UMIT TIROL
DIE TIROLER PRIVATUNIVERSITÄT

Master Program Medical Informatics

Leading to the academic degree of
„Master of Science in Medical Informatics (MSc)“

§ 1 Program-specific regulations

(1) In accordance with Article I § 1 (2) in conjunction with Article II § 1 (2) of the Study and Examination Regulations, the Senate, by decision on June 8, 2021, enacted the following "Program-Specific Regulations" and amended them by decision on July 5, 2023. They constitute an integral part of the current Study and Examination Regulations and come into effect on the day following their announcement.

(2) The "Program-Specific Regulations" for the Master's program in Medical Informatics include:

1. Qualification profile (§ 2)
2. Special admission requirements, admission procedure (§ 3)
3. Academic year, academic achievements (§ 4)
4. Curriculum (including module and course descriptions) (§ 5)
5. Specific requirements for the thesis (§ 6)

§ 2 Qualification profile

(1) The Master's program in Medical Informatics provides an in-depth, scientifically and methodologically oriented qualification for demanding professional activities in the field of medical informatics and related areas. It empowers students for independent scientific research while simultaneously enabling them to practically conceive, develop, and apply methods and tools in the field of medical informatics.

(2) Specifically, graduates acquire the following competencies:

(1) They recognize and analyze complex medical informatics problems from research and practice, even in unfamiliar situations, and develop and evaluate solution approaches based on the current state of research and technology, considering relevant laws and professional ethical aspects.

(2) They conceptualize, implement, manage, and evaluate information systems in healthcare from both tactical and strategic perspectives, within healthcare

institutions and across institutions, in close collaboration with other professionals from healthcare and medical technology.

(3) They identify, model, integrate, analyze, and visualize health-related data and information, contributing to the answering of relevant clinical or scientific questions and the generation and utilization of this new knowledge in healthcare.

(4) They independently and self-organizedly conceptualize projects and can implement and evaluate them responsibly and goal-oriented, even in leadership positions, according to common standards.

(5) They are competent in working in interdisciplinary teams, recognizing different perspectives and communicating their own positions and results professionally and audience-appropriate in both German and English.

(6) They can systematically address scientific questions, considering the international state of research, using appropriate research methods, and avoiding scientific misconduct, thereby contributing to the progress of science and communicating results in the international scientific community.

(7) They independently and self-organizedly acquire knowledge on new topics, methods, and procedures in medical informatics (lifelong learning) and critically reflect on their practical applicability. This allows them to bring new knowledge into their work area and drive innovations and developments.

(8) They reflect on the ethical, regulatory, and practical aspects of medical informatics solutions in healthcare and critically evaluate solution concepts from this perspective.

(3) The Master's program enables graduates to engage in diverse professional activities in both public and private healthcare institutions, especially in hospitals, nursing and social facilities. Graduates can also pursue careers in the Health IT industry (software, hardware, medical technology), Health IT consulting firms, social insurance institutions, statutory health insurances, universities, and other research institutions, as well as with manufacturers of medical products, health authorities, public service, and public administration.

(4) Depending on prior qualifications, individual specialization, and professional experience, graduates have various career opportunities, including but not limited to IT project management or team and departmental leadership in healthcare institutions or health networks, roles in requirements engineering, solution engineering, software development, product management, software quality assurance, sales or customer management, involvement in the approval and quality management of medical products, consultancy for healthcare institutions, clinical data analysis, research and development departments, as well as participation or leadership in academic research projects. The

qualification profile ensures international comparability of education while also considering the regional context.

§ 3 Special Admission Requirements, Admission Procedure

(1) In addition to the admission requirements outlined in Article I § 4, the following special conditions must be demonstrated for admission to the Master's program in Medical Informatics:

a) Completed university studies (at least a Bachelor's degree or equivalent) at a recognized domestic or foreign post-secondary educational institution in the field of Medical Informatics or Computer Science, or equivalent studies.

b) Completed university studies (at least a Bachelor's degree or equivalent) at a recognized domestic or foreign post-secondary educational institution in an engineering or technical field (e.g., studies in Mechatronics, Electrical Engineering, Biomedical Engineering, Business Informatics) with a curriculum containing a minimum of 30 ECTS credits in computer science. Additionally, the applicant must have successfully completed a supplementary examination in the field of Practical Computer Science as specified in paragraph (4).

c) Completed university studies (at least a Bachelor's degree or equivalent) at a recognized domestic or foreign post-secondary educational institution in a natural science or business science field (e.g., Medicine, Biostatistics, Epidemiology, Physics, Biochemistry, Biology, Molecular Biology, Molecular Medicine, Business Administration, International Management). In this case, an additional postgraduate education or postgraduate program in Computer Science, Medical Informatics, or Biomedical Engineering, comprising a minimum of 60 ECTS credits at a recognized domestic or foreign post-secondary educational institution, must also be successfully completed.

(2) In individual cases, the Study and Examination Committee may, analogous to Article I § 4 (5) of the Study and Examination Regulations of UMIT TIROL, prescribe a supplementary examination for the recognition of qualifications other than those mentioned in paragraph (1). The content, extent, scope, and format of the supplementary examinations are determined on a case-by-case basis by the Study and Examination Committee and must be successfully completed by the end of the first semester at the latest. The supplementary examination(s) can be repeated once. If the repetition of the supplementary examination is also unsuccessful, the admission according to Article I § 5 (2) expires.

(3) The Study and Examination Committee reserves the right to impose a supplementary examination, analogous to Article I § 4 (5) of the Study and Examination Regulations of UMIT TIROL, for the subject "Medical Terminology" (see Module Handbook) on applicants without demonstrable knowledge in medical terminology.

(4) Adequate German language skills for the study will be recognized if a school leaving certificate from a German-speaking school is presented or the completion of a German-speaking study of at least 2 years is demonstrated. Alternatively, a current language certificate (not older than 2 years, language level at least B2) can be submitted. Adequate English language skills for the study will be recognized if a positive English grade is evident in the school leaving certificate or the most recent annual certificate issued by a school in the EU/EWR area, including Switzerland, or if at least a 2-year study in English has been successfully completed. Alternatively, a current language certificate (not older than 2 years, language level at least B2) can be submitted. If these proofs cannot be provided in advance, applicants will have the opportunity to credibly demonstrate sufficient language skills in the admission interview. If the proof is not convincingly provided, the Study and Examination Committee may impose a supplementary examination as a prerequisite for admission. This examination must be completed within the first academic year.

(5) The formal fulfillment of the specified admission requirements does not guarantee admission to the program. In the Master's program in Medical Informatics, a mandatory admission interview is required.

(6) The examination of all documents to be submitted (including graduation certificates, curriculum vitae, motivation letters) and the fulfillment of the special admission requirements (according to § 3 (1)) in connection with Article I § 4 of the Study and Examination Regulations is carried out by a person appointed by the Study and Examination Committee, who is professionally qualified for this task.

(7) If the fulfillment of the specified admission requirements is confirmed, the Study and Examination Committee invites the applicant to an admission interview. The admission interview is conducted by a qualified member of the Study and Examination Committee or a person appointed by them, who is professionally qualified for this task. The interview typically lasts about 30 minutes and can take place in person, over the phone, or through an online video conference. The results of the discussion are to be documented. During the admission interview, the prior experiences and existing entry competencies, personal motivation, and the fit between the study profile and the expectations of the applicant are discussed. The person conducting the admission interview, taking into account all submitted documents and based on the interview results, provides a recommendation on

admission to the study to the Study and Examination Committee.

(8) The Study and Examination Committee makes the decision on admission to the program based on the documents submitted during the admission process and the impressions gained.

§ 4 Academic Year, Academic Achievements

(1) Courses for the Master's program in Medical Informatics take place from October 1st to September 30th each year.

(2) All required academic achievements are outlined in the following curriculum and are indicated in ECTS credits. The total ECTS credits for the successfully completed Master's program in Medical Informatics amount to 120 ECTS credits.

(3) The Study and Examination Committee is authorized (Article I § 20) to recognize previously completed training, further education, and professional development, including corresponding academic achievements (Article I § 4 (5)). Suitable evidence must be provided to the Study and Examination Committee for the recognition, enabling the determination of the equivalence of the prescribed examinations in the curriculum. It is noted that any prior achievements considered during the admission process (a procedure separate from recognition applications) according to Article I § 4 of the Study and Examination Regulations in conjunction with § 3 of the Program-Specific Provisions, in whatever form, cannot be additionally credited as academic achievements.

§ 5 Curriculum

(1) The standard duration of study, including the completion of the written thesis (Master's thesis) and the successful completion of all examinations, is four semesters. The maximum duration of study is eight semesters.

(2) The program is structured in modules and is primarily conducted online.

(3) The description of the modules and their courses is documented in Annex 1, "Module Handbook Master's Program in Medical Informatics."

(4) Unless otherwise indicated in the study plan, the modules consist of a combination of virtual contact hours and guided self-study phases following a blended learning approach. This is designed in a manner suitable for ensuring the achievement of the learning objectives for each module. Additionally, for Module 13, on-site presence at UMIT TIROL may be defined. Moreover, networking days at UMIT TIROL are offered per semester with optional participation.

(5) Module coordinators have the authority to establish attendance requirements for on-site and virtual contact hours. In cases of absence, missed time or periods must be compensated through individually agreed-upon additional activities. Decisions regarding this matter are at the discretion of the respective module coordinators.

(6) The language of instruction is both German and English.

(7) Within the compulsory Module 14 (Advanced Methods in Medical Informatics), students can choose between courses offered in the Master's Program in Mechatronics or the Master's Program in Public Health. Registration for the selected courses must be completed by the student at the beginning of the third semester. If the Study and Examination Committee determines equivalence, up to 15 ECTS credits of the required study performance can also be fulfilled through participation in university-related, related summer or winter schools or by taking relevant courses from other programs at UMIT TIROL or other post-secondary educational institutions. In this case, an application for approval and recognition must be submitted to the Study and Examination Committee in advance.

(8) The academic degree "Master of Science in Medical Informatics (MSc)" will be awarded when, within the applicable deadlines, all modules, including the written thesis (master's thesis) and the oral final examination, have been successfully completed, thereby fulfilling the prescribed workload of 120 ECTS credits.

§ 6 Specific Requirements for the Thesis

(1) The written master's thesis (thesis) with a workload of 27 ECTS credits is to be completed in the fourth semester. The topic must be structured in a way that allows for completion within 6 months. An extension of the deadline is possible upon request to the study and examination committee, for a maximum of six additional months.

(2) An exposé for the master's thesis must be submitted at the beginning of the fourth semester. The exposé outlines the problem statement, state of research, objectives, planned approach and methods, expected results and impact, as well as a work plan for the master's thesis. The study and examination committee decides on the acceptance of the exposé and the approval of the master's thesis; it may reject the exposé for revision.

(3) In the master's thesis, the student addresses a scientific question in the field of Medical Informatics.

(4) Topics for the master's thesis can be offered by any academically qualified instructors in the Master's program in Medical Informatics. Students should be given the opportunity to propose their own topics, which should originate from the areas of modules they have

successfully completed.

(5) If a candidate has made unsuccessful attempts to obtain a topic for the master's thesis, the Chair of the Study and Examination Committee ensures, upon request, that they are assigned a topic.

(6) The thesis can be written in English or German. In any case, the thesis must include a summary in both English and German.

(7) The students will be supported in the execution of the thesis through a dedicated course (Master-Collegium). In this collegium, aspects of planning, developing, and presenting a research project, as well as concepts for creating a master's thesis, will be taught. Guidance and support for the research question and data analysis will also be provided.

(8) The oral final examination, worth 3 ECTS credits, consists of a presentation in English or German about the completed master's thesis, followed by a discussion led by two examiners. The duration of the oral final examination is approximately 45 minutes and must not exceed 60 minutes. The oral final examination takes place on-site at UMIT TIROL.

Hall in Tirol, 05.07.2023

Univ.-Prof. Dr. Elske Ammenwerth, e.h.

Chairperson of the Study and Examination Committee Master's Program in Medical Informatics

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Annex 1:

Module Manual

Master's Program in Medical Informatics

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Module Manual

Master's Programm in Medical Informatics

(Academic Degree: Master of Science in Medical Informatics;
Workload: 120 ECTS-Credits)

of the

UMIT TIROL – Private University for Health Sciences and Health Technology

(Adopted by the Curriculum Commission for the Master's Program in Medical Informatics on July 5, 2023, confirmed by the Senate of UMIT TIROL through a resolution on June 11, 2023)

Table 1: Tabular Curriculum Master's Program in Medical Informatics

Semester	Content	ECTS Credits Overall	Contact Studies & Individual Self-Study[2] (ECTS Credits)	Guided Self-Study[3] (ECTS Credits)	*Virtual Contact Time [3](UE) in the Contact Studies*
1st Semester	Module 1: Health IT Project Management and Process Engineering	5	2	3	*20*
	Module 2: Software Product Management and Requirements Engineering	5	2	3	*20*
	Module 3: Health Data & Decision Science and Machine Learning	5	2	3	*20*
	Module 4: TeleHealth and Consumer Health Informatics	5	2	3	*20*
	Module 5: Biomedical Technologies and Interfaces	5	2	3	*20*
	Module 6: Interdisciplinary Perspectives of Medical Informatics	5	2	3	*20*
TOTAL		**30**	**12**	**18**	**120**
2nd Semester	Module 7: Health Information Systems and IT Strategy Management	5	2	3	*20*
	Module 8: IT Security and Risk Management	5	2	3	*20*
	Module 9: Data Integration for Clinical Data Analytics	5	2	3	*20*
	Module 10: Clinical Research Informatics and Infrastructures	5	2	3	*20*
	Module 11: Certification of Medical Software and Devices	5	2	3	*20*
	Module 12: Applications of Machine Learning in Health Care	5	2	3	*20*
TOTAL		**30**	**12**	**18**	**120**
3rd Semester	Module 13: Advanced Methods in Medical Informatics	15	10	5	*100[1]*
	Module 14: Applied Practice in Medical Informatics	10	1	9	*10*
	Module 15: Research Methods and Scientific Writing	5	2	3	*20*
TOTAL		**30**	**13**	**17**	**130**
4th Semester	Module 16: Master thesis (written thesis and oral exam)	30 *(27/3)*	3	27	*30*
GESAMT		**30**	**3**	**27**	**30**
TOTAL		**120**	**40**	**80**	**400**

[1] The teaching units (UEs) for Module 13 are provided as a guide only; the exact number depends on the chosen specialization subjects. In Module 13, courses may also take place on-site at UMIT TIROL.
[2] For example, pre- and post-preparation for contact events, in-depth reading, individual practice, exam preparation, master's thesis, and final examination.
[3] Virtual contact time = learning activities in the virtual space, in interaction with fellow students and teachers; 1 UE = 45 minutes. For example, online-supported phases of guided self-study with the completion of learning tasks (Etivities), such as case studies, data analyses, concept developments, presentations, reflections. UE = teaching units (1 UE = 45 minutes); 1 ECTS credit = 25 working hours at 60 minutes each.

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Module Title

Health IT Project Management and Process Engineering *(Compulsory Module)*

Module: **1**
Semester: **1**

Content

- Success Factors for IT Projects in Healthcare
- Initiation, Planning, Execution, Closure of Projects
- Project Mandate and Project Objectives
- Project Organization and Project Environment Analysis
- Team and Meeting Management
- Analysis, Modeling, Evaluation, and IT-supported Optimization of Business Processes
- Tendering and Selection of Information Systems
- Introduction and Operation of Information Systems

Learning outcomes

The students...

- can initiate a project and, in particular, formulate a complete project mandate and project objectives;
- can independently create a complete project plan based on a project mandate;
- can apply methods and tools of project management purposefully;
- can explain why IT projects encounter resistance and what can be done about it;
- can plan a system analysis purposefully and choose suitable methods for information gathering;
- can analyze, formally model, and evaluate clinical processes purposefully;
- are familiar with the contents of a system specification;
- are familiar with the essential steps in system selection and tendering;
- can plan a system implementation and create an introduction and training concept.

Work assignments in the guided self-study (examples):

- Reflection on personal prior experiences and assumptions regarding the topic and determination of individual learning goals and priorities
- Analysis of the success factors of selected IT projects based on various frameworks
- Formulation or supplementation of the project assignment and goal definition for an IT project
- Creation of a project plan based on a project assignment using relevant methods and software tools.
- Analysis of a process using various information gathering methods.
- Modeling and evaluation of a clinical process and identification of opportunities for improvement

LV-Code: **38N001**

Group size: **30**

Type of course: **Lecture with Exercise**

Attendance requirement: **none**

Language of instruction: **German**

Prerequisite for Participation: **none**

Exam information: **Exam-integrated course, written or oral examination**

Total ECTS credits **5**

Contact study and individual self-study in ECTS credits: **2**

Guided Self-Study in ECTS credits: **3**

Virtual contact time in UE: **20**

Qualification of the examiners

(see the current version of the study and examination regulations)

• Development of an introduction concept for a clinical application system • Summary and reflection of the essential personal content and insights in a short script or cognitive map	
Literature/Teaching Materials **Gerold Patzak, Günter Rattay** (2017). Projektmanagement: Projekte, Projektportfolios, Programme und projektorientierte Unternehmen. Linde-Verlag. 7. Auflage. **Jonathan Leviss (eds.)**. HIT or Miss: Lessons Learned from Health Information Technology Projects. 3rd edition, 2019 **Elske Ammenwerth, Reinhold Haux u.a.** (2014). IT-Projekt-management im Gesundheitswesen. Thieme. 2. Auflage. Supplementary literature and teaching materials (e.g., presentations, articles) will be provided on the teaching and learning platform.	*Instructor(s):* **(see the current schedule)**

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Module Title

Software Product Management and Requirements Engineering *(Compulsory Module)*

Module: **2**
Semester: **1**

Contents

- Product and Technology Life Cycle
- Software Development Models
- Procedural and Object-Oriented Paradigms
- Types of Software Architectures
- Requirements Management
- Gathering, Specification, and Quality Assurance of Requirements
- Software Testing and Software Quality
- Product Management

Learning outcomes

The students...

- can gather requirements for a given problem and create a solution concept.
- can identify and formally model requirements in interdisciplinary environments using appropriate information gathering methods.
- can assess the advantages and disadvantages of different software development models and system architectures.
- are familiar with the significance and various methods of software testing.

Work assignments in the guided self-study (examples):

- Reflect on personal prior experiences and assumptions about the topic and define personal learning goals and focal points.
- Analyze and model requirements for a given real-life case study through interviews and observations.
- Develop a solution concept for a case study that takes into account the previously analyzed requirements.
- Summarize and reflect on the essential personal content and insights in a short script or cognitive map.

Literature/Teaching Materials

Ian Sommerville (2010). Software Engineering Global Edition, Harlow, England: Pearson Education. ISBN-13: 978-1292096131

Supplementary literature and teaching materials (e.g., presentations, articles) will be provided on the teaching and learning platform.

LV-Code: **38N002**

Group size: **30**

Type of course: **Lecture with Exercise**

Attendance requirement: **none**

Language of instruction: **English**

Prerequisite for Participation: **none**

Exam information: **Exam-integrated course, written or oral examination**

Total ECTS credits **5**

Contact study and individual self-study in ECTS credits: **2**

Guided Self-Study in ECTS credits: **3**

Virtual contact time in UE: **20**

Qualification of the examiners **(see the current version of the study and examination regulations)**

Instructor(s): **(see the current schedule)**

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Module Title

Health Data & Decision Science and Machine Learning *(Compulsory Module)*

Module: **3**
Semester: **1**

Contents

- Statistical Testing Methods
- Uni- and multivariate statistical methods
- Linear regression and logistic regression
- Methods of health decision-making
- Causal inference and causal modeling
- Use of decision trees
- Introduction to machine learning methods (supervised/unsupervised, reinforcement learning, active learning)
- Applications, prerequisites, possibilities, and limitations of machine learning methods
- Ethical aspects
- Outlook: Big Data and causal discovery

LV-Code: **38N003**

Group size: **30**

Type of course: **Lecture with Exercise**

Attendance requirement: **none**

Language of instruction: **English, German**

Learning outcomes

The students...

- understand the common terms used in applied statistics;
- use a statistical program;
- explain the difference between correlation and causality;
- interpret, communicate, and argue the results of statistical analyses;
- recognize decision problems in clinical situations and analyze their basic components;
- construct and apply decision trees;
- explain the fundamentals and applications of machine learning methods, including their strengths, limitations, and ethical aspects.

Work assignments in the guided self-study (examples):

- Reflect on personal prior experiences and assumptions regarding the topic and define individual learning goals and priorities.
- Analyze a dataset to address a scientific question. Select an appropriate multivariate statistical method with justification, apply it, and present the results in the form of a conference presentation.
- Search for an example of decision analysis or decision tree in the literature and present it.
- Structure and analyze a decision problem with target population, action options, outcomes, and tradeoffs.
- Develop a decision tree for a given case and propose a decision.
- Find examples of supervised learning, unsupervised learning, reinforcement learning, and active learning in healthcare. Explain these approaches in a tutorial.

Prerequisite for Participation: **none**

Exam information: **Exam-integrated course, written or oral examination**

Total ECTS credits **5**

Contact study and individual self-study in ECTS credits: **2**

Guided Self-Study in ECTS credits: **3**

Virtual contact time in UE: **20**

Qualification of the examiners **(see the current version of the study and examination regulations)**

• Find, analyze, and present examples of practical applications of machine learning methods in healthcare. • Summarize and reflect on the essential personal content and insights in a short script or cognitive map.	
Literature/Teaching Materials **C Weiß** (2010). Basiswissen Medizinische Statistik, Springer **KJ Rothman, S Greenland, TL Lash** (2008). Modern Epidemiology. Lippincott Williams & Wilkins **U Siebert** (2012). Transparente Entscheidungen in Public Health mittels systematischer Entscheidungsanalyse. In: Schwartz FW et al. (Hrsg.). Public Health. Gesundheit und Gesundheitswesen. 3. Aufl. Urban & Fischer. S. 517-535 **U Siebert** (2003). When should decision-analytic modeling be used in the economic evaluation of health care? Eur J Health Econ;4(3):143-50 **T Hastie, R Tibshirani, J Friedman** (2020). The Elements of Statistical Learning. Springer **WN Venables, DM Smith, R Core Team:** An Introduction to R, cran.r-project.org/doc/manuals/r-release/R-intro.pdf **J Pearl.** Theoretical impediments to machine learning with seven sparks from the causal revolution. Technical Report R-475, 2018. arXiv preprint arXiv:1801.04016. Supplementary literature and teaching materials (e.g., presentations, articles) will be provided on the teaching and learning platform.	*Instructor(s):* **(see the current schedule)**

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Module Title

TeleHealth and Consumer Health Informatics
(Compulsory Module)

Module: **4**
Semester: **1**

Contents

- Understand the basic concepts of eHealth, mHealth, and pHealth.
- Explore electronic patient and health records.
- Examine telemedical applications.
- Study IT architectures and standards for integrated healthcare.
- Analyze success factors, best practices, and project examples.
- Explore patient-centered information systems.
- Examine mobile health technologies.
- Learn about the collection, integration, and analysis of data in the treatment process.

LV-Code: **38N004**

Group size: **30**

Type of course: **Lecture with Exercise**

Attendance requirement: **none**

Language of instruction: **English**

Learning outcomes

The students...

- can justify the significance of eHealth applications for patient care.
- understand the various stakeholders in healthcare and can present their different perspectives and goals for eHealth applications.
- are familiar with architectural forms and standards for eHealth applications and their strengths and limitations.
- can systematically analyze eHealth applications with respect to their functional, technical, procedural, and organizational components.
- understand the organizational, legal, political, and technical challenges as well as ethical implications in the introduction of eHealth and approaches to address them.

Work assignments in the guided self-study (examples):

- Reflecting on personal prior experiences and assumptions on the topic and setting personal learning goals and focal points.
- Presenting the existing evidence for the benefits and costs of selected eHealth applications (e.g., telemonitoring, patient portals).
- Analyzing and presenting central technical and organizational components of selected regional or national eHealth applications.
- Collaboratively creating a structured presentation of essential technical, syntactic, and semantic interoperability standards for eHealth applications with an analysis of selected examples.
- Summarizing and reflecting on the key personal content and insights in a short script or cognitive map.

Prerequisite for Participation: **none**

Exam information: **Exam-integrated course, written or oral examination**

Total ECTS credits **5**

Contact study and individual self-study in ECTS credits: **2**

Guided Self-Study in ECTS credits: **3**

Virtual contact time in UE: **20**

Qualification of the examiners **(see the current version of the study and examination regulations)**

Literature/Teaching Materials	*Instructor(s):* **(see the current schedule)**
Shashi Gogia, Fundamentals of Telemedicine and Telehealth, Academic Press, 2019, ISBN-10: -13: 978-0128143094 Supplementary literature and teaching materials (e.g., presentations, articles) will be provided on the teaching and learning platform.	

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Module Title

Biomedical Technologies and Interfaces *(Compulsory Module)*

Module: **5**
Semester: **1**

Contents

- Origin and Modeling of Physiological Signals and Measurements
- Concepts and Technologies for Capturing Physiological Signals, Measurements, and Image Data
- Biomedical Sensing
- Biomedical Imaging
- Characteristics and Features of Biosignals, Measurements, and Image Data
- Fundamentals of Processing and Analysis of Biosignals, Measurements, and Image Data, Derivation of Parameters, Feature Extraction
- Interfaces to Health Information Systems

LV-Code: **38N005**
Group size: **30**
Type of course: **Lecture with Exercise**
Attendance requirement: **none**
Language of instruction: **English**

Learning outcomes

The students...

- Understand the interdisciplinary requirements of biomedical engineering;
- Can explain the origin of important physiological signals and measurements and are familiar with basic models for their description;
- Can explain basic concepts and technologies for capturing physiological signals, measurements, and image data and assign specific measurement tasks;
- Can explain essential biomedical sensors and imaging procedures in their basic characteristics and compare them;
- Can establish the connection between the origin, acquisition, and resulting specific properties of biosignals, measurements, and image data;
- Can explain important methods for the processing and analysis of biosignals, measurements, and image data and understand how suitable methods are selected for a given task;
- Can define appropriate interfaces to health information systems.

Work assignments in the guided self-study (examples):

- Reflection on personal previous experiences and assumptions regarding the topic and determination of personal learning goals and focal points.
- Compilation of a glossary for essential terms and concepts related to the origin and modeling of physiological signals and measurements.
- Development of a technology for a specific medical measurement task, including signal and data evaluation.
- Analysis of a specific measurement dataset (e.g., professional EKG versus mobile EKG) regarding properties, parameters, quality, and meaningfulness.

Prerequisite for Participation: **none**
Exam information: **Exam-integrated course, written or oral examination**
Total ECTS credits **5**
Contact study and individual self-study in ECTS credits: **2**
Guided Self-Study in ECTS credits: **3**
Virtual contact time in UE: **20**
Qualification of the examiners **(see the current version of the study and examination regulations)**

• Implementation of a data evaluation concept for a telemonitoring application for a chronic illness and exemplary implementation based on self-collected test data. • Summary of essential personal content and insights in a short script or cognitive map.	
Literature/Teaching Materials **John Enderle**: Introduction to Biomedical Engineering. Academic Press. 4. Auflage, 2021 **Joseph D. Bronzino, Donald R. Peterson:** The Biomedical Engineering Handbook. CRC Press, 2015 **W. Mark Saltzman:** Biomedical Engineering: Bridging Medicine and Technology. Cambridge University Press; 2. Auflage, 2015 **Rangaraj M. Rangayyan:** Biomedical Signal Analysis. Wiley, Second Edition, 2015 Supplementary literature and teaching materials (e.g., presentations, articles) will be provided on the teaching and learning platform.	*Instructor(s):* **(see the current schedule)**

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Module Title

Interdisciplinary Perspectives of Medical Informatics *(Compulsory Module)*

Module: **6**
Semester: **1**

Contents

- Medical Informatics as a distinct discipline and its role in interdisciplinary project settings
- Introduction to neighbouring disciplines (lecture series) with the following content:
  - Organization and financing of the healthcare system;
  - Health economics;
  - Strategic management of healthcare facilities;
  - Personnel management;
  - Quality management in healthcare facilities;
  - Medical law;
  - Medical ethics;
  - Nursing science;
  - Health technology assessment;
  - Public health.

LV-Code: **38N006**

Group size: **30**

Type of course: **Lecture with Exercise**

Attendance requirement: **none**

Language of instruction: **German**

Learning outcomes

The students...

- Can explain the goals and characteristics of Medical Informatics as a distinct discipline;
- Are familiar with basic perspectives and terms from neighboring disciplines;
- Can identify the interfaces of Medical Informatics with adjacent fields and explain implications for interdisciplinary projects;
- Can perceive various perspectives on an issue and contribute to work in interdisciplinary teams.

Work assignments in the guided self-study (examples):

- Reflection on personal previous experiences and assumptions regarding the topic and determination of personal learning goals and focal points.
- Creation of a short presentation on Medical Informatics as an independent discipline and its connections to neighboring disciplines.
- Development of a joint script as well as a glossary for the essential perspectives and basic concepts of the discussed neighboring disciplines.
- Summary and reflection of the essential personal content and insights in a short script or cognitive map.

Prerequisite for Participation: **none**

Exam information: **Exam-integrated course, written or oral examination**

Total ECTS credits **5**

Contact study and individual self-study in ECTS credits: **2**

Guided Self-Study in ECTS credits: **3**

Virtual contact time in UE: **20**

Qualification of the examiners **(see the current version of the study and examination regulations)**

Literature/Teaching Materials	*Instructor(s):* **(see the current schedule)**
CA Kulikowski et al (2012): AMIA Board white paper: definition of biomedical informatics and specification of core competencies for graduate education in the discipline. JAMIA 19(6): 931–938. **P Payne et al** (2018): Biomedical informatics meets data science: current state and future directions for interaction. JAMIA Open 2018 Oct; 1(2): 136–141. **RJ Holden et al** (2018): Best Practices for Health Informatician Involvement in Interprofessional Health Care Teams. ACI 9(1): 141–148. **IMIA Yearbook of Medical Informatics** – Synopsis and Review Papers. Thieme. https://www.ncbi.nlm.nih.gov/pmc/journals/2656/ Supplementary literature and teaching materials (e.g., presentations, articles) will be provided on the teaching and learning platform.	

UMIT TIROL
DIE TIROLER PRIVATUNIVERSITÄT

Module Title

Health Information Systems and IT Strategy Management *(Compulsory Module)*

Module: **7**
Semester: **2**

Contents

- Strategic, tactical, and operational information management in healthcare
- Architectural forms of information systems in healthcare
- Modeling of hospital information systems
- Integration and interoperability in information systems
- Communication and interoperability standards in healthcare

LV-Code: **38N007**
Group size: **30**
Type of course: **Lecture with Exercise**
Attendance requirement: **none**
Language of instruction: **English**

Learning outcomes

The students...

- Can analyze and model components of information systems;
- Can analyze, describe, model, evaluate, and further develop architectures of an information system;
- Are familiar with standards for syntactic and semantic interoperability in healthcare and can describe their applications, strengths, and weaknesses;
- Can propose interoperability standards and frameworks suitable for specific problems;
- Can devise an IT strategy for a healthcare institution;
- Can identify, analyze problems in information management and propose technical and organizational solutions.

Work assignments in the guided self-study (examples):

- Reflection on personal previous experiences and assumptions regarding the topic and determination of personal learning goals and focal points.
- Creation of an IT penetration matrix for a healthcare institution.
- Analysis and modeling of a specific information system in a healthcare facility and presentation of possibilities for further development.
- Joint creation of a script compiling important syntactic and semantic interoperability standards and frameworks.
- Outline of an IT strategy for a healthcare institution.
- Summary and reflection of essential personal content and insights in a short script or cognitive map.

Prerequisite for Participation: **none**
Exam information: **Exam-integrated course, written or oral examination**
Total ECTS credits **5**
Contact study and individual self-study in ECTS credits: **2**
Guided Self-Study in ECTS credits: **3**
Virtual contact time in UE: **20**
Qualification of the examiners **(see the current version of the study and examination regulations)**

Literature/Teaching Materials

Alfred Winter, Reinhold Haux, Elske Ammenwerth, Birgit Brigl, Franziska Jahn: Health Information Systems: Architectures and Strategies. New York: Springer. 3. Auflage. 2022.

Supplementary literature and teaching materials (e.g., presentations, articles) will be provided on the teaching and learning platform.

Instructor(s): **(see the current schedule)**

UMIT TIROL
DIE TIROLER PRIVATUNIVERSITÄT

Module Title

IT-Sicherheits- und Risikomanagement *(Compulsory Module)*

Module: **8**
Semester: **2**

Contents

- Basic terms of information security (confidentiality, availability, integrity, data protection vs. data security) and risk management (scope, identification, analysis, treatment).
- IT threats (social engineering, malware, phishing, data loss) and countermeasures (encryption, system hardening, whitelisting, data backup concepts, network segmentation).
- Information security management in healthcare (ISO 2700x, ISO 27799, EU-GDPR, NISG, BSI).
- Challenges in managing information security in healthcare (security of clinical information systems, cybersecurity in medical technology, influence of information security on patient safety and care effectiveness).
- IT risk analysis for IT-supported clinical processes.

Learning outcomes

The students...

- Can correctly define and critically handle the basic concepts of information security and data protection;
- Are familiar with significant IT threats and appropriate countermeasures;
- Understand the challenges of information security in healthcare and can effectively address them in IT projects;
- Can identify, explain, and critically discuss technical and organizational measures in the realm of information security and data protection;
- Are knowledgeable about legal and normative foundations and can consider them in relevant projects;
- Can conduct a systematic and comprehensive IT risk analysis for a specific use case in healthcare;
- Can actively contribute to and support IT security projects in healthcare.

Work assignments in the guided self-study (examples):

- Reflection on personal previous experiences and assumptions regarding the topic and determination of personal learning goals and focal points.
- Discussing possible causes and consequences of IT security issues in specific healthcare use cases.
- Systematically analyzing and evaluating clinical processes in terms of safety-related aspects.
- Deriving and implementing technical and organizational measures to ensure information security for specific healthcare use cases.
- Estimating the effort and benefits of measures for information security for specific healthcare use cases.
- Creating an IT risk analysis for a specific clinical process.

LV-Code: **38N008**

Group size: **30**

Type of course: **Lecture with Exercise**

Attendance requirement: **none**

Language of instruction: **German**

Prerequisite for Participation: **none**

Exam information: **Exam-integrated course, written or oral examination**

Total ECTS credits **5**

Contact study and individual self-study in ECTS credits: **2**

Guided Self-Study in ECTS credits: **3**

Virtual contact time in UE: **20**

Qualification of the examiners **(see the current version of the study and examination regulations)**

• Summary and reflection of essential personal content and insights in a short script or cognitive map.	
Literature/Teaching Materials ISO/IEC 27001 “Information technology - Security techniques - Information security management systems – Requirements” **Brenner, Michael**, et al. Praxisbuch ISO/IEC 27001: Management der Informationssicherheit und Vorbereitung auf die Zertifizierung. Hanser Verlag, 2019. **Secorvo Security Consulting** (Hrsg.). Informationssicherheit und Datenschutz. dpunkt.verlag GmbH, 2019. **E Dulaney C Easttom.** CompTIA Security+ Study Guide: Exam SY0-501. John Wiley & Sons, 2017. **C Eckert.** IT-Sicherheit: Konzepte-Verfahren-Protokolle. Walter de Gruyter, 2013. Bundesamt für Sicherheit in der Informationstechnik (BSI). Leitfaden - Schutz Kritischer Infrastrukturen: Risikoanalyse Krankenhaus-IT, 2013. Various laws and regulations (EU Cybersecurity Act, NIS-Gesetz, etc.) Supplementary literature and teaching materials (e.g., presentations, articles) will be provided on the teaching and learning platform.	*Instructor(s):* **(see the current schedule)**

UMIT TIROL
DIE TIROLER PRIVATUNIVERSITÄT

Module Title

Data Integration for Clinical Data Analytics
(Compulsory Module)

Module: **9**
Semester: **2**

Contents

- Primary vs. Secondary Use of Clinical Routine Data
- Data Sources in the Clinical Environment
- Architecture, Development, and Application of Data Warehouse Systems
- Extraction and Integration of Data from Heterogeneous Sources
- Process from Formulating a Question to Data Analysis and Visualization

Learning outcomes

The students...

- Can explain the significance and challenges of secondary use of clinical data;
- Can identify data sources, extract, transform, and integrate data;
- Can design and technically implement clinical data warehouses and data marts;
- Can analyze data for given questions and communicate insights in a target audience-appropriate manner.

Work assignments in the guided self-study (examples):

- Reflection on personal previous experiences and assumptions regarding the topic and determination of personal learning goals and focal points.
- Design and implementation of a specific data warehouse based on sample data from various sources.
- Utilization of this data warehouse to conduct specific analyses to address relevant questions for selected target audiences.
- Summary and reflection of essential personal content and insights in a short script or cognitive map.

Literature/Teaching Materials

Vaisman A, Zimanyi E (2016). Data Warehouse Systems: Design and Implementation. Springer

Barton RD (2013). Talend Open Studio Cookbook. Packt Publishing.

Bauer A, Günzel H (2013). Data-Warehouse-Systeme: Architektur, Entwicklung, Anwendung. Dpunkt Verlag

LV-Code: **38N009**

Group size: **30**

Type of course: **Lecture with Exercise**

Attendance requirement: **none**

Language of instruction: **English, German**

Prerequisite for Participation: **none**

Exam information: **Exam-integrated course, written or oral examination**

Total ECTS credits **5**

Contact study and individual self-study in ECTS credits: **2**

Guided Self-Study in ECTS credits: **3**

Virtual contact time in UE: **20**

Qualification of the examiners **(see the current version of the study and examination regulations)**

Instructor(s): **(see the current schedule)**

Rossak I (2013). Datenintegration: Integrationsansätze, Beispielszenarien, Problemlösungen, Talend Open Studio. Carl Hanser Verlag. **Hackl WO, Ammenwerth E** (2016). SPIRIT - Systematic Planning of Intelligent Reuse of Integrated Clinical Routine Data. Meth Inf Med 55(2) 114-24. **Hackl WO, Rauchegger F, Ammenwerth E** (2015). A Nursing Intelligence System to Support Secondary Use of Nursing Routine Data. Applied Clinical Informatics 6(2): 418-28. Supplementary literature and teaching materials (e.g., presentations, articles) will be provided on the teaching and learning platform.	

UMIT TIROL
DIE TIROLER PRIVATUNIVERSITÄT

Module Title

Clinical Research Informatics and Infrastructures *(Compulsory Module)*

Module: **10**
Semester: **2**

Contents

- Tasks of IT support for clinical research
- Architectural forms for IT support in clinical research
- Integration of clinical and administrative data, even across organizational boundaries, for research inquiries
- Data protection in medicine
- Anonymization and pseudonymization of patient data
- Creation and operation of clinical and epidemiological registers and biobanks
- Interlinking of registers
- Modeling in chronic diseases
- Epidemiological modeling (including epidemics)
- Legal, regulatory, and organizational conditions for the use of research data

Learning outcomes

The students...

- Can create an IT solution concept for a given question regarding IT support for clinical research;
- Can integrate heterogeneous data sources in a central repository to address scientific questions;
- Can perform modeling based on given data to answer a specific question;
- Can assess the legal implications of a planned IT solution concept.

Work assignments in the guided self-study (examples):

- Reflection on personal previous experiences and assumptions regarding the topic and determination of personal learning goals and focal points.
- Creation of an IT solution concept and an IT architecture for a given case study, with an assessment of the legal implications.
- Utilization of an existing dataset to create a model to answer a research question and presentation of the findings in a manner suitable for the target audience.
- Ability to perform modeling based on given data to answer a specific question.
- Summary and reflection of essential personal content and insights in a short script or cognitive map.

LV-Code: **38N010**

Group size: **30**

Type of course: **Lecture with Exercise**

Attendance requirement: **none**

Language of instruction: **English**

Prerequisite for Participation: **none**

Exam information: **Exam-integrated course, written or oral examination**

Total ECTS credits **5**

Contact study and individual self-study in ECTS credits: **2**

Guided Self-Study in ECTS credits: **3**

Virtual contact time in UE: **20**

Qualification of the examiners **(see the current version of the study and examination regulations)**

Literature/Teaching Materials	*Instructor(s):*
Essential Concepts in Clinical Research: Randomised Controlled Trials and Observational Epidemiology; Elsevier; 2 edition (24 Sep 2018); ISBN-13: 978-0702073946 **Michael G. Kahn, Chunhua Weng.** Clinical research informatics: a conceptual perspective. J Am Med Inform Assoc. 2012 Jun; 19(e1): e36–e42 Supplementary literature and teaching materials (e.g., presentations, articles) will be provided on the teaching and learning platform.	**(see the current schedule)**

UMIT TIROL
DIE TIROLER PRIVATUNIVERSITÄT

Module Title

Certification of Medical Software and Devices
(Compulsory Module)

Module: **11**
Semester: **2**

Contents

- European Security Strategy
- Medical Device Regulation (MDR)
- Medical Devices Act
- Certification
- Security concepts
- Conformity assessment
- Clinical investigation
- Medical devices from the perspective of manufacturers and operators
- Software as a medical device

Learning outcomes

The students...

- Can explain what a medical device is and under what criteria medical devices are classified into classes;
- Can explain the legal framework for the approval of medical devices and apply it to specific examples;
- Can outline the basic steps and processes in the certification of medical devices from the manufacturer's perspective;
- Can explain the requirements for operators of medical devices;
- Can determine when clinical software qualifies as a medical device and understand the consequences for manufacturers and operators.

Work assignments in the guided self-study (examples):

- Reflection on personal previous experiences and assumptions regarding the topic and determination of personal learning goals and focal points.
- Collaborative creation of a short script on the essential contents of the Medical Device Regulation (MDR).
- Classification of various medical devices according to their intended purpose based on the MDR.
- Development of a security concept for a fictional clinical software.
- Description of the central steps in the process of obtaining market approval for a medical device from a regulatory perspective.
- Research on medical apps and discussion of whether they could be considered medical devices and the implications for the manufacturer.
- Summary of essential personal content and insights in a short script or cognitive map.

LV-Code: **38N011**

Group size: **30**

Type of course: **Lecture with Exercise**

Attendance requirement: **none**

Language of instruction: **German**

Prerequisite for Participation: **none**

Exam information: **Exam-integrated course, written or oral examination**

Total ECTS credits **5**

Contact study and individual self-study in ECTS credits: **2**

Guided Self-Study in ECTS credits: **3**

Virtual contact time in UE: **20**

Qualification of the examiners

(siehe Studien- und Prüfungsordnung idgF)

Literature/Teaching Materials	*Instructor(s):*
European Commission. Medical Device Regulation 2017/745. 2017. Medical Device Regulation (MDR). Beuth Verlag, 2. Auflage, 2020 **Petri Pommelin:** The Survival Guide to EU Medical Device Regulations. Books on Demand, 2017 European Commission. Medical Device Regulation 2017/745. 2017. Supplementary literature and teaching materials (e.g., presentations, articles) will be provided on the teaching and learning platform.	**(see the current schedule)**

UMIT TIROL
DIE TIROLER PRIVATUNIVERSITÄT

Module Title

Applications of Machine Learning in Health Care *(Compulsory Module)*

Module: **12**
Semester: **2**

Contents

- Deepening into machine learning methods and multivariate statistical methods
- Implementation and practical examples of application
- Interpretation of results from machine learning methods from a clinical perspective
- Decision support in clinical practice
- Information presentation (visualization) of data and results from machine learning methods for users
- Opportunities, limitations, and ethical implications of decision-support systems

Learning outcomes

The students...

- Can categorize various types of machine learning methods and describe their respective approaches;
- Can software-implement selected machine learning methods exemplarily and demonstrate their application;
- Can interpret the outputs of machine learning methods and present them in a target audience-appropriate manner;
- Are familiar with the applications of decision-support systems in clinical practice and their success factors and limitations;
- Can discuss the ethical implications of decision-support systems;
- Can identify the strengths and weaknesses of different ways to visualize data and results from machine learning methods.

Work assignments in the guided self-study (examples):

- Reflection on personal previous experiences and assumptions regarding the topic and determination of personal learning goals and focal points.
- Creation of a short script on the characteristics and statistical approaches in machine learning methods.
- Presentation of examples of the use of machine learning methods, the approaches used, and clinical applications.
- Implementation of selected machine learning methods for sample data and interpretation of results, also from a clinical perspective.
- Literature analysis and compilation of success factors for the use of decision-support systems in clinical practice.
- Reflection on ethical limits when using decision-support systems through case examples.
- Design of a study to examine which visualization methods are most informative.
- Summary and reflection of essential personal content and insights in a short script or cognitive map.

LV-Code: **38N012**

Group size: **30**

Type of course: **Lecture with Exercise**

Attendance requirement: **none**

Language of instruction: **English, German**

Prerequisite for Participation: **none**

Exam information: **Exam-integrated course, written or oral examination**

Total ECTS credits **5**

Contact study and individual self-study in ECTS credits: **2**

Virtual contact time in UE: **20**

Guided Self-Study in ECTS credits: **3**

Qualification of the examiners **(see the current version of the study and examination regulations)**

Literature/Teaching Materials	*Instructor(s):* **(see the current schedule)**
EJ Topol. High-performance medicine: the convergence of human and artificial intelligence. Nat Med. 2019;25:44–56. **ES Berner** (ed). Clinical decision support systems: theory and practice (3rd ed). Springer; 2016. **EW Steyerberg** Clinical prediction models: a practical approach to development, validation, and updating (2nd ed). Springer; 2019. Supplementary literature and teaching materials (e.g., presentations, articles) will be provided on the teaching and learning platform.	

UMIT TIROL
DIE TIROLER PRIVATUNIVERSITÄT

Module Title

Advanced Methods in Medical Informatics
(Compulsory Module)

Module: **13**
Semester: **3**

Contents

Individual specialization with a total scope of 15 ECTS credits on selected topics, which can be freely combined. In light of the intended learning outcomes, within the framework of this Compulsory Module, courses from the accredited master's programs in Mechatronics and Public Health at UMIT TIROL, as well as from other accredited programs, can be taken. For this purpose, a positive list is provided by the Study and Examination Commission at the beginning of the academic year, describing the subjects for which an automatic accreditation of the completed examination performance is possible. The selection of the chosen courses must be made by the students by the beginning of the 3rd semester. The module coordinator advises the students as needed on the choices and individual profile formation. If equivalence is determined by the responsible Study and Examination Commission, the required study performance of up to 15 ECTS credits can also be obtained through participation in university-related, related summer/winter schools, or by enrolling in relevant courses at UMIT TIROL or other post-secondary educational institutions. In this case, an application for approval and accreditation must be submitted to the Study and Examination Commission in advance.

Note: Depending on the curriculum planning, the chosen courses may also take place in person at UMIT TIROL.

LV-Code: **See Code of the selected module**

Group size: **30**

Type of course: **Lecture with Exercise**

Attendance requirement: **none**

Language of instruction: **Englisch**

Prerequisite for Participation: **none**

Exam information: **Exam-integrated course, written or oral examination**

Learning outcomes

The students...

- Acquire knowledge on selected topics in medical informatics, medical technology, health technology, public health, epidemiology, or other health-related subjects;
- Deepen competencies in interdisciplinary discourse and enhance the ability to operate effectively in interdisciplinary groups.

Work assignments in the guided self-study (examples):

- Individuelle Arbeitsaufträge je nach gewähltem Fach
- Zusammenfassung und Reflexion des Bezugs der Themen zur Medizinischen Informatik

Total ECTS credits **15**

Contact study and individual self-study in ECTS credits: **10**

Guided Self-Study in ECTS credits: **5**

Virtual contact time in UE: **100**

Qualification of the examiners **(see the current version of the study and examination regulations)**

Literature/Teaching Materials

Specific literature depending on the courses attended.

Instructor(s): **(see the current schedule)**

UMIT TIROL
DIE TIROLER PRIVATUNIVERSITÄT

Module Title

Applied Practice in Medical Informatics *(Compulsory Module)*

Modul: **14**
Semester: **3**

Contents

- Planning and implementation of an individual project in collaboration with a healthcare institution, research facility, or the health IT or medical technology industry.
- Identification and solution of a practical problem in medical informatics using learned scientific and technical methods and tools.
- Oral and written reporting on goals, procedures, and results.
- Critical reflection on the acquired knowledge.
- Topic Search: The module coordinator provides a list of possible topics with selected partners (hospitals, other healthcare institutions, research institutes, health IT industry, medical technology industry). Students can also propose their own topics.
- Process: The topic, goal, procedure, and conditions are agreed upon between students and the module coordinator at the beginning of the module. The module coordinator monitors progress and provides guidance in case of problems. At the conclusion, there is an oral and written presentation (in German or English) of the goals, approach, and results.

Learning outcomes

The students...

- Develop a time and work plan for a given objective.
- Execute the planning in a timely and goal-oriented manner and address encountered problems.
- Reflectively apply methods, approaches, and tools learned in studies to solve a practical problem.
- Communicate convincingly and purposefully with various professional groups and different hierarchical levels.
- Structure and present results in a target audience-oriented manner, both in writing and orally.
- Expand their competence in action and problem-solving in practical situations.
- Gain insight into selected areas of activity in medical informatics, providing exposure to potential career paths.
- Develop self-management and self-organization skills.

Work assignments in the guided self-study (examples):

- Elaboration of a detailed work and time plan, with necessary clarification of objectives for the given problem statement.
- Conduct a literature and material analysis to decide on the methodological approach.
- Independently implement the project plan and provide regular reporting to cooperation partners and the module coordinator.
- Draft a written final report.
- 5. Oral presentation.

LV-Code: **38N014**

Group size: **30**

Type of course: **Lecture with Exercise**

Attendance requirement: **none**

Language of instruction: **English**

Prerequisite for Participation: **none**

Exam information: **Exam-integrated course, written or oral examination**

Total ECTS credits **10**

Contact study and individual self-study in ECTS credits: **1**

Guided Self-Study in ECTS credits: **9**

Virtual contact time in UE: **10**

Qualification of the examiners

(see the current version of the study and examination regulations)

Literature/Teaching Materials	*Instructor(s):*
Translation: UMIT TIROL Guide for the Practical Project in the Master's Program in Medical Informatics. Individual literature depending on the chosen topic.	**(see the current schedule)**

UMIT TIROL
DIE TIROLER PRIVATUNIVERSITÄT

Module Title

Research Methods and Scientific Writing
(Compulsory Module)

Module: **15**
Semester: **3**

Contents

- Science and Scientific Evidence
- Fundamentals of Scientific Methods (including hypotheses, objectivity, deduction, induction, observation, and experiments)
- Research and Research Process: From identifying research gaps to formulating research questions
- Literature search and literature evaluation
- Scientific work, formulation of research questions and hypotheses, development of a study plan, conducting a scientific investigation
- Structure of a scientific paper
- Written and oral presentation and defense of research results
- Evaluation of scientific works, the review process, providing critical and constructive feedback
- Scientific integrity, prevention of scientific misconduct, and consideration of gender-sensitive language regulations

LV-Code: **38N015**

Group size: **30**

Type of course: **Lecture with Exercise**

Attendance requirement: **none**

Language of instruction: **English, German**

Learning outcomes

The students...

- Have a thorough understanding of basic scientific paradigms and can apply them contextually within the field of Medical Informatics.
- Are aware of the rules of scientific integrity and their significance for proper scientific work.
- Know the fundamental steps of the research process and can apply them using examples, implementing them in their own future research work.
- Can effectively find, understand, and use scientific literature relevant to a given research question through appropriate search strategies.
- Can correctly apply rules for scientific citation and know how to avoid plagiarism.
- Can deliver a well-structured oral scientific presentation in English tailored to the audience.
- Are familiar with the basic structure of a scientific article and can assess its quality.
- Can comprehend and summarize the content of more extensive English-language articles.
- Can provide constructive and clearly formulated feedback.
- Can explain and defend their own results.
- Test and enhance their communication and presentation skills, as well as improve their language proficiency.

Work assignments in the guided self-study (examples):

- Reflection on personal prior experiences and assumptions regarding the topic and determination of individual learning goals and priorities.

Prerequisite for Participation: **none**

Exam information: **Exam-integrated course, written or oral examination**

Total ECTS credits **5**

Contact study and individual self-study in ECTS credits: **2**

Guided Self-Study in ECTS credits: **3**

Virtual contact time in UE: **20**

Qualification of the examiners **(see the current version of the study and examination regulations)**

• Identification of five current scientific publications on a selected research question. • Creation of an abstract for a publication and comparison of the personal abstract with those prepared by the authors. • Assessment of the quality of a scientific study based on previously established criteria. • Presentation of a selected scientific article as a scientific presentation at an international conference, adhering to given guidelines and delivering the presentation in English. • Providing critical and constructive feedback on a selected presentation. • Summarization and reflection on the essential personal content and insights in a short script or cognitive map.	
Literature/Teaching Materials **VJ Watzlaf** (2017). Health Informatics Research Methods: Principles and Practice. AHIMA. 2nd edition. https://www.ahimapress.org/Watzlaf5320/ **Diana Communication Training:** http://www.diana.ibg.uu.se/ UMIT TIROL Plagiarism Policy in the current version Supplementary literature and teaching materials (e.g., presentations, articles) will be provided on the teaching and learning platform.	*Instructor(s):* **(see the current schedule)**

UMIT TIROL
DIE TIROLER PRIVATUNIVERSITÄT

Module Title

Master thesis (written thesis and oral exam)

Master-Arbeit (schriftliche Ausarbeitung und mündliche Prüfung) incl. Master-Kolleg (Compulsory Module)

Module: **16**
Semester: **4**

Contents

In accordance with the current regulations of the study and examination regulations, students in the Master's program in Medical Informatics are required to write a scientific thesis on a topic relevant to medical informatics at the end of their studies (conducting an empirical or conceptual research project). The Master's thesis should provide information on the objective, methods used, and results achieved following the principles of scientific work. It involves the transfer of learned methods and procedures to the solution of a scientifically relevant research problem. The ability to research, critically analyze, and use scientific literature is presupposed.

As part of the oral, publicly accessible final examination, which takes place in person at UMIT TIROL, the student presents the results in a scientifically structured and concise manner, explaining and defending them. The candidate's ability to engage in scientific discourse (presentation and response behavior) is also assessed.

The accompanying Master's colloquium covers the following content:

- Formulation of one's own research question
- Planning and implementation of the research project
- Time and work planning, milestones, self-management
- Structure and systematics of the Master's thesis
- Literature search and proper citation
- Dealing with problems
- Written and oral presentation as well as defense of one's own research results
- Sensitization regarding the avoidance of scientific misconduct and consideration of gender-sensitive language.

Group size:
30

Type of course:
Project work in connection with a colloquium

Attendance requirement:
Yes

Language of instruction:
English, German

Learning outcomes

The students...

- engage in-depth with a specific topic in Medical Informatics;
- can identify and refine a scientifically relevant research question;
- can project the processing of the identified research question in a scientifically structured manner, applying methods of project management among others;
- are capable of selecting suitable methods and approaches for addressing the research question and subsequently applying them;
- are able to use scientific literature for problem-solving;

Prerequisite for Participation:
Successfully completed all other modules

Exam information:
Written and oral examination

- can independently conduct a scientific project in a timely and goal-oriented manner and write a scientific thesis;
- can present the research conception, progress, and results in a scientifically structured and concise manner;
- are able to explain and defend the results;
- can critically reflect on what has been learned and achieved;
- are sensitive to the use of gender-sensitive language and implement it;
- are sensitive to avoiding scientific misconduct;
- can provide constructive feedback on presented results.

Work assignments in the guided self-study (examples):

Writing the master's thesis with the following requirements:

- Clear formulation of the research problem in the context of current research literature,
- Precise and understandable presentation of the chosen methods,
- Structured presentation and critical discussion of the obtained results.

Throughout their research process, students are continuously accompanied by supervision appointed by the Study and Examination Committee. Additionally, the ongoing colloquium reports on the current state of research, and this is discussed within the group.

Literature/Teaching Materials

UMIT TIROL Guideline for the Master's Thesis in the Master's Program in Medical Informatics.

Individual literature depending on the chosen topic.

Total ECTS credits
30

Contact study and individual self-study in ECTS credits:
3

Guided Self-Study in ECTS credits:
27

Virtual contact time in UE:
30

Qualification of the examiners
(see the current version of the study and examination regulations)

Instructor(s):
(see the current schedule)