

EBERHARD KARLS  
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FACULTY OF MEDICINE  
Department of MOLECULAR MEDICINE  
Study Dean for Molecular Medicine: Prof. Dr. T. Iftner





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## **Welcome Message:**

*Welcome to Tübingen and in particular to the Faculty of Medicine. We aim to offer a range of educational opportunities and a structured and balanced program of study that enable students to acquire knowledge and skills.*

*We recognize that we have entered into a mutual contract with our students. You have the right to expect high standards from us, and we expect you to apply yourself with determination and enthusiasm to your studies. We are looking forward to your feedback on the quality of the degree program we deliver.*

*In recent years, higher education, in general, has become increasingly diverse. The variety of students and their needs have grown bigger over the past. We recognize that by treating all of our students as individuals with unique strengths, weaknesses, and needs rather than as generalized representatives of a particular racial, ethnic, or cultural group.*

*This handbook contains valuable information relating to our program of study, and you should retain it for reference throughout your time here in Tübingen. The handbook should be read in conjunction with the study regulations.*

*We trust that you will make the most of the opportunity you have been offered to study here with us at Tübingen University.*

*Prof. Dr. T. Iftner  
Study Dean of Molecular Medicine*

*Dr. Konstanze Muschko  
Program Coordinator*

## 1. Objectives of the Program

Our program aims to recruit high-quality students who are committed to a career in science. The innovative Master's program in Molecular Medicine is characterized by an interdisciplinary and a practical orientation and will allow students to acquire a higher level knowledge in selected disciplines aligned to the research strengths of the Faculty and to gain additional practical laboratory experience to prepare them for a research-based career. A particular strength of the Faculty of Medicine at the University of Tübingen is research in the focus areas of neurosciences, immunology, oncology, and infection biology.

The Master's program in Molecular Medicine is a consecutive, research-oriented program, which leads to a Master of Science (M. Sc.) degree. The program is offered by the Faculty of Medicine and the Graduate Training Centre of Neuroscience. Courses in academic, computational and soft skills are provided by the Competence Centre for University Teaching in Medicine, the Career Service and the "Zentrum für Datenverarbeitung."

The Master's program lasts one academic year and includes a total of 60 ECTS. It has been designed to provide a broad base of knowledge and the opportunity to specialize in the subjects that particularly interest you. The one-year curriculum is divided into two main parts, the first concentrating on deepening knowledge and advanced laboratory research training, the second on an individual research project (= Master's thesis).

In the first semester, students can choose from a catalog of modules in two selected areas of specialization allowing the student to tailor the program to their individual interests. A total of five modules (33 ECTS) must be taken. The Master's Thesis Research Project (27 ECTS) in the second semester forms a major component of the program and entails six months of full-time practical work in the laboratory on an autonomous research project. This module gives students experience in independently solving a scientific problem within the field of modern biomedical research and writing a scientific publication.

### Learning outcomes

The program provides opportunities for students to develop and demonstrate knowledge, qualities, skills, and other attributes in the following areas:

### Subject and Interdisciplinary skills

- Graduates have profound knowledge and understanding of the biomedical sciences in general and in-depth expertise in specialized fields, enabling them to participate in top class research.
- Graduates have professional skills and interdisciplinary competencies including organizational skills and the ability to communicate and work effectively in a team. As part of that, graduates also gain knowledge in computational skills and literature search.
- Graduates are capable of using critical and analytical skills to analyze problems, to propose solutions and to critically assess alternatives.

### **Practical skills in research**

- Graduates have well-developed practical skills and techniques in the biomedical sciences and have an awareness of good scientific practice in laboratory work.
- Graduates can design and conduct experiments independently to answer scientific questions in pursuit of their own research project. They possess the ability to assess the significance of outcomes of their experiments.
- Graduates can perform quantitative and qualitative analyses of obtained data and can present their work in written and oral form.

### **Personal development and future career**

- Graduates have an understanding of ethical reasoning and the ethical issues associated with current biomedical research.
- Graduates earn the practical and technical skills relevant to the commencement of a dissertation.
- Graduates have the qualities needed for employment requiring a sound judgment, personal responsibility and initiative in complex professional environments.
- Graduates are capable of working in a wide variety of careers, including careers in biomedical and related sciences in research and development in academics and industry, careers in education, and careers in administration with and without a clinical background.

## 2. Curriculum

### 2.1 Overview by Modules

(according to the module overview in the study regulations)

Module Code	Obligatory /Elective	Module Title	Recommended Semester	CP
Compulsory Lectures (2 have to be chosen – depending on the selected focus areas)				
1	Obligatory	Advanced Lectures in Molecular Medicine	1	Σ 6
1.1	Elective	Advanced Immunology	1	3
1.2	Elective	Advanced Neurosciences	1	3
1.3	Elective	Advanced Oncology	1	3
1.4	Elective	Advanced Infection Biology	1	3
Compulsory Laboratory rotations (2 Laboratory rotations have to be chosen – depending on the focus areas. Both lab rotations can be done in the <b>same</b> focus area.)				
2	Obligatory	Laboratory Rotation A	1	Σ 12
2.1	Elective	Laboratory Rotation Immunology A	1	12
2.2	Elective	Laboratory Rotation Neurosciences A	1	12
2.3	Elective	Laboratory Rotation Oncology A	1	12
2.4	Elective	Laboratory Rotation Infection Biology A	1	12
3	Obligatory	Laboratory Rotation B	1	Σ 12
3.1	Elective	Laboratory Rotation Immunology B	1	12
3.2	Elective	Laboratory Rotation Neurosciences B	1	12
3.3	Elective	Laboratory Rotation Oncology B	1	12
3.4	Elective	Laboratory Rotation Infection Biology B	1	12
Compulsory Seminar				
4	Obligatory	Seminar Meet the Expert	1+2	3
Compulsory Master Thesis				
5	Obligatory	Master Thesis	2	27

## 2.2 Overview by Study Progress

Study Area	Code	Module Title	Obligatory /Elective (O/E)	Semester		Σ
				1	2	CP
Study Area Immunology	1.1	Advanced Immunology	E	1		3
	2.1	Laboratory Rotation Immunology A	E	1		12
	3.1	Laboratory Rotation Immunology B	E	1		12
Study Area Neurosciences	1.2	Advanced Neurosciences	E	1		3
	2.2	Laboratory Rotation Neurosciences A	E	1		12
	3.2	Laboratory Rotation Neurosciences B	E	1		12
Study Area Oncology	1.3	Advanced Oncology	E	1		3
	2.3	Laboratory Rotation Oncology A	E	1		12
	3.3	Laboratory Rotation Oncology B	E	1		12
Study Area Infection Biology	1.4	Advanced Infection Biology	E	1		3
	2.4	Laboratory Rotation Infection Biology A	E	1		12
	3.4	Laboratory Rotation Infection Biology B	E	1		12
Study Area Molecular Medicine	4	Seminar Meet the Expert	O	1	2	3
Study Area Molecular Medicine	5	Master Thesis	O		2	27
						<b>60</b>

<b>Key</b>	
<b>Grading:</b>	g = graded; ug = ungraded (pass/fail) ne = no module examination
<b>Type of Exam:</b>	W = written exam; O = oral exam; T = term paper; P = classroom presentation; WR = written report; PP = practical performance
<b>Duration:</b>	duration of the examination in minutes
<b>Weight:</b>	courses: weighting of the examination grade towards the module grade modules: weighting of the module grade towards the final grade
<b>Contact Hours:</b>	CH; hours spent in the classroom per week during the semester
<b>Status:</b>	o = obligatory; e = elective
<b>Type of Course</b>	L = lecture; S = seminar; E = exercise; T = tutorial, P = Practical laboratory course
<b>CP:</b>	Credit Points (ECTS Credits)



### 3. Module Descriptions

#### 3.1. Modules

<b>Module Code:</b> 1.1	<b>Module Title:</b> <i>Advanced Immunology</i>		<b>Type of Module:</b> elective
<b>CP</b> (ECTS Credits)	3		
<b>Workload</b> - Time in Class - Self-Study	<i>Total Workload:</i> 90 h	<i>Time in Class:</i> 30 h / 2 CH	<i>Self-Study:</i> 60 h
<b>Duration</b>	1 semester		
<b>Frequency</b>	<i>The lecture is offered once per year in the winter semester</i>		
<b>Language of Instruction</b>	<i>English</i>		
<b>Forms of Teaching and Learning</b>	<i>Lecture</i>		
<b>Content</b>	<p><i>The specialist field of immunology imparts knowledge of the complex processes involved in the regulation of cellular and immunological processes in both human and animals. The immunological processes are thus examined in association with disease-induced malfunctions, for example in the case of immune defects or tumor immunology.</i></p> <p><i>The lectures in the series “Advanced Immunology” cover the detailed mechanisms of the immune system. This includes an examination of the recent discoveries made in cellular and molecular immunology. The major topics include the evolution of immune systems, therapeutic antibodies, computational immunobiology, antigen processing, cellular communication, negative and positive regulatory mechanisms in immunity, the interaction between immune systems, and pathogens and pathomechanisms.</i></p> <p><u><i>Thematic focus:</i></u></p> <p><i>Introduction and evolution of immune systems</i></p> <p><i>Therapeutic antibodies</i></p> <p><i>Computational immunology</i></p> <p><i>T-cell populations</i></p> <p><i>Cell-cell-communication and signal transduction in immune systems</i></p> <p><i>Immunity in the intestine</i></p> <p><i>Immunodeficiency – strategies/mechanisms of pathogens</i></p> <p><i>Function of neutrophil granulocytes</i></p> <p><i>MHC and antigen processing</i></p> <p><i>Immunopathology</i></p> <p><i>Pattern-recognition receptors in immune response: Recognition and regulation</i></p>		
<b>Objectives</b>	<i>The course provides important and up-to-date knowledge of cellular and molecular immunology.</i>		

	<p>After completion of this module, students will be able to understand the state-of-the-art strategies, modern methodologies, and open questions in selected fields of immunology</p> <p>After completion of this module, students will have acquired a specialized knowledge and understanding of innate and adaptive immunology.</p>								
Requirements for Obtaining Credit, Grading, Weight if appl.	Type of Course	Status	CH	CP	Type of Exam	Length of Exam	Type of Evaluation	Calculation of Module Grade	
	Module Component	L	e	2	3	W	90	g	100
Aplicability / Transfer	M.Sc. in Molecular Medicine								
Prerequisites	B.Sc. degree								
Module Leader	Stevanović, Stefan, Prof., Dr. rer. nat.								
Literature/ teaching materials	<p>Janeway's Immunobiology (Murphy, Travers, Walport), Garland Science, New York, 2008, 2012</p> <p>Teaching materials will be announced at the beginning of term.</p> <p>Further teaching materials will be available on the web page of the Department of Immunology.</p>								

<b>Module Code:</b> 1.2	<b>Module Title:</b> <i>Advanced Neurosciences</i>		<b>Type of Module:</b> elective						
<b>CP</b> (ECTS Credits)	3								
<b>Workload</b> - Time in Class - Self-Study	<i>Total Workload:</i> 90 h	<i>Time in Class:</i> 30 h / 2 CH	<i>Self-Study:</i> 60 h						
<b>Duration</b>	1 semester								
<b>Frequency</b>	<i>The lecture is offered once per year in the winter term</i>								
<b>Language of Instruction</b>	<i>English</i>								
<b>Forms of Teaching and Learning</b>	<i>Lecture</i>								
<b>Content</b>	<i>Aging is the most important risk factor for neurodegenerative diseases, and thus an understanding of the age-related neural changes is of fundamental importance. Cerebral proteopathy is a unifying term for neurodegenerative diseases in which proteins misfold and polymerize into aggregates that are resistant to clearance. Whether these protein aggregations are causative for the disease or are epiphenomena will be discussed for each disorder. This course emphasis on the molecular and cellular pathomechanisms of the most common dementias and other neurodegenerative disorders, especially Alzheimer's and Parkinson's disease. Other dementias covered in this lecture course are the heterogenous group of Frontotemporal Dementias and the Prion diseases including Creutzfeldt-Jakob disease. Additional movement disorders discussed in this lecture series include Huntington's disease and various ataxias. Finally, motor neuron disease such as Amyotrophic Lateral Sclerosis will be presented and the recent link to the pathogenesis of Frontotemporal Dementia highlighted.</i>								
<b>Objectives</b>	<i>At the end of the course, the students will know the molecular and cellular pathogenesis of Alzheimer's disease and Parkinson's disease and related disorders. They will have an understanding of "tauopathies", "synucleinopathies", "amyloidosis", and "triplet repeat disorders". Furthermore, the students will understand the molecular and pathological commonalities among age-related neurodegenerative diseases as well as disease-specific lesions and dysfunctions. Based on the molecular and cellular pathomechanism for each disease the students will be able to identify potential therapeutic targets.</i>								
<b>Requirements for Obtaining Credit, Grading, Weight if appl.</b>		<i>Type of Course</i>	<i>Status</i>	<i>CH</i>	<i>CP</i>	<i>Type of Exam</i>	<i>Length of Exam</i>	<i>Type of Evaluation</i>	<i>Calculation of Module Grade</i>
	<i>Module Component</i>	L	e	2	3	W	90	g	100
<b>Aplicability / Transfer</b>	<i>M.Sc. in Molecular Medicine</i>								

<b>Prerequisites</b>	<i>B.Sc. degree Good knowledge in cell &amp; molecular biology and genetics.</i>
<b>Module Leader</b>	<i>Gasser, Thomas, Prof., Dr. med. Jucker, Mathias, o. Prof., Dr. sc. nat.</i>
<b>Literature/ teaching materials</b>	<i>(1) Beal, Lang, Ludolph: Neurodegenerative Diseases - Neurobiology, Pathogenesis, and Therapeutics. University Press, Cambridge, 2005. (2) Hof, Mobbs: Functional Neurobiology of Aging, Academic Press; 1st edition (2001). For selected topics, see also: <a href="http://www.emedicine.com/">http://www.emedicine.com/</a>. Further teaching materials will be available on the electronic platform ILIAS.</i>

<b>Module Code:</b> 1.3	<b>Module Title:</b> <i>Advanced Oncology</i>		<b>Type of Module:</b> elective
<b>CP</b> (ECTS Credits)	3		
<b>Workload</b> - Time in Class - Self-Study	<i>Total Workload:</i> 90 h	<i>Time in Class:</i> 30 h / 2 CH	<i>Self-Study:</i> 60 h
<b>Duration</b>	1 semester		
<b>Frequency</b>	<i>The lecture is offered once per year in the winter term</i>		
<b>Language of Instruction</b>	<i>English</i>		
<b>Forms of Teaching and Learning</b>	<i>Lecture</i>		
<b>Content</b>	<p><i>The lecture on Advanced Oncology is intended to provide further knowledge on the molecular basis of tumor development and the molecular approaches to pathology and diagnostics as well as into molecular strategies in cancer therapy. Based on the topics to be addressed the students will acquire deep insights into state-of-the-art of molecular and translational oncology with respect to</i></p> <ul style="list-style-type: none"> <li>● <i>Molecular mechanisms of cancer development</i> <ul style="list-style-type: none"> <li>- <i>genetic aspects</i></li> <li>- <i>epigenetic aspects</i></li> <li>- <i>toxicological/environmental aspects</i></li> <li>- <i>viral aspects</i></li> <li>- <i>radiogenic aspects</i></li> </ul> </li> <li>● <i>Molecular pathology and diagnostics</i> <ul style="list-style-type: none"> <li>- <i>identification of biomarkers</i></li> <li>- <i>identification of tumor cells by molecular and functional imaging</i></li> </ul> </li> <li>● <i>Molecular strategies in cancer therapies</i> <ul style="list-style-type: none"> <li>- <i>chemotherapy</i></li> <li>- <i>radiotherapy</i></li> <li>- <i>viral therapy</i></li> </ul> </li> </ul> <p><i>In addition to the theoretical backgrounds provided during the lecture current research projects and key experiments are supposed to be presented. This gives the students a better insight into the research area of the chosen field of specialization.</i></p>		
<b>Objectives</b>	<i>After completion of this module, students will have acquired a specialized knowledge and understanding of the basic mechanisms of neoplastic transformation and cancer development as well as of molecular approaches to cancer diagnostics and therapy.</i>		

<b>Requirements for Obtaining Credit, Grading, Weight if appl.</b>		<i>Type of Course</i>	<i>Status</i>	<i>CH</i>	<i>CP</i>	<i>Type of Exam</i>	<i>Length of Exam</i>	<i>Type of Evaluation</i>	<i>Calculation of Module Grade</i>
	<i>Module Component</i>	<i>L</i>	<i>e</i>	<i>2</i>	<i>3</i>	<i>W</i>	<i>90</i>	<i>g</i>	<i>100</i>
<b>Aplicability / Transfer</b>	<i>M.Sc. in Molecular Medicine</i>								
<b>Prerequisites</b>	<i>B.Sc. degree</i>								
<b>Module Leader</b>	<i>Skokowa, Julia, Prof., Dr. med., Ph.D.</i>								
<b>Literature/ teaching materials</b>	<i>Teaching materials will be available on the electronic platform ILIAS. The Biology of Cancer (Robert Weinberg)</i>								

<b>Module Code:</b> 1.4	<b>Module Title:</b> <i>Advanced Infection Biology</i>				<b>Type of Module:</b> elective				
<b>CP</b> (ECTS Credits)	3								
<b>Workload</b> - Time in Class - Self-Study	<i>Total Workload:</i> 90 h			<i>Time in Class:</i> 30 h / 2 CH		<i>Self-Study:</i> 60 h			
<b>Duration</b>	1 semester								
<b>Frequency</b>	<i>The lecture is offered once per year in the winter term</i>								
<b>Language of Instruction</b>	<i>English</i>								
<b>Forms of Teaching and Learning</b>	<i>Lecture</i>								
<b>Content</b>	<p><i>The lecture on Advanced Infection Biology is intended to provide further knowledge on the molecular basis of</i></p> <ul style="list-style-type: none"> <li>- <i>Viral control of translation</i></li> <li>- <i>trafficking of viral components</i></li> <li>- <i>reverse transcription and integration</i></li> <li>- <i>evolution and emergence of viruses</i></li> <li>- <i>Bacteria-phagocyte interaction</i></li> <li>- <i>In vivo infection models</i></li> <li>- <i>DNA sequencing techniques, protein expression systems</i></li> <li>- <i>Flow cytometry</i></li> <li>- <i>Malaria vaccines</i></li> <li>- <i>Drug resistance of Plasmodium falciparum</i></li> <li>- <i>Reverse genetics in Plasmodium falciparum</i></li> <li>- <i>Helminths and allergies</i></li> </ul> <p><i>In addition to the theoretical backgrounds provided during the lecture current research projects and key experiments are supposed to be presented. This gives the students a better insight into the research area of the chosen field of specialization.</i></p>								
<b>Objectives</b>	After completion of this module, students will have acquired a specialized knowledge and understanding of current topics in virology, microbiology, and parasitology. In addition to the theoretical backgrounds provided during the lecture, students will have acquired understanding of state-of-the-art strategies, modern methodologies, and open questions in selected fields of infection biology.								
<b>Requirements for Obtaining Credit, Grading, Weight if appl.</b>		<i>Type of Course</i>	<i>Status</i>	<i>CH</i>	<i>CP</i>	<i>Type of Exam</i>	<i>Length of Exam</i>	<i>Type of Evaluation</i>	<i>Calculation of Module Grade</i>
	<i>Module Component</i>	L	e	2	3	W	90	g	100

<b>Aplicability / Transfer</b>	<i>M.Sc. in Molecular Medicine</i>
<b>Prerequisites</b>	<i>B.Sc. degree Good knowledge in cell &amp; molecular biology and genetics.</i>
<b>Module Leader</b>	<i>Schindler, Michael, Prof., Dr. rer. nat.</i>
<b>Literature/ teaching materials</b>	<i>Teaching materials will be available on the electronic platform ILIAS.</i>



<b>Module Code:</b> 2.1	<b>Module Title:</b> <i>Module Laboratory Rotation Immunology A</i>				<b>Type of Module:</b> elective				
<b>CP</b> (ECTS Credits)	12								
<b>Workload</b> - Time in Class - Self-Study	<i>Total Workload:</i> 360 h		<i>Time in Class:</i> 270 h / 19 CH		<i>Self-Study:</i> 90 h				
<b>Duration</b>	8 weeks (6 weeks practical and 2 weeks self-study)								
<b>Frequency</b>	<i>The practical course is offered throughout the year</i>								
<b>Language of Instruction</b>	<i>English</i>								
<b>Forms of Teaching and Learning</b>	<i>Practical laboratory course (19 CH)</i>								
<b>Content</b>	<p><i>Students are required to perform a 6-week practical laboratory course (full-time) in which they concentrate on a research project in the laboratory of their choice (in immunology research groups). The project is assigned in accordance with ongoing research in the respective laboratory; it is supervised either by an advanced doctoral student or, ideally, by a postdoctoral researcher.</i></p> <p><i>Projects in the laboratory are concluded by a written report (according to the regulations and style mentioned on the grading sheet, attached) and by an oral presentation of the project.</i></p> <p><i>Each student has to prepare and give an oral presentation of one of the two laboratory rotation research projects presented in the interdisciplinary seminar Molecular Medicine.</i></p>								
<b>Objectives</b>	<i>In the 6-week research period, students acquire a wide range of practical skills in state-of-the-art methods. They are faced with current scientific questions and become acquainted with various research approaches. In addition, they are trained in the analysis and compilation of data for scientific reports and receive basic training necessary for writing scientific reports.</i>								
<b>Requirements for Obtaining Credit, Grading, Weight if appl.</b>		<i>Type of Course</i>	<i>Status</i>	<i>CH</i>	<i>CP</i>	<i>Type of Exam</i>	<i>Length of Exam</i>	<i>Type of Evaluation</i>	<i>Calculation of Module Grade</i>
	<i>Module Component</i>	<i>P</i>	<i>e</i>	<i>19</i>	<i>12</i>	<i>PP</i>		<i>g</i>	<i>100</i>
						<i>P</i>		<i>g</i>	
						<i>WR</i>		<i>g</i>	
<i>More information on calculation of the module grade can be found in the grading sheet attached.</i>									
<b>Applicability / Transfer</b>	<i>M.Sc. in Molecular Medicine</i>								

<b>Prerequisites</b>	<i>B.Sc. degree</i>
<b>Module Leader</b>	<i>Stevanović, Stefan, Prof., Dr. rer. nat.</i>
<b>Literature / teaching materials</b>	<i>These will be provided by the supervisor before the practical laboratory course begins. Janeway's Immunobiology, (Murphy, Travers, Walport), Garland Science, New York, 2008, 2012 Teaching materials are also available on the electronic platform ILIAS.</i>

<b>Module Code:</b> 2.2	<b>Module Title:</b> <i>Laboratory Rotation Neurosciences A</i>				<b>Type of Module:</b> elective				
<b>CP</b> (ECTS Credits)	12								
<b>Workload</b> - Time in Class - Self-Study	<i>Total Workload:</i> 360 h			<i>Time in Class:</i> 270 h / 19 CH		<i>Self-Study:</i> 90 h			
<b>Duration</b>	8 weeks (6 weeks practical and 2 weeks self-study)								
<b>Frequency</b>	The practical course is offered throughout the year								
<b>Language of Instruction</b>	English								
<b>Forms of Teaching and Learning</b>	Practical laboratory course (19 CH)								
<b>Content</b>	<p>Students are required to perform a 6-week long, all day laboratory rotation where they work on small research projects in laboratories of their choice (Neuroscience Research groups and various teachers of the Centre for Neurosensory Systems). In general, the assigned study is in line with currently ongoing research in the respective laboratory and supervised at least by an advanced doctoral student or, ideally, a postdoc.</p> <p>The lab projects will be concluded with a written report (according to the regulations and style mentioned on the grading sheet, attached) and by an oral presentation of the project.</p> <p>Each student has to prepare and give an oral presentation of one of the two laboratory rotation research projects presented in the interdisciplinary seminar Molecular Medicine.</p>								
<b>Objectives</b>	During these 6 weeks, students will acquire a wide range of practical skills in state-of-the-art methods. They get to know current scientific questions and research approaches; they are trained in analyzing and compiling data for a scientific report, and they have learned the basics of how to write a report.								
<b>Requirements for Obtaining Credit, Grading, Weight if appl.</b>		<i>Type of Course</i>	<i>Status</i>	<i>CH</i>	<i>CP</i>	<i>Type of Exam</i>	<i>Length of Exam</i>	<i>Type of Evaluation</i>	<i>Calculation of Module Grade</i>
	Module Component	P	e	19	12	PP		g	100
						P		g	
						WR		g	
More information on calculation of the module grade can be found in the grading sheet attached.									
<b>Applicability / Transfer</b>	M.Sc. in Molecular Medicine								



<b>Prerequisites</b>	<i>B.Sc. degree</i>
<b>Module Leader</b>	<i>Gasser, Thomas, Prof., Dr. med.</i>
<b>Literature / teaching materials</b>	<i>Will be provided by the supervisor before the start of the rotation. Teaching materials will be available on the electronic platform ILIAS.</i>

<b>Module Code:</b> 2.3	<b>Module Title:</b> <i>Laboratory Rotation Oncology A</i>				<b>Type of Module:</b> elective				
<b>CP</b> (ECTS Credits)	12								
<b>Workload</b> - Time in Class - Self-Study	<i>Total Workload:</i> 360 h		<i>Time in Class:</i> 270 h / 19 CH		<i>Self-Study:</i> 90 h				
<b>Duration</b>	8 weeks (6 weeks practical and 2 weeks self-study)								
<b>Frequency</b>	<i>The practical course is offered throughout the year</i>								
<b>Language of Instruction</b>	<i>English</i>								
<b>Forms of Teaching and Learning</b>	<i>Practical laboratory course (19 CH)</i>								
<b>Content</b>	<p><i>Students perform a 6-week long, all day laboratory rotation where they work on small research projects in laboratories of their choice (Oncology Research groups). In general, the assigned study is in line with currently ongoing research in the respective laboratory and supervised at least by an advanced doctoral student or postdoc.</i></p> <p><i>Projects in the laboratory are concluded by a written report (according to the regulations and style mentioned on the grading sheet, attached) and by an oral presentation of the project.</i></p> <p><i>Each student has to prepare and give an oral presentation of one of the two laboratory rotation research projects presented in the interdisciplinary seminar Molecular Medicine.</i></p>								
<b>Objectives</b>	<p><i>During these 6 weeks, students will acquire a wide range of practical skills in state-of-the-art methods. They get to know current scientific questions and research approaches; they are trained in analyzing and compiling data for a scientific report, and they have learned the basics of how to write a report.</i></p> <p><i>The course is intended to provide important and recent knowledge of cellular and molecular oncology.</i></p>								
<b>Requirements for Obtaining Credit, Grading, Weight if appl.</b>		<i>Type of Course</i>	<i>Status</i>	<i>CH</i>	<i>CP</i>	<i>Type of Exam</i>	<i>Length of Exam</i>	<i>Type of Evaluation</i>	<i>Calculation of Module Grade</i>
	<i>Module Component</i>	<i>P</i>	<i>e</i>	<i>19</i>	<i>12</i>	<i>PP</i>		<i>g</i>	<i>100</i>
						<i>P</i>		<i>g</i>	
						<i>WR</i>		<i>g</i>	
<i>More information on calculation of the module grade can be found in the grading sheet attached.</i>									
<b>Applicability / Transfer</b>	<i>M.Sc. in Molecular Medicine</i>								



<b>Prerequisites</b>	<i>B.Sc. degree</i>
<b>Module Leader</b>	<i>Skokowa, Julia, Prof., Dr. med., Ph.D.</i>
<b>Literature / teaching materials</b>	<i>Will be provided by the supervisor before the start of the rotation. Teaching materials will be available on the electronic platform ILIAS.</i>

<b>Module Code:</b> 2.4	<b>Module Title:</b> <i>Laboratory Rotation Infection Biology A</i>				<b>Type of Module:</b> elective				
<b>CP</b> (ECTS Credits)	12								
<b>Workload</b> - Time in Class - Self-Study	<i>Total Workload:</i> 360 h		<i>Time in Class:</i> 270 h / 19 CH		<i>Self-Study:</i> 90 h				
<b>Duration</b>	8 weeks (6 weeks practical and 2 weeks self-study)								
<b>Frequency</b>	The practical course is offered throughout the year								
<b>Language of Instruction</b>	English								
<b>Forms of Teaching and Learning</b>	Practical laboratory course (19 CH)								
<b>Content</b>	<p>Students are required to perform a 6-week long, all day laboratory rotation where they work on small research projects in laboratories of their choice. In general, the assigned study is in line with currently ongoing research in the respective laboratory and supervised at least by an advanced doctoral student or, ideally, a postdoc.</p> <p>Projects in the laboratory are concluded by a written report (according to the regulations and style mentioned on the grading sheet, attached) and by an oral presentation of the project.</p> <p>Each student has to prepare and give an oral presentation of one of the two laboratory rotation research projects presented in the interdisciplinary seminar Molecular Medicine.</p>								
<b>Objectives</b>	<p>In the 6-week research period, students acquire a wide range of practical skills in state-of-the-art methods. They are faced with current scientific questions and become acquainted with various research approaches. In addition, they are trained in the analysis and compilation of data for scientific reports and receive basic training necessary for writing scientific reports.</p> <p>The course is intended to provide important and recent knowledge of cellular and molecular microbiology, virology, or parasitology.</p> <p>The students should be able to understand and present research questions, hypotheses, experimental approaches and methods, results from their experiments and the data evaluation and interpretation.</p>								
<b>Requirements for Obtaining Credit, Grading, Weight if appl.</b>		Type of Course	Status	CH	CP	Type of Exam	Length of Exam	Type of Evaluation	Calculation of Module Grade
	Module Component	P	e	19	12	PP		g	100
						P		g	
						WR		g	

	<i>Projects in the laboratory are concluded by a written report (according to the regulations and style mentioned on the grading sheet, attached) and by an oral presentation of the project.</i>
<b>Applicability / Transfer</b>	<i>M.Sc. in Molecular Medicine</i>
<b>Prerequisites</b>	<i>B.Sc. degree</i>
<b>Module Leader</b>	<i>Schindler, Michael, Prof., Dr. rer. nat.</i>
<b>Literature / teaching materials</b>	<i>Will be provided by the supervisor before the start of the rotation. Teaching materials will be available on the electronic platform ILIAS.</i>



<b>Module Code:</b> 3.1	<b>Module Title:</b> <i>Module Laboratory Rotation Immunology B</i>				<b>Type of Module:</b> elective				
<b>CP</b> (ECTS Credits)	12								
<b>Workload</b> - Time in Class - Self-Study	<i>Total Workload:</i> 360 h		<i>Time in Class:</i> 270 h / 19 CH		<i>Self-Study:</i> 90 h				
<b>Duration</b>	8 weeks (6 weeks practical and 2 weeks self-study)								
<b>Frequency</b>	The practical course is offered throughout the year								
<b>Language of Instruction</b>	English								
<b>Forms of Teaching and Learning</b>	Practical laboratory course (19 CH)								
<b>Content</b>	<p>Students are required to perform a 6-week practical laboratory course (full-time) in which they concentrate on a research project in the laboratory of their choice (in immunology research groups). The project is assigned in accordance with ongoing research in the respective laboratory; it is supervised either by an advanced doctoral student or, ideally, by a postdoctoral researcher.</p> <p>Projects in the laboratory are concluded by a written report (according to the regulations and style mentioned on the grading sheet, attached) and by an oral presentation of the project.</p>								
<b>Objectives</b>	In the 6-week research period, students acquire a wide range of practical skills in state-of-the-art methods. They are faced with current scientific questions and become acquainted with various research approaches. In addition, they are trained in the analysis and compilation of data for scientific reports and receive basic training necessary for writing scientific reports.								
<b>Requirements for Obtaining Credit, Grading, Weight if appl.</b>		Type of Course	Status	CH	CP	Type of Exam	Length of Exam	Type of Evaluation	Calculation of Module Grade
	Module Component	P	e	19	12	PP		g	100
						P		g	
						WR		g	
More information on calculation of the module grade can be found in the grading sheet attached.									
<b>Applicability / Transfer</b>	M.Sc. in Molecular Medicine								
<b>Prerequisites</b>	B.Sc. degree								

<b>Module Leader</b>	<i>Stevanović, Stefan, Prof., Dr. rer. nat.</i>
<b>Literature / teaching materials</b>	<i>These will be provided by the supervisor before the practical laboratory course begins. Janeway's Immunobiology, (Murphy, Travers, Walport), Garland Science, New York, 2008, 2012 Teaching materials are also available on the electronic platform ILIAS.</i>

<b>Module Code:</b> 3.2	<b>Module Title:</b> <i>Laboratory Rotation Neurosciences B</i>				<b>Type of Module:</b> elective				
<b>CP</b> (ECTS Credits)	12								
<b>Workload</b> - Time in Class - Self-Study	<i>Total Workload:</i> 360 h			<i>Time in Class:</i> 270 h / 19 CH		<i>Self-Study:</i> 90 h			
<b>Duration</b>	8 weeks (6 weeks practical and 2 weeks self-study)								
<b>Frequency</b>	The practical course is offered throughout the year								
<b>Language of Instruction</b>	English								
<b>Forms of Teaching and Learning</b>	Practical laboratory course (19 CH)								
<b>Content</b>	<p>Students are required to perform a 6-week long, all day laboratory rotation where they work on small research projects in laboratories of their choice (Neuroscience Research groups and various teachers of the Centre for Neurosensory Systems). In general, the assigned study is in line with currently ongoing research in the respective laboratory and supervised at least by an advanced doctoral student or, ideally, a postdoc.</p> <p>Projects in the laboratory are concluded by a written report (according to the regulations and style mentioned on the grading sheet, attached) and by an oral presentation of the project.</p>								
<b>Objectives</b>	During these 6 weeks, students will acquire a wide range of practical skills in state-of-the-art methods. They get to know current scientific questions and research approaches; they are trained in analyzing and compiling data for a scientific report, and they have learned the basics of how to write a report.								
<b>Requirements for Obtaining Credit, Grading, Weight if appl.</b>		Type of Course	Status	CH	CP	Type of Exam	Length of Exam	Type of Evaluation	Calculation of Module Grade
	Module Component	P	e	19	12	PP		g	100
						P		g	
						WR		g	
More information on calculation of the module grade can be found in the grading sheet attached.									
<b>Applicability / Transfer</b>	M.Sc. in Molecular Medicine								
<b>Prerequisites</b>	B.Sc. degree								

<b>Module Leader</b>	<i>Gasser, Thomas, Prof., Dr. med.</i>
<b>Literature / teaching materials</b>	<i>Will be provided by the supervisor before the start of the rotation. Teaching materials will be available on the electronic platform ILIAS.</i>

<b>Module Code:</b> 3.3	<b>Module Title:</b> <i>Laboratory Rotation Molecular Oncology B</i>				<b>Type of Module:</b> elective				
<b>CP</b> (ECTS Credits)	12								
<b>Workload</b> - Time in Class - Self-Study	<i>Total Workload:</i> 360 h		<i>Time in Class:</i> 270 h / 19 CH		<i>Self-Study:</i> 90 h				
<b>Duration</b>	8 weeks (6 weeks practical and 2 weeks self-study)								
<b>Frequency</b>	The practical course is offered throughout the year								
<b>Language of Instruction</b>	English								
<b>Forms of Teaching and Learning</b>	Practical laboratory course (19 CH)								
<b>Content</b>	<p>Students perform a 6-week long, all day laboratory rotation where they work on small research projects in laboratories of their choice (Oncology Research groups). In general, the assigned study is in line with currently ongoing research in the respective laboratory and supervised at least by an advanced doctoral student or postdoc.</p> <p>Projects in the laboratory are concluded by a written report (according to the regulations and style mentioned on the grading sheet, attached) and by an oral presentation of the project.</p>								
<b>Objectives</b>	<p>During these 6 weeks, students will acquire a wide range of practical skills in state-of-the-art methods. They get to know current scientific questions and research approaches; they are trained in analyzing and compiling data for a scientific report, and they have learned the basics of how to write a report.</p> <p>The course is intended to provide important and recent knowledge of cellular and molecular oncology.</p>								
<b>Requirements for Obtaining Credit, Grading, Weight if appl.</b>		Type of Course	Status	CH	CP	Type of Exam	Length of Exam	Type of Evaluation	Calculation of Module Grade
	Module Component	P	e	19	12	PP		g	100
						P		g	
						WR		g	
More information on calculation of the module grade can be found in the grading sheet attached.									
<b>Applicability / Transfer</b>	M.Sc. in Molecular Medicine								
<b>Prerequisites</b>	B.Sc. degree								

<b>Module Leader</b>	<i>Skokowa, Julia, Prof., Dr. med., Ph.D.</i>
<b>Literature / teaching materials</b>	<i>Will be provided by the supervisor before the start of the rotation. Teaching materials will be available on the electronic platform ILIAS.</i>

<b>Module Code:</b> 3.4	<b>Module Title:</b> <i>Laboratory Rotation Infection Biology B</i>				<b>Type of Module:</b> elective				
<b>CP</b> (ECTS Credits)	12								
<b>Workload</b> - Time in Class - Self-Study	<i>Total Workload:</i> 360 h		<i>Time in Class:</i> 270 h / 19 CH		<i>Self-Study:</i> 90 h				
<b>Duration</b>	8 weeks (6 weeks practical and 2 weeks self-study)								
<b>Frequency</b>	<i>The practical course is offered throughout the year</i>								
<b>Language of Instruction</b>	<i>English</i>								
<b>Forms of Teaching and Learning</b>	<i>Practical laboratory course (19 CH)</i>								
<b>Content</b>	<p><i>Students are required to perform a 6-week long, all day laboratory rotation where they work on small research projects in laboratories of their choice. In general, the assigned study is in line with currently ongoing research in the respective laboratory and supervised at least by an advanced doctoral student or, ideally, a postdoc.</i></p> <p><i>Projects in the laboratory are concluded by a written report (according to the regulations and style mentioned on the grading sheet, attached) and by an oral presentation of the project.</i></p>								
<b>Objectives</b>	<p><i>In the 6-week research period, students acquire a wide range of practical skills in state-of-the-art methods. They are faced with current scientific questions and become acquainted with various research approaches. In addition, they are trained in the analysis and compilation of data for scientific reports and receive basic training necessary for writing scientific reports.</i></p> <p><i>The course is intended to provide important and recent knowledge of cellular and molecular microbiology, virology, or parasitology.</i></p> <p><i>The students should be able to understand and present research questions, hypotheses, experimental approaches and methods, results from their experiments and the data evaluation and interpretation.</i></p>								
<b>Requirements for Obtaining Credit, Grading, Weight if appl.</b>		<i>Type of Course</i>	<i>Status</i>	<i>CH</i>	<i>CP</i>	<i>Type of Exam</i>	<i>Length of Exam</i>	<i>Type of Evaluation</i>	<i>Calculation of Module Grade</i>
	<i>Module Component</i>	<i>P</i>	<i>e</i>	<i>19</i>	<i>12</i>	<i>PP</i>		<i>g</i>	<i>100</i>
						<i>P</i>		<i>g</i>	
						<i>WR</i>		<i>g</i>	
<i>More information on calculation of the module grade can be found in the grading sheet attached.</i>									

<b>Applicability / Transfer</b>	<i>M.Sc. in Molecular Medicine</i>
<b>Prerequisites</b>	<i>B.Sc. degree</i>
<b>Module Leader</b>	<i>Schindler, Michael, Prof., Dr. rer. nat.</i>
<b>Literature / teaching materials</b>	<i>Will be provided by the supervisor before the start of the rotation. Teaching materials will be available on the electronic platform ILIAS.</i>




<b>Module Code:</b> 4	<b>Module Title:</b> <i>Seminar Meet the Expert</i>		<b>Type of Module:</b> obligatory
<b>CP</b> (ECTS Credits)	3		
<b>Workload</b> - Time in Class - Self-Study	<i>Total Workload:</i> 90 h	<i>Time in Class:</i> 45 h / 3 CH	<i>Self-Study:</i> 45 h
<b>Duration</b>	2 semesters		
<b>Frequency</b>	<i>Seminars are offered are offered all year round</i>		
<b>Language of Instruction</b>	<i>English</i>		
<b>Forms of Teaching and Learning</b>	<i>Seminar, Journal Club, Colloquium, Problem-based learning (PBL) seminar, Congress, Symposium</i>		
<b>Content</b>	<p><i>Part A:</i> <i>The module comprises</i></p> <ul style="list-style-type: none"> <li>• <i>weekly lectures that are organized in the framework of the focus area research centers and various institutes,</i></li> <li>• <i>colloquia (expert meetings with guest speakers)</i></li> <li>• <i>journal clubs and</i></li> <li>• <i>participation in scientific congresses/symposia/etc.</i></li> </ul> <p><i>Some formats require registration (e.g. journal clubs) and students need to attend on a regular basis. Attendance is monitored via the coordinator (e.g. Seminar Meet the Expert Cell Biology &amp; Immunology).</i></p> <p><i>Other formats do not need registration (e. g. progress seminars/colloquia), and students might decide on a weekly basis if they are interested in the topic or not. Students shall keep a record of their attendance and the different topics via an attendance sheet.</i></p> <p><i>Part B: Interdisciplinary Seminar Molecular Medicine</i></p> <p><i>Each student has to present one of the two Laboratory Rotations in a 10-minute talk followed by a discussion with fellow students and supervisors.</i></p>		
<b>Objectives</b>	<p><i>The students work independently or in small groups and know to read and then to present the research area and the specific content of the paper effectively to the members of the seminar group.</i></p> <p><i>The seminar participants thus accumulate background information on the specific research area that is the topic the publication and learn how to pose questions and discuss scientific subjects with experts.</i></p> <p><i>Initial contacts with external guest researchers and researchers of Tübingen University are thus made possible.</i></p> <p><i>The students acquire scientific presentation skills. Furthermore, students get an insight into all specialist fields of the Master program and the projects of their fellow students.</i></p>		

	Type of Course	Status	CH	CP	Type of Exam	Length of Exam	Type of Evaluation	Calculation of Module Grade
<b>Requirements for Obtaining Credit, Grading, Weight if appl.</b>	Module Component	S	o	3	3		ne	
	<p><i>Preparation of the subject matter prior to the expert lecture/seminar/journal club, attendance of at least 15 seminar dates, active participation in discussions. Additionally, attendance to the Interdisciplinary Seminar Molecular Medicine. Attendance is monitored via an attendance sheet (no signature necessary), students monitor their seminar dates themselves (title and date of the seminar are written on the attendance sheet).</i></p>							
<b>Applicability / Transfer</b>	M.Sc. in Molecular Medicine							
<b>Prerequisite to attend the activities</b>	B.Sc. degree							
<b>Module Leader</b>	<p>Stevanović, Stefan, Prof., Dr. rer. nat.                      Gasser, Thomas, Prof., Dr. med.                      Skokowa, Julia, Prof., Dr. med., Ph.D.                      Schindler, Michael, Prof., Dr. rer. nat.</p>							
<b>Literature / teaching materials</b>	Teaching materials also available on the electronic platform ILIAS.							

<b>Module Code:</b> 5	<b>Module Title:</b> <i>Master Thesis</i>		<b>Type of Module:</b> obligatory						
<b>CP</b> (ECTS Credits)	27								
<b>Workload</b> - Time in Class - Self-Study	<i>Total Workload:</i> 810 h		<i>Time in Class:</i> 540 h / 39 CH			<i>Self-Study:</i> 270 h			
<b>Duration</b>	6 months								
<b>Frequency</b>	Each semester								
<b>Language of Instruction</b>	English								
<b>Forms of Teaching and Learning</b>	Practical work								
<b>Content</b>	depending on the project								
<b>Objectives</b>	<p>The student is able to...</p> <ul style="list-style-type: none"> <li>-to study published data to get insight a research field</li> <li>-to understand the general flow from the idea of an experiment via the experimental design and methodology to the interpretation of the results taking sufficient and appropriate controls and published data into account</li> <li>-documentation, oral and written presentation of experimental data</li> </ul> <p>The Master thesis module contains both practical work and writing process within 6 months. The practical work should not exceed 5 months, depending on the character of the project. One to two months has to be calculated for literature search and writing the Master thesis.</p> <p>At the end of the master thesis, the students should be able to develop an own research project idea and design and perform the appropriate experiments with the help of published data. They should be able to present their research in oral and written form.</p>								
<b>Requirements for Obtaining Credit, Grading, Weight if appl.</b>		Type of Course	Status	CH	CP	Type of Exam	Length of Exam	Type of Evaluation	Calculation of Module Grade
	Module Component	P	o	39	27	WR		g	100
	- optional oral presentation of results (not graded) - written thesis => graded by two referees (examiner) Upon the successful completion of the module examination "Master Thesis" the student obtains 27 CP (No weighting of CP)								



<b>Applicability / Transfer</b>	<i>M.Sc. in Molecular Medicine</i>
<b>Prerequisite to attend the activities</b>	<i>B.Sc. degree Successful completion of modules counting for at least 18 CP</i>
<b>Module Leader</b>	<i>Iftner, Thomas, Prof., Dr. rer. nat./various researchers from Tübingen University</i>
<b>Literature / teaching materials</b>	<i>a) will be provided by the supervisor before the start of the Thesis b) literature research by the student</i>

<b>Grading Sheet Laboratory rotation/ internship M.Sc. Molecular Medicine</b>			
<b>Student:</b>	Mustermann, Thomas		
<b>Title:</b>	Clinical application of PCR		
<b>Institute/Research group:</b>	Institute for Mustermöbel, Musterhausen lab		
<b>Time period:</b>	1970/01/01 - 1970/02/15		
<b>Supervisor:</b>	Dr. Musterfrau, Bettina		
<b>Type of</b>	Lab rotation Oncology 1		
Please enter only numbers 1.0, 1.3, 1.7, 2.0, 2.3, 2.7, 3.0, 3.3, 3.7, 4.0, 5.0 in Grade column. Leave cell blank if not graded.			
	Weighting (%)	The student...	Grade
<b>Laboratory work</b>			
Theoretical and practical skills	50	is able to understand and independently conduct experiments after a suitable amount of training; documents and analyzes results appropriately.	1,3
<b>Motivation</b>			
Motivation	20	is reliable, punctual, and able to work in a team.	1,0
<b>Report</b>			
Content and form	15	presents the acquired data concisely; pays attention to the uniform and formal correct presentation of the data; uses proper citation; pays attention to accurate orthography and grammar.	3,3
<b>Presentation</b>			
Content, structure and language	15	presents the acquired data well structured; uses appropriate media; adheres to the given time frame; uses adequate language.	1,3
<b>Result</b>			<b>1,5</b>

# Grading Sheet Laboratory rotation/ internship M.Sc. Molecular Medicine

EBERHARD KARLS  
UNIVERSITÄT  
TÜBINGEN



<b>Student:</b>	Mustermann, Thomas
<b>Title:</b>	Clinical application of PCR
<b>Institute/Research group:</b>	Institute for Mustermöbel, Musterhausen lab
<b>Time period:</b>	1970/01/01 - 1970/02/15
<b>Supervisor:</b>	Dr. Musterfrau, Bettina
<b>Type of</b>	Lab rotation Oncology 1

**Review:**

Send signed form to: Prüfungsamt Molekulare Medizin, Frau Sigrid Czarnotta  
(sigrid.czarnotta@med.uni-tuebingen.de), Studiendekanat Med. Fakultät, Universität Tübingen,

Place, Date	Signature Supervisor