5 credit points can be obtained in this module. The module grade is the grade of the written exam. §11 section 1, clause 5 of the examination regulations remains unaffected.	
Frequency	The module is offered every academic year, starting in the winter semester.	
Work Load	The total effort amounts to 150 hours.	
Duration	The module comprises two semesters.	

Module Number	Module Name	Lecturer in Charge
OME-1.4	Basics Module	Dean of Studies
Contents and Objectives	<p>The module comprises courses selected by the student from the following subjects:</p> <ul style="list-style-type: none"> - solid state- and semiconductor physics, - general and organic chemistry - basics of circuit technology. <p>The students acquire basic knowledge required for specialized courses of the OME Master's program that has not been taught in their respective Bachelor programs.</p>	
Teaching and Learning Methods	<p>Students choose courses in scope of at least: 6 semester hours per week of lectures, 2 semester hours per week of exercises, 2 semester hours per week of practical courses from the "Basics" catalogue. The catalogue will be announced at the faculty in the usual way.</p>	
Prerequisites		
Usability	<p>The module is a compulsory module of the Master's program „Organic and Molecular Electronics“. The knowledge of its contents is the prerequisite to participation in the modules OME-M1 and OME-M2.</p>	
Requirements for Acquiring Credit Points	<p>The credit points are awarded when the module assessment is passed. The assessment consists of an individual oral examination in the scope of 45 minutes. A confirmation of completing the assignments according to the Basics catalogue is the prerequisite for participation in the exam.</p>	
Credit Points and Grades	<p>14 credit points can be obtained in this module. The module grade corresponds to the oral examination grade.</p>	
Frequency	<p>The module is offered every winter semester.</p>	
Work Load	<p>The total effort amounts to 420 hours.</p>	
Duration	<p>The module comprises one semester.</p>	

Module Number	Module Name	Lecturer in Charge
OME-2.2	Optoelectronics	Prof. Leo
Contents and Objectives	<p>The students have a command of the basic concepts of optoelectronics and can apply them to the development of devices, i.e.:</p> <ul style="list-style-type: none"> - interaction of electromagnetic waves with condensed matter structures - propagation of EM-waves in layer structures - optical properties of condensed matter - generation of charge carriers <p>Furthermore, the students are able to apply this knowledge to solar energy conversion with the particular focus on the photovoltaic effect and its realization in solar cells.</p>	
Teaching and Learning Methods	The module comprises lectures (4 semester hours per week) and self-study.	
Prerequisites		
Usability	The module is a compulsory module of the Master's program „Organic and Molecular Electronics“.	
Requirements for Acquiring Credit Points	The credit points are awarded if the module assessment is passed. The module assessment consists of a written exam of 90 minutes duration.	
Credit Points and Grades	6 credit points can be obtained in this module. The module grade is the grade of the examination.	
Frequency	The module is offered every summer semester.	
Work Load	The total effort amounts to 180 hours.	
Duration	The module comprises one semester.	

Module Number	Module Name	Lecturer in Charge
OME-3.1	Molecular Electronics	Prof. Cuniberti
Contents and Objectives	The students are familiar with the basics of molecular electronics with emphasis on: experimental methods, physical effects and theoretical tools, such as single molecule electronics, raster probe and break-junction techniques, transport mechanisms at the nanoscale, molecular components (diodes, transistors, sensors) and molecular architectures. The students know the most important experimental and theoretical methods of investigation of charge transport at the molecular scale.	
Teaching and Learning Methods	The module comprises lectures (2 semester hours per week), exercises (2 semester hours per week), and self-study.	
Prerequisites		
Usability	The module is a compulsory module of the Master's program "Organic and Molecular Electronics".	
Requirements for Acquiring Credit Points	The credit points are awarded when the module assessment is passed. If the number of participants exceeds 10, the module assessment will consist of a written exam of 90 minutes duration. With up to 10 participants the written exam will be replaced by an oral exam as individual exam of 20 minutes duration. The nature of the specific exam is announced to the students in written form at the end of the registration period.	
Credit Points and Grades	6 credit points can be obtained by the module. The module grade is the grade of the examination.	
Frequency	The module is offered every winter semester.	
Work Load	The total effort amounts to 180 hours.	
Duration	The module comprises one semester.	

Module Number	Module Name	Lecturer in Charge
OME-3.2	Materials for Nanoelectronics and Printing Technology	Prof. Richter
Contents and Objectives	<p>The module encompasses the basic knowledge of materials for nanoelectronics and the basics of printing technology</p> <p>The students possess the knowledge of the assembly, the properties, the fabrication methods and the structure formation of materials as well as of the effects and the basic types of nanoelectronic structures to conclude the possibilities and the challenges of nanoelectronic material systems.</p> <p>The students are qualified to derive printing technological complexities from the knowledge of different types of printing methods as well as indicate adequate printing methods for different tasks.</p>	
Teaching and Learning Methods	The module comprises lectures (4 semester hours per week), practical courses (2 semester hours per week), and self-study.	
Prerequisites		
Usability	The module is a compulsory module of the Master's program "Organic and Molecular Electronics"	
Requirements for Acquiring Credit Points	The credit points are awarded when the module assessment is passed. The module assessment consists of a written exam of 90 minutes duration, an oral examination of 30 minutes duration, and a collection of lab reports.	
Credit Points and Grades	7 credit points can be obtained by the module. The module grade results from the following assessments: the written exam, the oral examination (each weighting 40%), and the collection of lab reports (weighting 20%).	
Frequency	The module is offered every winter semester.	
Work Load	The total effort amounts to 210 hours.	
Duration	The module comprises one semester.	

Module Number	Module Name	Lecturer in Charge
OME-3.3	Physical Characterization of Organic and Organic-Inorganic Thin Films	Prof. Dr. Ehrenfried Zschech
Contents and Objectives	<p>The module deals with physical analysis methods that are and will be employed for the characterization in organic electronics, where semiconductors, metals, glasses and organic materials applied. Furthermore, it comprises the meaning of the characterization of materials and processes for the functionality, capability and reliability. Finally, it deals with the issue of integration of components design, technology, materials, and analytics.</p> <p>The students know various techniques for the characterization of thin organic and organic-inorganic films. They have a command of theoretical basics of physical analysis techniques and their applications in characterizing thin films, film systems and interfaces. The students are able to use selected methods in experiments.</p>	
Teaching and Learning Methods	The module comprises lectures (2 semester hours per week), practical courses (2 semester hours per week), offered as a block course in lecture-free periods, and self-study.	
Prerequisites	Command of physics on Bachelor level, in particular classical and solid state physics.	
Usability	The module is a compulsory module in the Master's program „Organic and Molecular Electronics“.	
Requirements for Acquiring Credit Points	The credit points are awarded when the module assessment is passed. The module assessment consists of a written exam of 90 minutes duration and the lab report.	
Credit Points and Grades	5 credit points can be obtained by the module. The module grade results from the following assessments: the written exam, (weighting 75%), and the lab report (weighting 25%).	
Frequency	The module is offered every winter semester.	
Work Load	The total effort amounts to 150 hours.	
Duration	The module comprises one semester.	

Module Number	Module Name	Lecturer in Charge
OME-E1	Project Work	Dean of Studies
Contents and Objectives	<p>Contents: Research, development, modeling, analysis, planning in organic electronics and related fields.</p> <p>Objectives: The students have expertise in processing complex issues in scientific professional practice and are able to document and present their results. They have social skills of professional communication, project and product management.</p>	
Teaching and Learning Methods	The module comprises a practical course in the scope of 200 hours (8 semester hours per week) and self-study.	
Prerequisites		
Usability	The module is a compulsory module of the Master's program "Organic and Molecular Electronics".	
Requirements for Acquiring Credit Points	The credit points are awarded when the module assessment is passed. The module assessment consists of the project work.	
Credit Points and Grades	8 credit points can be obtained by the module. The module grade is the assessment grade.	
Frequency	The module is offered every year, starting in the summer semester.	
Work Load	The total effort amounts to 240 hours.	
Duration	The module comprises two semesters.	

Module Number	Module Name	Lecturer in Charge
OME-M1	Major	Dean of Studies
Contents and Objectives	<p>The students possess advanced knowledge of current issues and most recent developments in the selected subject area of organic and molecular electronics.</p> <p>The students have the choice of one of the following specialization areas offered in this module:</p> <ul style="list-style-type: none"> - Physics - Electronics - Chemistry - Nanotechnology <p>The students possess comprehensive knowledge of the selected specialization area. Within the first module semester they are able to choose the topic for their project work. After completing the module, they are able to choose the topic of their Master's thesis.</p>	
Teaching and Learning Methods	<p>The module comprises lectures (4 semester hours per week), if applicable – exercises accompanying lectures (at least 2 semester hours per week), and a lab course (4 semester hours per week). The courses in this scope are to be selected from the respective specialization area from the catalogue "Major/Minor." It will be announced at the beginning of the semester in the usual way.</p>	
Prerequisites	<p>Knowledge in chemistry, physics, and circuit technology, as thought in the module „Basics“.</p>	
Usability	<p>The module is a compulsory module of the Master's program „Organic and Molecular Electronics“.</p>	
Requirements for Acquiring Credit Points	<p>The credit points are awarded when the module assessment is passed. The module assessment comprises two written examinations, each of 90 minutes duration, as well as a non-graded lab report. If there are less than 15 students registered for the written examination, it can be replaced by an individual oral examination of 20 minutes duration.</p>	
Credit Points and Grades	<p>10 credit points can be obtained in this module. The module grade is the examination grade.</p>	
Frequency	<p>The module is offered every academic year, starting in the summer semester.</p>	
Work Load	<p>The total effort amounts to 300 hours.</p>	
Duration	<p>The module comprises two semesters.</p>	

Module Number	Module Name	Lecturer in Charge
OME-M2	Minor	Dean of Studies
Contents and Objectives	<p>The students possess advanced knowledge of current issues and most recent developments in the further subject area of organic and molecular electronics.</p> <p>The students have the choice of one of the following specialization areas offered in this module:</p> <ul style="list-style-type: none"> - Physics - Electronics - Chemistry - Nanotechnology <p>The students possess comprehensive knowledge of the selected additional specialization area. The knowledge acquired in this module helps students to choose the topics of their project work and Master's thesis.</p>	
Teaching and Learning Methods	<p>The module comprises lectures (4 semester hours per week), if applicable – exercises accompanying lectures (at least 2 semester hours per week). The courses in this scope are to be selected from the respective specialization area from the catalogue "Major/Minor." It will be announced at the beginning of the semester in the usual way.</p>	
Prerequisites	<p>Knowledge in chemistry, physics, and circuit technology, as thought in the module „Basics“.</p>	
Usability	<p>The module is a compulsory module of the Master's program „Organic and Molecular Electronics“.</p>	
Requirements for Acquiring Credit Points	<p>The credit points are awarded when the module assessment is passed. The module assessment comprises two written examinations, each of 90 minutes duration, as well as a non-graded lab report. If there are less than 15 students registered for the written examination, it can be replaced by an individual oral examination of 20 minutes duration.</p>	
Credit Points and Grades	<p>6 credit points can be obtained in this module. The module grade is the examination grade</p>	
Frequency	<p>The module is offered every academic year, starting in the summer semester.</p>	
Work Load	<p>The total effort amounts to 180 hours.</p>	
Duration	<p>The module comprises two semesters.</p>	

2. Elective Modules

Module Number	Module Name	Lecturer in Charge
OME-E3	German Language	
Contents and Objectives	Students possess the knowledge of everyday German language at the A1 level according to CEFR.	
Teaching and Learning Methods	The module comprises language course (4 semester hours per week) and self-study.	
Prerequisites		
Usability	The module is one of elective modules of the Master's program „Organic and Molecular Electronics.“	
Requirements for Acquiring Credit Points	The credit points are awarded when the module assessment is passed. The module assessment consists of a written examination of 90 minutes duration.	
Credit Points and Grades	4 credit points can be awarded in this module. The module grade is the examination grade.	
Frequency	The module is offered every winter semester.	
Work Load	The total effort amounts to 120 hours.	
Duration	The module comprises one semester.	

Module Number	Module Name	Lecturer in Charge
OME-E4 (up to WiSe 15/16)	Investing in a Sustainable Future	Prof. E. Günther
Contents and Objectives	<p>This course concentrates upon the acquisition and development of critical business skills while maintaining a vision of sustainability at its forefront.</p> <p>Students possess the basics of innovation management and are able to independently include ecological and economical aspects in the decision making process in the professional praxis. Furthermore, they can work in interdisciplinary and intercultural teams and present their results accurately in the written and oral manner.</p>	
Teaching and Learning Methods	The module comprises lectures (1 semester hour per week), seminars (2 semester hours per week) and self-study.	
Prerequisites		
Usability	The module is one of the 4 elective module of the Master's program „Organic and Molecular Electronics“.	
Requirements for Acquiring Credit Points	The credit points are awarded when the module assessment is passed. The module assessment consists of a project work in the scope of 45 hours, a colloquium in the scope of 20 minutes and an oral exam of 20 minutes duration.	
Credit Points and Grades	4 credit point can be obtained in this module. The module grade is calculated from the grades of the project work, the colloquium, and the oral exam.	
Frequency	The module is offered every sommer semester.	
Work Load	The total effort amounts to 120 hours.	
Duration	The module comprises one semester.	

Module Number	Module Name	Lecturer in Charge
OME-E4 (from SuSe 2016)	Investing in a Sustainable Future	Prof. E. Günther
Contents and Objectives	<p>The students know the development of Corporate Social Responsibility as one of the scientific and social areas of research.</p> <p>The students are able to independently process and conduct research using relevant scientific literature. The students are able to use theoretical framework to put information about case studies in order and analyze them considering the following five aspects: strategic, financial, ecological, social and barriers analysis. They are familiar with use of scientific English.</p>	
Teaching and Learning Methods	The module comprises seminars (2 semester hours per week), lectures (1 semester hour per week) and self-study. The lectures and seminars are offered in English.	
Prerequisites		
Usability	The module is one of elective modules of the Master's program „Organic and Molecular Electronics“.	
Requirements for Acquiring Credit Points	The credit points are awarded when the module assessment is passed. The module assessment consists of a written examination in the scope of 90 minutes.	
Credit Points and Grades	4 credit points can be obtained in this module. The credit points are awarded when the module assessment is passed. The module grade results from the examination grade.	
Frequency	The module is offered every summer semester.	
Work Load	The total effort amounts to 120 hours.	
Duration	The module comprises one semester.	

Module Number	Module Name	Lecturer in Charge
OME-E5	Current Topics in Materials Science	Prof. G. Cuniberti
Contents and Objectives	The students are familiar with the various aspects of the current research in materials science. Moreover, they have relevant soft skills (e.g. presentation skills, patent law, technology transfer, leadership skills).	
Teaching and Learning Methods	The module comprises lecture (1 semester hour per week), exercise (1 semester hour per week), a seminar (1 semester hour per week) and self-study.	
Prerequisites		
Usability	The module is one of elective modules of the Master's program „Organic and Molecular Electronics“.	
Requirements for Acquiring Credit Points	The credit points are awarded when the module assessment is passed. The module assessment consists of a written assignment and a presentation.	
Credit Points and Grades	4 credit points can be obtained in this module. The module grade is calculated from the presentation and assignment grades.	
Frequency	The module is offered every winter semester.	
Work Load	The total effort amounts to 120 hours.	
Duration	The module comprises one semester.	

Module Number	Module Name	Lecturer in Charge
OME-E6	Academic and Scientific Work	Dean of Studies
Contents and Objectives	After completing the module, the students have the soft skills required in the academic and scientific work. This comprises academic writing and presentation, project management, and other topics relevant for scientific work. The students are able to critically analyze scientific texts, share their knowledge with others and accompany their learning process.	
Teaching and Learning Methods	The module comprises lectures, exercises, practical courses, seminars, and self-study in the scope of 2 semester hours per week. The courses of this scope are to be selected from the catalog „Academic and Scientific Work“. The catalog including the required assessments will be communicated at the beginning of the semester in the usual way.	
Prerequisites		
Usability	The module is one of elective modules of the Master's program „Organic and Molecular Electronics“.	
Requirements for Acquiring Credit Points	The credit points are awarded when the module assessment is passed. The module assessment consists of the assessments defined in the catalog "Academic and Scientific Work".	
Credit Points and Grades	4 credit points can be obtained in this module. The module grade is calculated from the grades of individual assessments.	
Frequency	The module is offered every academic year.	
Work Load	The total effort amounts to 120 hours.	
Duration	The module comprises two semesters.	

Module Number	Module Name	Lecturer in Charge
OME-E7	Semiconductor Industry Challenges: Market Dynamics - Technology Innovations - Yield and Reliability Engineering	Prof. Dr. Ehrenfried Zschech
Contents and Objectives	Students understand key aspects of the semiconductor industry, both in terms of the market under the changing conditions for development and production as well as the context of the technological development. The students understand the importance of business concepts in introducing of new products. They can show the relationships between components design, technology, materials and analysis for products and can assess the importance of the reliability of components for the quality management of products and line stability of micro- and nanoelectronics.	
Teaching and Learning Methods	The module consists of 3 hours per week lectures, one excursion within the scope of one week (blocked in the lecture-free period) and self-study. The language of instruction is English at least partially.	
Prerequisites	Knowledge in electrical engineering, materials science and physics for engineers and scientists at the bachelor level. The competences are assumed, which can be acquired in the module Semiconductor Technology.	
Usability	The module is one of the elective modules of the Master's program „Organic and Molecular Electronics“.	
Requirements for Acquiring Credit Points	Knowledge in electrical engineering, materials science and physics for engineers and scientists at the bachelor level. The competences are assumed, which can be acquired in the module Semiconductor Technology.	
Credit Points and Grades	The credit points are awarded when the module assessment is passed. The module assessment consists of two examinations. Examination 1 is an assigned paper. Examination 2 is by more than 20 registered students a written exam in the scope of 90 minutes. With up to 20 registered students the written exam is replaced by an oral exam as group exam of 45 minutes. The nature of the specific exams are announced at the end of the registration period as usually known from the faculty.	
Frequency	The module is offered every academic year beginning in the summer semester.	
Work Load	The total effort amounts to 120 hours.	
Duration	The module comprises two semesters.	