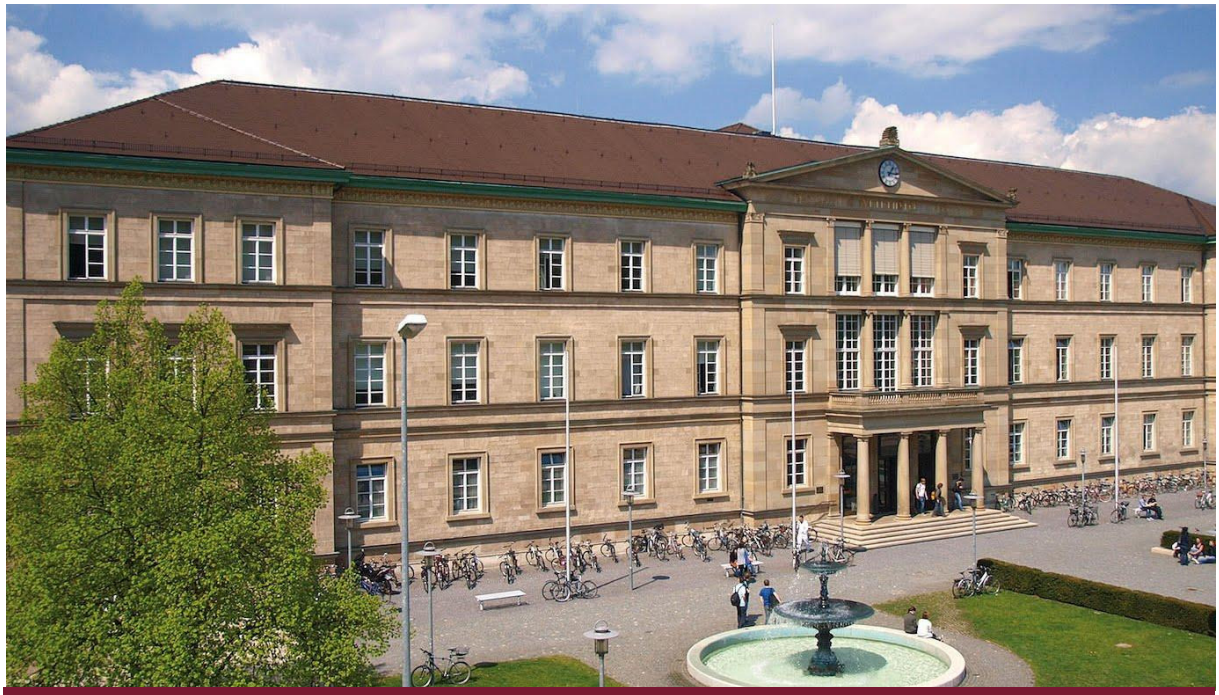
EBERHARD KARLS
UNIVERSITÄT
TÜBINGEN



Academic Year 2026/2027

Courses for Exchange Students

FACULTY OF MEDICINE
Department of MOLECULAR MEDICINE
Study Dean for Molecular Medicine: Prof. Dr. M. Schindler

Introductory Notes

Exchange Students can choose from a variety of courses in the List. Alle these courses are in English. Please be aware, to follow the classes your English Language Skills should be at least the B2 or C1 level.

Choosing the Courses please take a special attention to the course prerequisites, if any, the course level and the examination form. Undergraduate exchange students are eligible to take the degree courses as soon as the prerequisites are fulfilled.

If enrolled as an Erasmus Student at the Faculty of Medicine, unfortunately, it is not possible to sign in the courses offered by the other Faculties of the University of Tübingen. So please choose from this List.

Module Title	Winter/Summer Term	Study Cycle	ECTS
Oral Communication	Every Semester	1	3
Cell biology I	WS	1	3
Cell biology II	SS	1	6
Bioinformatics for Life Scientists	SS	1	3
Special Microbiology: Microbial Pathogenicity	SS	1	3
Special Virology	SS	1	3
Chosen Topics in Oncology	SS	1	3
Neuromodulation and Neuroplasticity	WS	1&2	6
Neurosciences	Every Semester	1&2	3,6 or 9
Neuroprosthetics and Intelligent Implants	SS	1&2	6
Tissue Engineering	WS	1	12
Python-Course	WS	1&2	6
Fundamentals and Ethical-Legal Dimensions of AI in Medicine	SS	1&2	3
Advanced Immunology	WS	2	3
Advanced Oncology	WS	2	3
Advanced Infection Biology	WS	2	3
CNS-Metastasis	SS	1&2	3
METHODS IN PROJECT MANAGEMENT	SS	1&2	3
Biomedical Technologies in Diagnostic and Therapy	WS	2	6

Laboratory Techniques and Methods	WS	2	3
Regulatory Affairs of Medical Devices	SS	2	3
Clinical Cases and Consequences for Medical Devices	SS	2	6
NanoBioAnalytics – Lecture and Seminar	Every Semester	2	6
Biomedical Engineering – Lecture	SS	2	3
Ethical and Social Aspects of Biomedical Technologies	SS	1&2	3
MRI-applications for neuroscientific and clinical research	SS	2	6
NanoBioPhysics and scanning probe microscopy	SS	2	3

Courses Description

Module Code: S02SMOLMED09	**Module Title:** *Oral Communication*		**Type of Module:** elective
CP (ECTS Credits)	*3*		
Workload **- Time in Class** **- Self-Study**	*Total Workload:* *90 h*	*Time in Class:* *30 h / 2 CH*	*Self-Study:* *60 h*
Duration	*1 semester*		
Study Cycle	*Bachelor and Master*		
Frequency	*The course is offered every semester*		
Language of Instruction	*English*		
Forms of Teaching and Learning	*Practical course*		
Content	*You will learn basic vocabulary for communication with English-Speaking colleagues in the lab, Lab jargon in English, basic vocabulary for discussing scientific texts from molecular biology / cell biology / immunology (specific vocabulary), conducting presentations, writing texts (e.g., resumes and cover letters)*		
Requirements for Obtaining Credit, Grading, Weight if appl.	*Mandatory attendance of at least 80% of the course*		
Requirements for Obtaining Credit, Grading, Weight if appl. **Aplicability / Transfer**	*Course is graded. It is possible to observe a level test at the End of the course*		
Prerequisites	*A Placement Test is required for the course registration. You will be contacted for the Placement Test by the Teaching staff shortly for Semester start*		
Registration	*You will be registered by Erasmus Coordinatorr*		

Module Code: *S03VMOLMED08*	**Module Title:** *Cell biology I*		**Type of Module:** elective
CP (ECTS Credits)	*3*		
Workload **- Time in Class** **- Self-Study**	*Total Workload:* *90 h*	*Time in Class:* *30 h / 2 CH*	*Self-Study:* *60 h*
Duration	*1 semester*		
Study Cycle	*Bachelor*		
Frequency	*The course is offered in winter semester*		
Language of Instruction	*English*		
Forms of Teaching and Learning	*Lecture*		
Content	• *General principals of signal transduction* • *Protein processing, trafficking, and degradation* • *Cytoskeletal dynamics, vesicular transport and cell motility* *At the end of this course, students will be able to:* *1. Explain how macromolecules interact to support cell structure, function, dynamics, and responses to environmental signals.* *2. Apply knowledge and technical understanding of cell and molecular biology to interpret experimental data and solve research/medical case-scenarios.*		
Requirements for Obtaining Credit, Grading, Weight if appl.	*Final exam (65%), Problem-based tutorials (30%), Lecture quizzes (5%).* *Attendance to all tutorial session is mandatory. The minimum passing grade for this course is 3.3 (60%)*		
Registration	*Please register in ALMA*		

Module Code: *S04VMOLMED01*	**Module Title:** *Cell biology II*		**Type of Module:** elective
CP (ECTS Credits)	*6*		
Workload **- Time in Class** **- Self-Study**	*Total Workload:* *180 h*	*Time in Class:* *Lecture 14 H* *Practical and Seminar 64 h*	*Self-Study:* *102 h*
Duration	*1 semester*		
Study Cycle	*Bachelor*		
Frequency	*The course is offered in summer semester*		
Language of Instruction	*English*		
Forms of Teaching and Learning	*Lecture*		
Content	• *Interactions between cells and their environment* • *Cell fate (proliferation, differentiation, apoptosis, regeneration).*		
Requirements for Obtaining Credit, Grading, Weight if appl.	*Lecture portion: Final exam (70%), problem-based tutorials (25%), quizzes (5%). Attendance to all tutorial session is mandatory. The minimum passing grade for the lecture portion of the course 3.3 (60%)*		
Prerequisites	*The course could only be taken in combination with Cell Biology I*		

Module Code: BIOINF1910	**Module Title:** *Bioinformatics for Life Scientists*		**Type of Module:** elective
CP (ECTS Credits)	*3*		
Workload **- Time in Class** **- Self-Study**	*Total Workload:* *90h*	*Time in Class:* *Lecture 30 H* *Practical 15 h*	*Self-Study:* *45 h*
Duration	*1 semester*		
Study Cycle	*Bachelor*		
Frequency	*The course is offered in summer semester*		
Language of Instruction	*English*		
Forms of Teaching and Learning	*Lecture and Practical Exercises*		
Content	This module provides an overview of the field of bioinformatics as well as elementary skills in sequence analysis and structural bioinformatics. Both, the theoretical foundations and the practical applications of key bioinformatics methods will be conveyed in a blended learning approach. Core contents of the course are: introduction and overview of bioinformatics, basics of computer systems, key concepts of computer science, programming in Python, sequences, strings, pairwise alignments, dynamic programming, multiple alignments sequence databases, database search (BLAST, PSI-BLAST), protein structure and related databases, prediction of protein secondary structure, threading and homology modeling, ab initio prediction of protein structure.		
Requirements for Obtaining Credit, Grading, Weight if appl.	*Graded Examination* *You are eligible to take part at the examination only if you have participated at the practical exercises.*		
Registration	*No registration is required.*		

2.

Module Code: Bio-MIB-208	**Module Title:** *Special Microbiology: Microbial Pathogenicity*		**Type of Module:** elective
CP (ECTS Credits)	*3*		
Workload **- Time in Class** **- Self-Study**	*Total Workload:* *90h*	*Time in Class:* *30 h*	*Self-Study:* *60 h*
Duration	*1 semester*		
Study Cycle	*Bachelor*		
Frequency	*The course is offered in summer semester*		
Language of Instruction	*English*		
Forms of Teaching and Learning	*Lecture and Seminar*		
Content	*The following topics are covered:* *B1. Basics and B2. adhesion* *B5. Metabolism and regulation* *B3. Bacterial protein secretion* *B4. Bacterial toxins* *C. Microbiom* *D1. Antimicrobial effectors* *D2. Recognition of microbial molecules* *D3. Detection of microbes by serum components* *D4. Elimination of microbes by phagocytes* *E1. E2. Adaptive immune system I* *E3. E4. Adaptive immune system II*		
Requirements for Obtaining Credit, Grading, Weight if appl.	*Graded Examination* *To get the ECTS you will also need to actively participate at the seminar and to hold your own presentation.*		
Prerequisite	*Basic Knowledge in Microbiology*		

Registration	*Registration via ALMA*

Module Code: S05VMVI01	**Module Title:** *Special Virology*		**Type of Module:** elective
CP (ECTS Credits)	*3*		
Workload **- Time in Class** **- Self-Study**	*Total Workload:* *90h*	*Time in Class:* *15 h*	*Self-Study:*
Duration	*1 semester*		
Study Cycle	*Bachelor*		
Frequency	*The course is offered in summer semester*		
Language of Instruction	*English*		
Forms of Teaching and Learning	*Lecture and Seminar*		
Content	*The following topics are covered:* *Adenoviruses, Parvoviruses, Emerging Viruses, Measles, Replication Strategies of DNA Viruses, Structural Virology, Antiviral Therapy, Hemorrhagic Fever, Prions*		
Requirements for Obtaining Credit, Grading, Weight if appl.	*Graded Examination*		
Prerequisite	*Basic knowledge in Virology*		
Registration	*Registration via ALMA.*		

Module Code: S08SMOLMED01	**Module Title:** *Chosen Topics in Oncology*		**Type of Module:** elective
CP (ECTS Credits)	*3*		
Workload **- Time in Class** **- Self-Study**	*Total Workload:* *90h*	*Time in Class:* *20 h*	*Self-Study:* *70h*
Duration	*1 semester*		
Study Cycle	*Bachelor*		
Frequency	*The course is offered in summer semester*		
Language of Instruction	*English*		
Forms of Teaching and Learning	*Seminar*		
Content	*Immunopeptidomics; Bioinformatics, sequencing; short-read/long-read next-generation sequencing or tumor sequencing within the framework of MTBs for advanced tumor diseases; T cells + immunomonitoring; cloning; CAR-T cells; Peptide vaccines; genome sequencing, clinical application; GMP / GCP*		
Requirements for Obtaining Credit, Grading, Weight if appl.	*Active Participation, Presentation*		
Prerequisite	*Basic knowledge in Molecular Biology and Cell Biology*		
Registration	*Registration via ALMA.*		

Module Code: MEDTEC_E19.1	**Module Title:** *Neuromodulation and Neuroplasticity*	**Type of Module:** elective
CP (ECTS Credits)	6	
Workload **- Time in Class** **- Self-Study**	*Total Workload:* *180h*	
Duration	*1 semester*	
Study Cycle	*Bachelor and Master*	
Frequency	*The course is offered in winter semester*	
Language of Instruction	*English*	
Forms of Teaching and Learning	*Lecture and Practical Training*	
Content	*Fundamentals of Anatomy and Physiology of the Sensorimotor Nervous System* *- Basic theories and models of neural plasticity (spike timing dependent plasticity; Hebbian plasticity; entrainment)* *- Application, advantages and disadvantages of transcranial neuromodulation: ◦ transcranial current stimulation ◦ transcranial magnetic stimulation* *- Application, advantages and disadvantages of peripheral neuromodulation: ◦ peripheral nerve stimulation ◦ neuromuscular electrical stimulation ◦ robot-based tactile and proprioceptive stimulation* *- Clinical application examples*	
Requirements for Obtaining Credit, Grading, Weight if appl.	*Graded examination*	
Prerequisite		
Registration	*Registration via Erasmus Coordinator*	

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Module Code: *May vary due to course choice*	**Module Title:** *Neurosciences*	**Type of Module:** elective
CP (ECTS Credits)	*3, 6 or 9 ECTS dependent on how many courses you are taking in the Area.*	
Duration	*1 semester*	
Frequency	*Courses are offered every Semester*	
Study Cycle	*Bachelor and Master*	
Language of Instruction	*English*	
Forms of Teaching and Learning	*Lectures*	
Content	*The Graduate school of Neuroscience offers a large number of courses on the Topic* *Choose up to 3 different courses from the offering and register on ALMA upon the arrival* *Here are some examples:* *Human neurogenetics;* *Genet Neurophysiology.* *Molecular and Cellular Biology of Neurons and Glia.* *Cellular and Molecular* *Neuroscience and molecular basis of neural diseases* As the choice of the courses varies from semester to semester, please enter only the Name of the Module (not the Names of the singular courses) and the total number of ECTS you want to take in your Learning Agreement	

Module Code: MEDTEC_E19.2	**Module Title:** *Neuroprosthetics and Intelligent Implants*		**Type of Module:** elective
CP (ECTS Credits)	6		
Workload **- Time in Class** **- Self-Study**	*Total Workload:* *180h*		
Duration	*1 semester*		
Study Cycle	*Bachelor and Master*		
Frequency	*The course is offered in winter semester*		
Language of Instruction	*English*		
Forms of Teaching and Learning	*Lecture and Practical Training*		
Content	• *Fundamentals of brain anatomy and electrophysiology* • *Theory and application of electrophysiological measurement techniques (including EEG, LFP)* • *Introduction to digital signal processing and machine learning using Python* • *Overview of neurological and psychiatric conditions treated with neuroimplants* • *Implantation of electrodes for deep brain stimulation* • *Specific ethical challenges posed by smart implants*		
Requirements for Obtaining Credit, Grading, Weight if appl.	*Graded examination*		
Prerequisite			
Registration	*Registration via Erasmus Coordinator*		

Module Code: MT24_K1	**Module Title:** *Tissue Engineering*		**Type of Module:** elective
CP (ECTS Credits)	12		
Workload **- Time in Class** **- Self-Study**	*Total Workload:* *360 h*		
Duration	*6 weeks block course*		
Study Cycle	*Bachelor*		
Frequency	*The course is offered in winter term*		
Language of Instruction	*English*		
Forms of Teaching and Learning	*Lecture, Seminar, Practical Training in the Lab*		
Content	*Medical fundamentals of vital implants• Cell culture techniques/methods for tissue cultivation• Carrier systems and cell colonizations• Coating of technical materials with bioactive capturing molecules• Coating of biodegradable biomaterials with biologically active factors• Extra- and intracorporeal bioartificial organs and bioreactors for organ replacement*		
Requirements for Obtaining Credit, Grading, Weight if appl.	*Graded examination*		
Prerequisite			
Registration	*Registration via Erasmus Coordinator*		

Module Code: MSc-MEDSTR-BM14-22	**Module Title:** *Python-Course*		**Type of Module:** elective
CP (ECTS Credits)	6		
Workload **- Time in Class** **- Self-Study**	*Total Workload:* *180 h*		
Duration	*1 semester*		
Study Cycle	*Bachelor and Master*		
Frequency	*The course is offered in winter term*		
Language of Instruction	*English*		
Forms of Teaching and Learning	*Practical course*		
Content	*The Python Programming Fundamentals is an immersive and comprehensive course designed to equip students with a strong foundation in Python, one of the most popular and versatile programming languages. Throughout this course, students will embark on a journey that takes them from the basics of Python syntax to advanced concepts, enabling them to become proficient Python programmers. The main covered topics are data structures, operators and control structures, functions, I/O operations, object-oriented programming and several advanced libraries for tasks such as data analysis.*		
Requirements for Obtaining Credit, Grading, Weight if appl.	*Graded examination*		
Prerequisite	*The course is designed for students with little or no programming background.*		
Registration	*Registration via Erasmus Coordinator*		

Module Code: MT24_K1	**Module Title:** *Fundamentals and Ethical-Legal Dimensions of AI in Medicine*		**Type of Module:** elective
CP (ECTS Credits)	3		
Workload **- Time in Class** **- Self-Study**	*Total Workload:* *90 h*		
Duration	*1 semester*		
Study Cycle	*Bachelor and Master*		
Frequency	*The course is offered in summer term*		
Language of Instruction	*English*		
Forms of Teaching and Learning	*Online-Course*		
Content	*Course aims to develop a cross-faculty curriculum on AI in medicine, integrating elements from medicine, life sciences, mathematics, statistics, and computer science. This curriculum will also address ethical, legal, and societal dimensions of AI. Participants can choose courses based on their prior knowledge, with a focus on the use of machine learning in medical research and practice. Additionally, workshops on visual science communication, teaching skills to create visual abstracts will be offered. Learning materials are provided through an online platform, featuring videos, quizzes, and exercises*.		
Requirements for Obtaining Credit, Grading, Weight if appl.	*Graded examination*		
Prerequisite			
Registration	*Registration via Erasmus Coordinator*		

Module Code in ALMA: *MED-Imm (Bio-4002)*	**Module Title:** *Advanced Immunology*		
CP (ECTS Credits)	*3*		
Workload **- Time in Class** **- Self-Study**	*Total Workload:* *90 h*	*Time in Class:* *30 h / 2 CH*	*Self-Study:* *60 h*
Duration	*1 semester*		
Study Cycle	*Master*		
Frequency	*The lecture is offered once per year in the winter semester*		
Language of Instruction	*English*		
Forms of Teaching and Learning	*Lecture*		
Content	*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.* *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.* *Thematic focus:* *Introduction and evolution of immune systems* *Therapeutic antibodies* *Computational immunology* *T-cell populations* *Cell-cell-communication and signal transduction in immune systems* *Immunity in the intestine* *Immunodeficiency – strategies/mechanisms of pathogens* *Function of neutrophil granulocytes* *MHC and antigen processing* *Immunopathology* *Pattern-recognition receptors in immune response: Recognition and regulation*		
Objectives	*The course provides important and up-to-date knowledge of cellular and molecular immunology.* *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*		

	After completion of this module, students will have acquired a specialized knowledge and understanding of innate and adaptive immunology.								
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	*Knowledge of Basic Immunology*								
Module Leader	*Weber, Alexander N. R., Prof., PhD*								
Literature/ teaching materials	*Janeway's Immunobiology (Murphy, Travers, Walport), Garland Science, New York, 2008, 2012* *Teaching materials will be announced at the beginning of term.* *Further teaching materials will be available on the web page of the Department of Immunology.*								

Module Code: *S01VMMOLMED03*	**Module Title:** *Advanced Oncology*		**Type of Module:** elective
CP (ECTS Credits)	*3*		
Workload **- Time in Class** **- Self-Study**	*Total Workload:* *90 h*	*Time in Class:* *30 h / 2 CH*	*Self-Study:* *60 h*
Duration	*1 semester*		
Study Cycle	*Master*		
Frequency	*The lecture is offered once per year in the winter term*		
Language of Instruction	*English*		
Forms of Teaching and Learning	*Lecture*		
Content	*The Advanced Oncology lecture intends to provide deep knowledge on the molecular basis of tumor development, the modern molecular approaches of tumor diagnostics, and state-of-the-art cancer therapy strategies. Advanced experimental models to study several aspects of tumorigenesis will also be addressed. The students will acquire deep insight into molecular and translational oncology with respect to* ● *Molecular mechanisms of cancer development* o *Cancer stem cells* o *Chemokine signaling and Cancer* o *Intravital microscopy for understanding microenvironmental control of tumor progression and therapy resistance* ● *Molecular diagnostics* o *Molecular Imaging in Oncology* ● *Experimental models of cancer* o *Dissecting the tumor microenvironment by highly multiplexed single-cell technologies* o *Current progress in cancer disease modeling using iPSCs, organoids, gene editing with CRISPR nucleases* ● *Molecular strategies in cancer therapies* o *Current approaches in pediatric cancer immunotherapy* o *RNA-Based Medicines in Hematology/Oncology and Beyond* o *De novo design of protein-based therapeutics* *In addition to the theoretical backgrounds provided during the lecture series, current research projects and cutting-edge experiments will be presented. This will give the students a better insight into the experimental field of oncology.*		
Objectives	*After completion of this module, students will have acquired specialized knowledge and understanding of the basic mechanisms of neoplastic transformation and cancer development. They will also become familiar with the state-of-the-art*		

	methods of diagnostics and therapy of neoplasms as well as experimental cancer models and modern techniques to study oncogenesis.								
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	*Good knowledge in cell & molecular biology and genetics. Basic knowledge in oncology.*								
Module Leader	*Skokowa, Julia, Prof., Dr. med., Ph.D.*								
Literature/ teaching materials	*Teaching materials will be available on the electronic platform ILIAS.* *The Biology of Cancer (Robert Weinberg)*								

Module Code: *S01VMMOLMED04*	**Module Title:** *Advanced Infection Biology*		**Type of Module:** elective
CP (ECTS Credits)	*3*		
Workload **- Time in Class** **- Self-Study**	*Total Workload:* *90 h*	*Time in Class:* *30 h / 2 CH*	*Self-Study:* *60 h*
Duration	*1 semester*		
Study Cycle	*Master*		
Frequency	*The lecture is offered once per year in the winter term*		
Language of Instruction	*English*		
Forms of Teaching and Learning	*Lecture*		
Content	*The lecture on Advanced Infection Biology is intended to provide further knowledge on the molecular basis of* *- Viral control of translation* *- trafficking of viral components* *- reverse transcription and integration* *- evolution and emergence of viruses* *- Bacteria-phagocyte interaction* *- In vivo infection models* *- DNA sequencing techniques, protein expression systems* *- Flow cytometry* *- Malaria vaccines* *- Drug resistance of Plasmodium falciparum* *- Reverse genetics in Plasmodium falciparum* *- Helminths and allergies* *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.*		
Objectives	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.		

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*

	Module Component	*L*	*e*	*2*	*3*	*W*	*90*	*g*	*100*
Aplicability / Transfer	*M.Sc. in Molecular Medicine*								
Prerequisites	*Good knowledge in cell & molecular biology and genetics.*								
Module Leader	*Schindler, Michael, Prof., Dr. biol. hum.*								
Literature/ teaching materials	*Teaching materials will be available on the electronic platform ILIAS.*								

Module Code: *WPM 21* S08SMOLMED04	**Module Title:** *CNS-Metastasis*		**Type of Module:** elective
CP (ECTS Credits)	3		
Workload **- Time in Class** **- Self-Study**	Total Workload: 90 h	Time in Class: 5 days (block seminar) 30 h / 2 CH	Self-Study: 60 h
Duration	1 semester		
Frequency / Number of participants	The lecture is offered once per year in the summer semester; Maximum of 15 students.		
Language of Instruction	English		
Forms of Teaching and Learning	Block seminar with lectures, group work, exercises		
Content	Definition of CNS metastasis, epidemiological aspects, basic scientific findings, state of research, current status of clinical treatment and clinical trials		
Objectives	Subject-specific qualification objectives: • Students are able to distinguish between the different forms of CNS metastasis and their characteristics. • Students can communicate current basic scientific findings on CNS metastasis with a focus on tumor-intrinsic properties and influences of the tumor microenvironment. • Students are able to understand clinical challenges related to this topic. • Students are familiar with current clinical study designs. • Students can comprehensively understand and retrace unresolved issues. • Students can design a research project based on research questions.		

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	*S*	*e*	*2*	*3*			*ug*	
	No grading, attendance check—80% attendance required for credit; active participation in discussions.								

Prerequisites	This WPM is designed for bachelor's and master's degree programs. Prerequisite: Bachelor's degree in molecular medicine, biology, biochemistry; **basic lecture in neurobiology/neuroscience.**
Registration	Register via Alma

Module Code: GTCNEURO	**Module Title:** *METHODS IN PROJECT MANAGEMENT*		**Type of Module:** elective
CP (ECTS Credits)	*3*		
Workload **- Time in Class** **- Self-Study**	*Total Workload:* *90 h*	*Time in Class:* *30 h / 2 CH*	*Self-Study:* *60 h*
Duration	*1 semester*		
Study Cycle	*Bachelor and Master*		
Frequency	*The course is offered in summer semester*		
Language of Instruction	*English*		
Forms of Teaching and Learning	*12 weeks, 1.5 h/week + self study,* *6 themes (2 weeks each) consisting of self study theory (concise, visual material) and interactive in-class* *elements such as guest lecturers, workshops, and role plays.*		
Content	*Learn how to plan, scope, and complete projects* *effectively.* *Build transferable skills in communication and teamwork.* *Apply project management tools directly to your thesis,* *internship, or future career.* *Innovative teaching: AI-supported reflection assignments*		
Requirements for Obtaining Credit, Grading, Weight if appl.	*Assessment: assignment completion and attendance*		
Prerequisites	*A Placement Test is required for the course registration. You will be contacted for the Placement Test by the Teaching staff shortly for Semester start*		
Registration	*You will be registered by Erasmus Coordinatorr*		

Module Code	Title: *Biomedical Technologies in Diagnostic and Therapy*			Nature: compulsory
Credit points	6 CP			
Work load **- contact hours (SWS)** **- self study**	Total: 180 h contact hours: 60 h (2 SWS per semester) self-study (preparation for exams included): 120 h			
Duration	1 semester			
Time schedule	The module is offered only in the winter term.			
Language	English			
Study Cycle	Master			
Structure /Teaching methods	lecture (4 SWS)			
Contents	The course provides important and up-to-date knowledge of different biomedical technologies: Heart-lung machine, artificial respiration, anaesthetic technique, computer-assisted surgery, electromedical technique, electronic implants, rehabilitation technology, biocompatible prosthesis, biomedical laser applications			
Objectives	After completion of this module, students will be able to understand the state-of-the-art technologies, modern methodologies and open questions in selected fields of biomedical technologies. The students know a selection of relevant biomedical technologies and can analyse compare the advantages and disadvantages. The students are able to evaluate biomedical technologies and know the different requirements for the use of biomedical technologies			
Requirements for credit points / exams and grading scheme (where appropriate, weighting)	course	assessment	Grading scheme	weighting
	Biomedical Technologies in Diagnostic and Therapy	Written examination	1-5	6 ECTS
Registration	Registration via Erasmus coordinator			

<table>
<tr><th>Module Code</th><th colspan="4">Title:
Laboratory Techniques and Methods</th><th>Nature:
compulsory</th></tr>
<tr><td>Credit points</td><td colspan="5">3 CP</td></tr>
<tr><td>Work load
- contact hours (SWS)
- self study</td><td colspan="5">Total: 90 h
contact hours: 30 h (2 SWS per semester)
self-study (preparation for exams included): 60 h</td></tr>
<tr><td>Duration</td><td colspan="5">1 semester</td></tr>
<tr><td>Time schedule</td><td colspan="5">The module is offered once per year in the winter term.</td></tr>
<tr><td>Language</td><td colspan="5">English</td></tr>
<tr><td>Study Cycle</td><td colspan="5">Master</td></tr>
<tr><td>Structure /Teaching methods</td><td colspan="5">lecture (2 SWS)</td></tr>
<tr><td>Contents</td><td colspan="5">The course provides important and up-to-date knowledge of different basic and state-of-the-art laboratory techniques. These techniques include general good scientific practice and statistical analysis, providing the base for every scientific work. Specific techniques covered in this program include, but are not limited to cell culture, xNA isolation, live cell imaging using advanced microscopic and spectroscopic techniques, lab-on-a-chip approaches and molecular interactions.
<u>Thematic focus:</u>
- molecular biology, cell culture, DNA, RNA and protein isolation, molecular interactions, surface refinement, opt. spectroscopy, microsystems engineering, lab-on-a-chip, live cell imaging, FACS, electron microscopy
- research methodologies, experimental design
- good scientific practice</td></tr>
<tr><td>Objectives</td><td colspan="5">After completion of this module, students will be able to understand the theory behind the different reviewed laboratory techniques and methods. Additionally, students will be able to plan experiments to answer scientific questions (ranging from molecular biology to biochemical composition of materials) by identifying and choosing suitable analytical methods. Additionally, students will gain the expertise to analyze, interpret and statistically evaluate data and results obtained from the taught methods under good scientific practice aspects.</td></tr>
<tr><td rowspan="2">Requirements for credit points/exams and grading scheme (where appropriate, weighting)</td><td>course</td><td>assessment</td><td>Grading scheme</td><td colspan="2">weighting</td></tr>
<tr><td>Laboratory Techniques and Methods</td><td>Written exam</td><td>1-5</td><td colspan="2">3 ECTS</td></tr>
<tr><td>Applicability</td><td colspan="5">M.Sc. in Biomedical Technologies (mandatory course) and M.Sc. in Medizinische Strahlenwissenschaften/Medical Radiation Sciences (elective course)</td></tr>
<tr><td>Recommended semester</td><td colspan="5">1st semester</td></tr>
<tr><td>Registration</td><td colspan="5">Registration via Erasmus Coordinator</td></tr>
</table>

Module Code	Title: *Regulatory Affairs of Medical Devices*	Nature compulsory
credit points	3 CP	
work load **- contact hours (SWS)** **- self study**	Total: 90 h contact hours: hybrid 30 h (2 SWS per semester) self-study (preparation for exams included): 60 h	
Duration	1 semester	
Time schedule	The module is offered only in the summer term.	
Language	English	
Study cycle	Master	
Structure /Teaching methods	- Pre-recorded lectures which will be updated regularly - seminar 1x per month - 1 compulsory online questionnaires for every lecture - Total 2 SWS Pre-recorded lectures will be made available to the students, it is their individual responsibility to study the subject. In the case of regulatory affairs, pre-recorded lectures are well suited, as the turnover rate of the legal foundation, on which they are based, is slow compared to technological advancements. Nevertheless, lectures will be updated as soon as new laws and requirements arise. Progress will be monitored via compulsory online questionnaires (1 questionnaire per lecture, 3-5 multiple choice questions per lecture), which need to be completed within 1 week after the lecture. Questionnaires will be graded in the standard grading scheme (1-5). Missed questionnaires will be graded with 5. Seminars will be held once per month to summarize lecture topics and clarify questions.	
Contents	Thematic focus: - regulatory affairs, patents, quality control, audits, startups - quality, risk and project management - incorporation of industry-based lectures The course provides important and up-to-date knowledge regarding regulatory affairs in the field of medical devices. The students will learn about the implemented mandatory safety strategies that ensure high quality materials and products in both academia and industry. These include, yet are not limited to, regulatory affairs, patenting and auditing. Additionally, measures to maintain quality will be highlighted by experts from academia and industry, including quality control and management. As universities are encouraging students to found spin-offs, students will gain insights on the objectives, hurdles and opportunities of creating their own startups from knowledgeable experts.	
Objectives	After the course, students will be able to - classify medical devices in corresponding regulations - recapitulate requirements for medical device in order to be patented and approved - describe the life cycle of a medical device from patenting to approval including mandatory quality control measures - recapitulate methods to ensure quality in an academic and industrial context	

Requirements for credit points / exams and grading scheme (where appropriate, weighting)	course	Assessment consists of following parts	Grading scheme	weighting
	Regulatory Affairs of Medical Devices	Final test 1 online questionaires per lecture 1 seminar presentation	1-5 1-5 1-5	1.5 ECTS (50%) 0.6 ECTS (20%) 0.9 ECTS (30%)
	All grades from the online questionnaires throughout the semester will be averaged and count 20% of the overall grade. A minimum passing grade (4.0) on average is a prerequisite to be eligible for the final test.			
Registration	Registration via Erasmus Coordinator			

Module Code	**Title:** *Clinical Cases and Consequences for Medical Devices*			**Nature** compulsory
Credit points	6 CP			
Work load **- contact hours (SWS)** **- self study**	Total: 180 h contact hours: 60 h (4 SWS) self-study (preparation for exams included): 120 h			
Duration	1 semester			
Time schedule	The module is offered once a year in Summer Term.			
Language	English			
Study Cycle	Master			
Structure /Teaching methods	lecture (4 SWS)			
Contents	Thematic focus: The course provides up-to-date knowledge of different clinical cases (e.g., brain diseases), diagnostic and therapeutic procedures (e.g., neuromodulation), the potential, limitations and future perspectives of medical technology devices.			
Objectives	After completing the module, students will have - knowledge of the symptoms, pathophysiology, demographics and epidemiology of different clinical cases, - an understanding of different diagnostic and therapeutic procedures, - the ability to assess the potential and limitation of pharmacological and non-pharmacological interventions, - knowledge of the state-of-the-art of medical technology devices and the skill to evaluate them from a clinical perspective, - an understanding of unresolved therapeutic challenges and the ability to develop ideas and strategies to overcome them, - the ability to anticipate future trends and perspectives in medical technology.			
Requirements for credit points / exams and grading scheme (where appropriate, weighting)	course	exam	Grading scheme	weighting
	Clinical Cases and Consequences for Medical Devices	Written exam	1-5	6 ECTS
Registration	Registration via Erasmus Coordinator			

Number: S2V or E2	**Title:** *NanoBioAnalytics – Lecture and Seminar*	**Nature:** specialization
Credit points	6 CP	
Work load **- contact hours (SWS)** **- self study**	Total: 180 h contact hours: 60 h self-study (preparation for exams included): 120 h	
Duration	1 semester	
Time schedule	The module is offered twice a year in winter and summer term	
Language	English	
Study Cycle	Master	
Structure /teaching methods	NanoBioAnalytics Lecture (2 SWS) and NanoBioAnalytics Seminar (2 SWS)	
Contents	Thematic focus: - Introduction to nanophysics, fundamentals of nanotechnology, statistical physics, soft matter and polymer physics, mechanics of cells and tissues, physics of the cytoskeleton, cellular forces, motor proteins, methods in nanobiophysics, high resolution microscopy techniques, micro- and nanofluidics, lab-on-a-chip technology - Discussion of current research topics in the field of nanotechnology and nanoanalytics for medical applications - Student prepare and present seminar talks with 30 minutes duration about selected topic and discuss them afterwards	
Objectives	The module conveys the basics and in-depth knowledge of nanoanalytics and biophysics. After attending the module, students - understand the basic phenomena, terms and concepts of nanoanalytics and biophysics - can solve simple problems in the field of nanoanalytics and biophysics - understand the connections between the various aspects of nanoanalytics and biophysics - have the knowledge to critically discuss current fields of biomedical research - can compare and evaluate different nanoanalytical tools for different applications and sample types - have the competence to independently study a scientific research topic and present it in the form of an oral seminar talk - have the competence to critically read, review, and discuss scientific studies and results - have the competence to plan and schedule the preparation of their presentation - are able to communicate in an understandable way about the above-mentioned technical content - have experience with testing different styles, techniques, and media for oral presentations	

Requirements for credit points / exams and grading scheme (where appropriate, weighting)	course	assessment	Grading scheme	weighting
	NanoBioAnalytics Lecture	Written Examination	1-5	50%
	NanoBioAnalytics Seminar	Oral presentation (30 min presentation + 15 min discussion)	1-5	50%
Applicability	M.Sc. in Biomedical Technologies (specialization and elective course) and M.Sc. in Medizinische Strahlenwissenschaften/ Medical Radiation Sciences (elective course) and elective course for students of M.Sc. Medical Engineering Univ. of Stuttgart. For elective courses only, the lecture is applicable.			
Recommended semester	1st or 2nd semester			
Participation requirements	Basic Knowledge in Biology and Physics			
Registration	Register via Erasmus Coordinator			
Literature / Teaching materials	Literature will be announced at the beginning of term.			

Number: S3V	**Title:** *Biomedical Engineering – Lecture*			**Nature:** specialization
Credit points	3 CP			
Work load **- contact hours (SWS)** **- self study**	Total: 90h contact hours: 30 h self-study (preparation for exams included): 60 h			
Duration	Block course in April-May			
Time schedule	The module is offered once per year in the summer term as block course			
Language	English			
Study Cycle	Master			
Structure /teaching methods	lectures			
Contents	<u>Thematic focus:</u> - Tissue engineering: cell biology, biomaterials, extracellular matrix (ECM), micropatterning - Implants: ATMPs, cell-/material interface, host response, biostability, biocompatibility - Bioengineered in vitro models: Spheroid, transwell models, hydrogels and bioprinting, organoids, organ-on-chip and multi-organ-chips			
Objectives	Students - Get fundamental overview over in vitro models as alternatives to animal models from the development to regulatory acceptance and use, with their advantages, limitations, and applications - Gain insight in the most recently established technologies and basics of microfabrication and additive fabrication - Gain knowledge of ECM (focus on collagen and elastic fibres), properties of biomaterials, cell-ECM interactions - Understand the coupling and interaction between technical implants and tissue, material and bio-compatibility, rejection, knowledge about the passivation of surfaces and technical body parts of all kinds, principles of sensory and motor function			
Requirements for credit points / exams and grading scheme (where appropriate, weighting)	course	assessment	Grading scheme	weighting
	Lecture	Written/oral exam	1-5	100%
Registration	Registration via Erasmus Coordinator			

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Number: E13	**Title:** *Ethical and Social Aspects of Biomedical Technologies*			**Nature:** Elective course
Credit points	3 CP			
Work load **- contact hours (SWS)** **- self study**	Total: 90 h contact hours: 30 h self-study (preparation for exams included): 60 h			
Duration	1 semester			
Time schedule	The module is offered once per year in the winter term			
Language	English			
Study Cycle	Master and Bachelor			
Structure /Teaching methods	Seminar (2 SWS)			
Contents	Basics: - What makes and innovation a good innovation? - What are ethical and social aspects of biomedical technologies? - How to deal with those aspects? Joint case study of a particular biomedical technology: - What is the case? - How can we detect ethical and social aspects of the case? - How to deal with those aspects? Individual case studies of the technologies the students develop in their master thesis: - Which ethical and social aspects has my own work? - How can I deal with them?			
Objectives	- The students reflect their criteria for good innovations and get to know the debates about responsible, sustainable innovation. - The students get an idea of what ethical and social questions are. They become familiar with ethical and social scientific research on biomedical technologies. - The students are empowered to detect and to discuss ethical and social aspects of the technologies they develop. They get to know tools which support ethical and social reflections.			
Requirements for credit points / exams and grading scheme (where appropriate, weighting)	course	assessment	Grading scheme	weighting
	Seminar	Presentation during Seminar and writing of a reflection paper	1-5	3 ECTS
Registration	Register via Erasmus Departmental Coordinator			

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ALMA Code: GTCNEURO	**Title:** *MRI-applications for neuroscientific and clinical research*			**Nature:** Elective course
Creditpoints	6 CP			
Work load **- contact hours (SWS)** **- self study**	Total: 90h Contact hours:30 h Self-study: 60h			
Time schedule	The module is offered only in summer term			
Language	English			
Study Cycle	Master			
Structure/Teaching methods	Lecture and seminar			
Contents	MRI has widely increased our knowledge about the structure and function of the human brain. The continuous development of new technologies and methods in this field allow investigations to be carried out at an ever-increasing level of detail. In this course, established and emerging methods that allow robust and reproducible quantification of physiologic and pathologic processes will be taught. Topics include: - Non-invasive imaging of tissue - MR principles - Tissue structure and MRI of gray matter regions - White matter (WM) microstructure and diffusion weighting (DWI) - Mapping long-range connections, brain plasticity and neurodegeneration using DWI - MRI of WM using non-diffusion techniques - Mapping brain function, structure: connectome networks and radiomics - How structure and function modify local magnetic susceptibility - Contrast agents for cell-labelling and studies of the 'glymphatic' system - Neurochemistry and multi-nuclear magnetic resonance spectroscopy - MRI at high magnetic field strengths – Visit of the MRZ			
Objectives	After completion of the module students know how does connectivity analyses relate to the progression of neurodegenerative diseases. They are able to investigate the anatomical microstructure. Students can measure the function of the blood-brain-barrier. Students follow the fate of stem-cells within the anatomical microstructure by MR.			
Requirements for credit points / exams and grading scheme (where appropriate, weighting)	Lecture / Seminar	assessment	Grading scheme	weighting
	M.Sc. in Biomedical Technologies (elective course)	Final report 8-15 pages	Passed/failed	6 ECTS
Registration	Register via ALMA			

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ALMA Code: PHY-VFNBPRM	**Title:** *NanoBioPhysics and scanning probe microscopy*			**Nature:** Elective course
Credit points	3 CP			
Work load **- contact hours (SWS)** **- self study**	Total: 90 h contact hours: 30 h self-study (preparation for exams included): 60h			
Duration	1 semester			
Time schedule	The module is offered once per year in the summer term			
Language	German or English			
Study Cycle	Master			
Structure/Teaching methods	Lecture (2 SWS)			
Contents	<u>Thematic focus:</u> - Interactions on the nanoscale, measurement of inter- and intramolecular forces, contact models, technology of scanning probe microscopy, mechanical oscillations of nanostructures such as cantilevers, static and dynamic imaging modes, atomic force microscopy.			
Objectives	The module conveys the basics and in-depth knowledge of NanoBioPhysics and Scanning Probe Microscopy. After attending the module, students - have become familiar with a young field of nanobio-science - have acquired fundamental knowledge about the area of NanoBioPhysics - have learned interdisciplinary methods and applications of scanning probe microscopy - understand the basic phenomena, terms and concepts of NanoBioPhysics and Scanning Probe Microscopy - can solve simple problems in the field of NanoBioPhysics and Scanning Probe Microscopy - understand the connections between the various aspects of NanoBioPhysics and Scanning Probe Microscopy - have acquired experience in mathematically formulating and solving simple linear differential equations			
Requirements for credit points / exams and grading scheme (where appropriate, weighting)	course	assessment	Grading scheme	weighting
	Lecture	Written exam (ca. 90 min) or oral exam	1-5	3 ECTS
Registration	Register via ALMA			